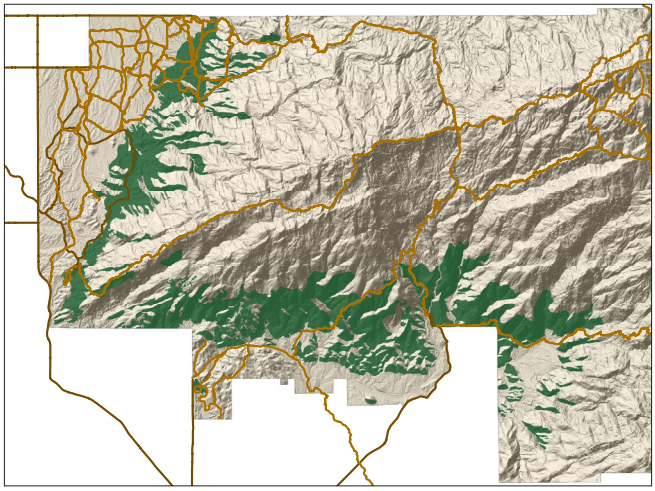
National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science

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

Volume II, Association Summaries

Natural Resource Report NPS/SODN/NRR—2021/2237







ON THE COVER

Clockwise from top left: Distribution map, representative photo, and satellite image of the (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland Association, found in both districts of Saguaro National Park. NPS photos and graphics.

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

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Natural Resource Report NPS/SODN/NRR—2021/2237

Prepared by
Jeff Galvin
Sarah E. Studd
Sonoran Desert Network
National Park Service
12661 E. Broadway Blvd.
Tucson, Arizona 85748

Editing and Design
Alice Wondrak Biel
Patty Valentine-Darby
Sonoran Desert Network
National Park Service
12661 E. Broadway Blvd.
Tucson, Arizona 85748

March 2021

U.S. Department of the Interior
National Park Service
Natural Resource Stewardship and Science
Fort Collins, Colorado

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Please cite this publication as:

Galvin, J., and S. E. Studd. 2021. Vegetation inventory, mapping, and characterization report, Saguaro National Park: Volume II, association summaries. Natural Resource Report NPS/SODN/NRR—2021/2237. National Park Service, Fort Collins, Colorado. https://doi.org/10.36967/nrr-2284793.

NPS 151/175128, March 2021

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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 National Vegetation Classification (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 II of three volumes comprising the Saguaro National Park Vegetation Mapping Inventory. This volume provides two-page summaries of the 97 associations identified and mapped during the project, and detailed in Volume I. Summaries are presented by district, starting with the Tucson Mountain District. These summaries are abridged versions of the full association descriptions found in Volume III.

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 II of three volumes comprising the Saguaro National Park Vegetation Mapping Inventory. On the following pages are two-page summaries of the 97 associations identified and mapped during the project and detailed in Volume I of the report. These summaries are abridged versions of the full association descriptions provided in Volume III.

Summaries are presented by district, starting with the Tucson Mountain District. Each summary briefly describes the floristic and structural characteristics of the vegetation and includes:

1. A representative photo of the association (left-side page),
2. The association's distribution across the district (top of right-side page), and
3. An example of the satellite imagery for one polygon (bottom of right-side page).

When distribution is limited to a certain part of a district, the area shown in the distribution map is indicated by the red box in an accompanying district map.

In the text, numbers to the first decimal in parentheses indicate frequency. A plant with a value of (1.0) means that species was documented in every plot (100%) of that association. Readers may refer to the digital maps and databases accompanying this report for more detail.

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

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

Common species

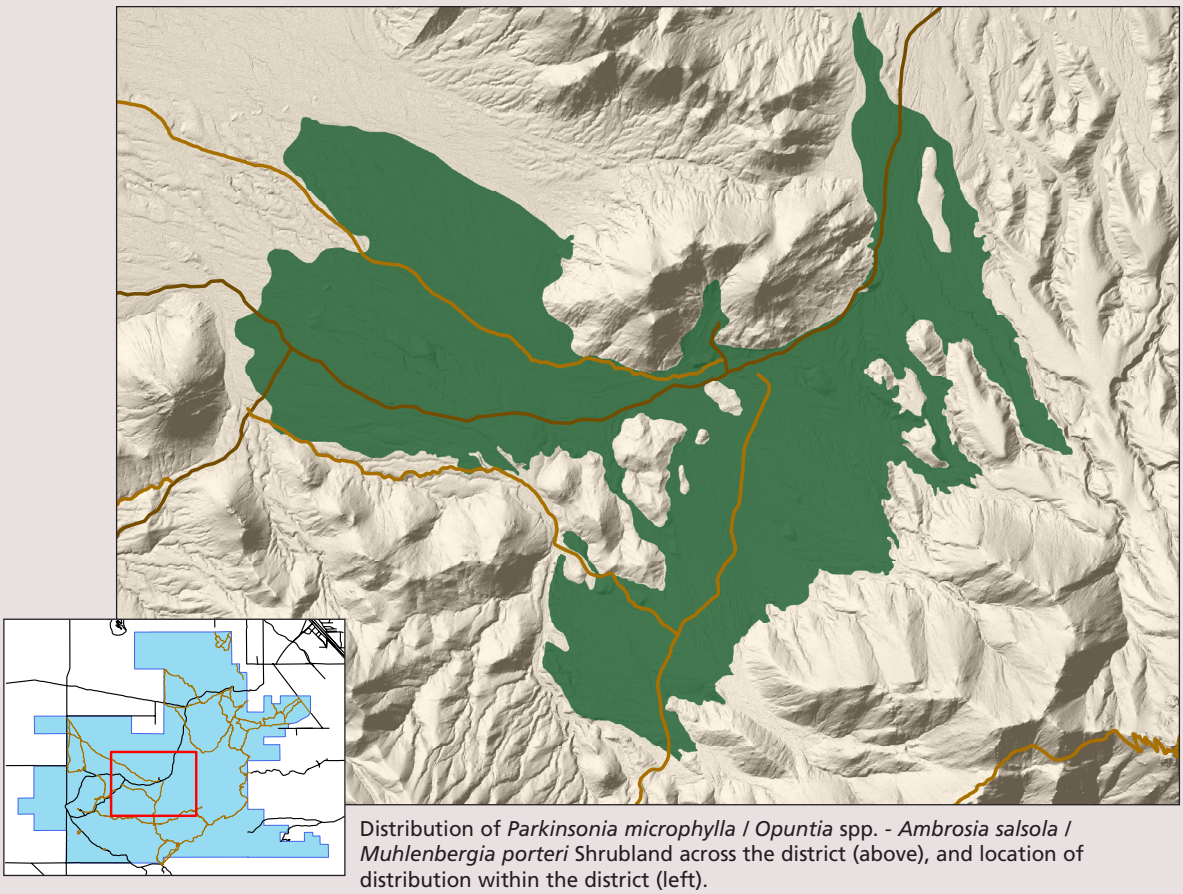
- *Parkinsonia microphylla*
- *Ambrosia salsola*
- *Opuntia engelmannii*
- *Opuntia phaeacantha*
- *Muhlenbergia porteri*

This association is characterized by an open (<10% cover) 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* spp.), and a field stratum (<0.5 m) dominated by bush muhly (*Muhlenbergia porteri*). Yellow paloverde (*P. microphylla*) presents 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 or (rarely) surpassing that of yellow paloverde (*P. microphylla*). Burrobush (*A. 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 that of burrobush (*A. salsola*). These species form large, round individual clumps spaced widely apart. The field layer is quite sparse in this association, with bushy muhly (*M. porteri*) as the sole dominant with consistent (1.0) cover of around 2%. Other noteworthy field components include pinkflower hedgehog cactus (*Echinocereus fasciculatus*), spidergrass (*Aristida ternipes*), purple threeawn (*Aristida purpurea*), and slender janusia (*Cottsia gracilis*).

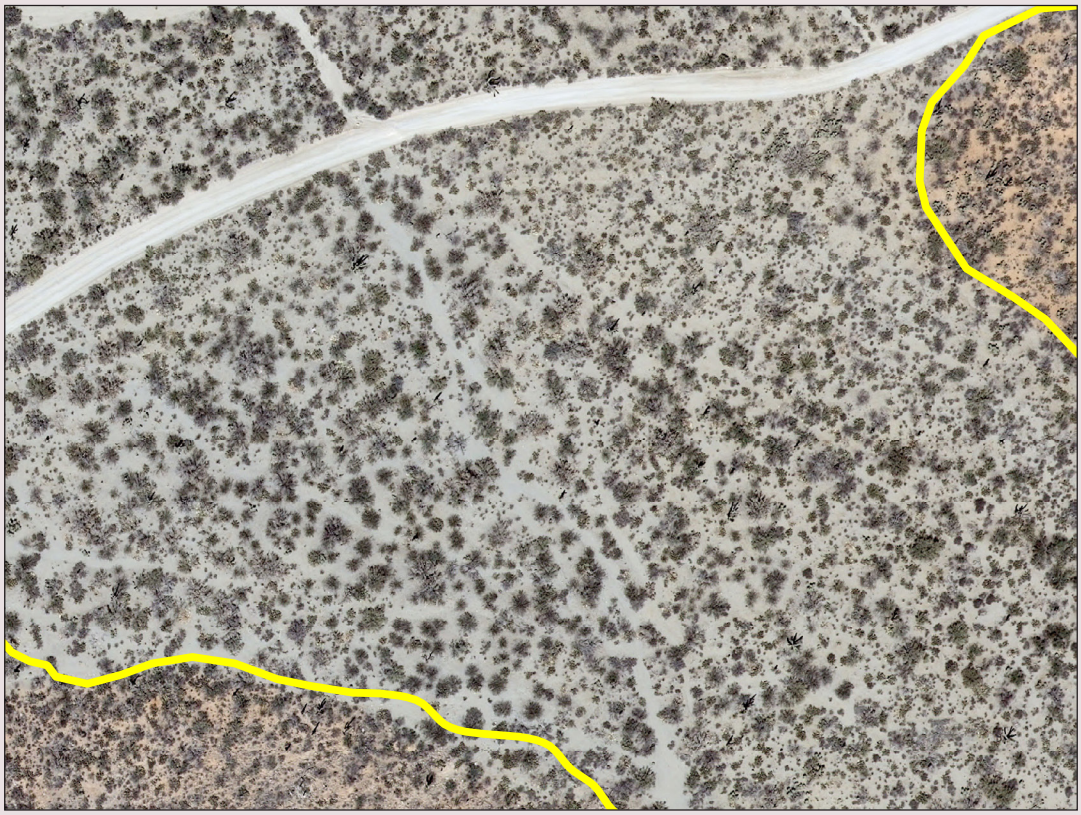
This community covers 3% (328 ha/791 ac) of the Tucson Mountain District and is found along a major drainage/alluvial-fan system running northwest from the Wasson Peak area. Elevation ranges from approximately 700 to 968 meters (2,300–3,175 ft), with most areas occurring above 760 meters (2,500 ft) within this range. Old and new alluvial-gravel dominance is characteristic of these generally north–northwest-trending flats.



Example of *Parkinsonia microphylla* / *Opuntia* spp. - *Ambrosia salsola* / *Muhlenbergia porteri* Shrubland.



Distribution of *Parkinsonia microphylla* / *Opuntia* spp. - *Ambrosia salsola* / *Muhlenbergia porteri* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

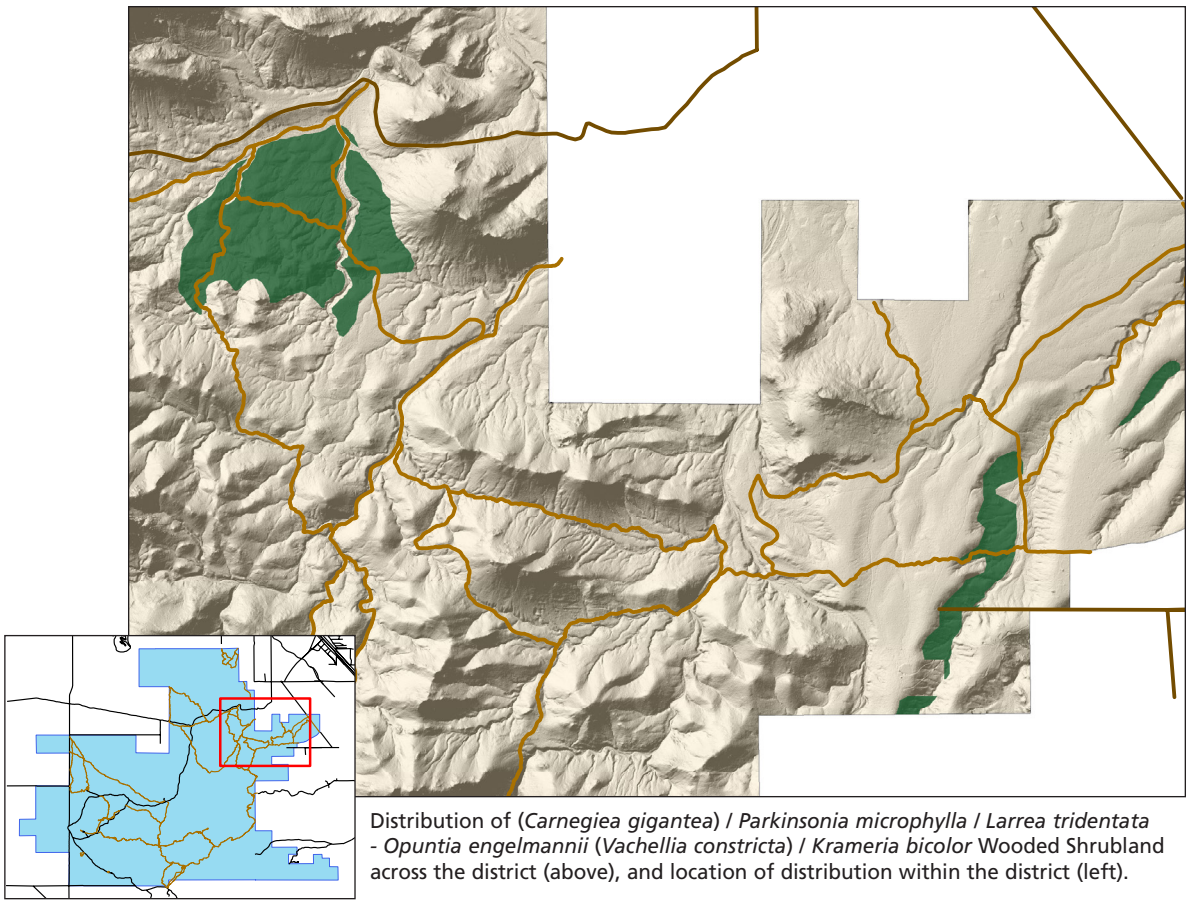
- *Carnegiea gigantea*
- *Parkinsonia microphylla*
- *Larrea tridentata*
- *Vachellia constricta*
- *Krameria bicolor*

This community is characterized by a very open (<5% cover) 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. Yellow paloverde (*P. microphylla*) averages 3% cover, growing mostly as small trees up to four meters in height. Saguaro (*Carnegiea gigantea*) is a consistent (1.0) associate, with average cover of around 1%. Ocotillo (*Fouquieria splendens*) is a patchy (0.67), low-cover (<1%) associate. Whitethorn acacia (*V. constricta*) and creosote (*L. tridentata*) are very consistent (1.0) subcanopy dominants, with average cover of around 5% and 2%, respectively. Buckhorn cholla (*Cylindropuntia acanthocarpa*) is a consistent (1.0), low-cover (1%) associate. White ratany (*K. 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 (*Cylindropuntia 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*).

This community covers 0.5% (55 ha/136 ac) of the Tucson Mountain District in two small locations, one south of Picture Rocks Road, near the Mule Deer Trail, and the other along the eastern boundary near Veterans Trail. It 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.



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



Distribution of (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Larrea tridentata* - *Opuntia engelmannii* (*Vachellia constricta*) / *Krameria bicolor* Wooded Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

- *Parkinsonia microphylla*
- *Fouquieria splendens*
- *Encelia farinosa*
- *Cottsia gracilis*

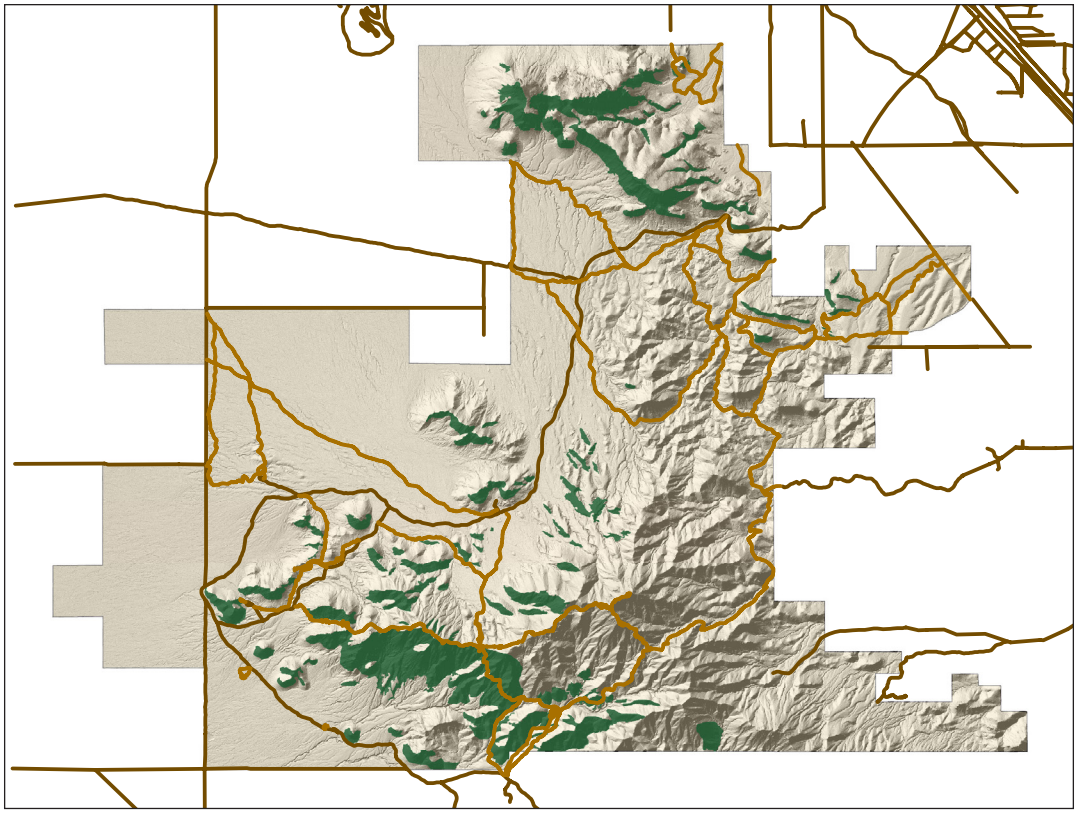
This shrubland association is characterized by a sparse (<10% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and ocotillo (*Fouquieria splendens*), with a variable (8–35% cover) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) and slender janusia (*Cottsia gracilis*). Ocotillo (*F. splendens*) is a very consistent (>0.9) common associate, with individuals 3–4 meters tall providing around 1–3 [8]% cover throughout. Yellow paloverde (*P. microphylla*) is also a consistent (1.0) associate that rarely surpasses 5% cover. 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 a mix of low-cover associate shrubs and succulents. At the Rincon Mountain District (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 the Tucson Mountain District (TMD). The field stratum is characterized by the dominance of brittlebush (*E. farinosa*), which is the most consistent (1.0) and highest-cover (5–10 [20]%) species in this community. Slender janusia (*C. gracilis*) is the next most-dominant species, providing consistent (>0.8) cover averaging around 3% across the community.

This shrubland is contained within a two-association map class that covers 8% (833 ha/2,058 ac) of the TMD. It is widely distributed across the slopes southwest of Wasson Peak and south of Safford Peak. This community prefers steep, exposed, south-facing slopes from 840 to 1,470 meters (2,755–4,822 ft). The ground surface is covered with very coarse gravel and rock, with vast expanses of bedrock outcrops/shelves.

This association is one of five found in both the TMD and the RMD (see page 44).



Example of (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland.



Distribution of (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland across the district.



Example of satellite imagery for one polygon.

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

(Yellow paloverde) / Creosote - Mixed Cacti / Triangle bur ragweed Shrubland Association (P)

Common species

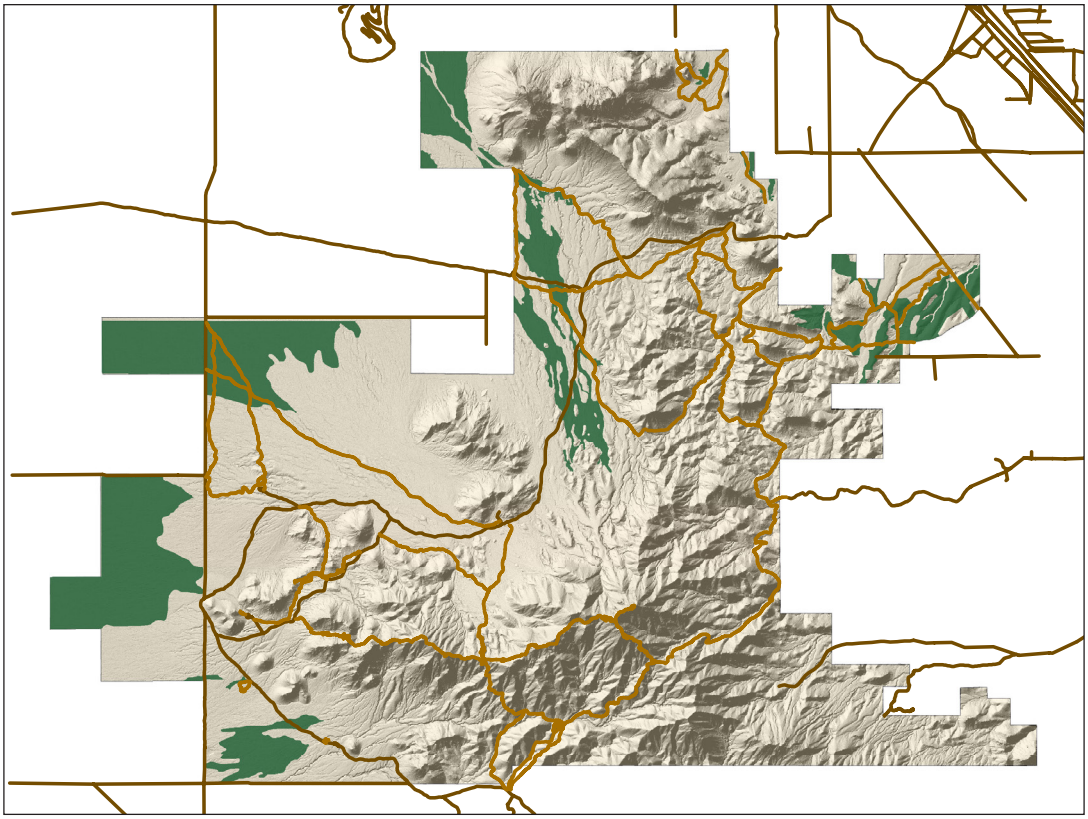
- *Parkinsonia microphylla*
- *Larrea tridentata*
- *Cylindropuntia fulgida*
- *Opuntia engelmannii*
- *Ambrosia deltoidea*

This community is characterized by an open (<10% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*), a variable (5–20% cover) subcanopy (0.5–2 m) dominated by creosote and a diverse suite of succulents, and a sparse (<5% cover) field stratum (<0.5 m) dominated by triangle bur ragweed (*Ambrosia deltoidea*). Yellow paloverde *(P. microphylla*) grows as a short (3 m) tree contributing cover that typically ranges from 2% to 5%, with occasional dense inclusions up to 10%. Saguaro (*Carnegiea gigantea*) is present as a low-density associate in all examples of this community, with a median of seven individuals per classification plot. Creosote (*L. tridentata*) is the most dominant species, providing consistent (1.0) cover that typically ranges from 3% to 10%, with some dense inclusions 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*). Triangle bur ragweed (*A. deltoidea)* is a consistent (1.0) dominant in the field stratum, contributing with cover ranging from 3% to 6%.

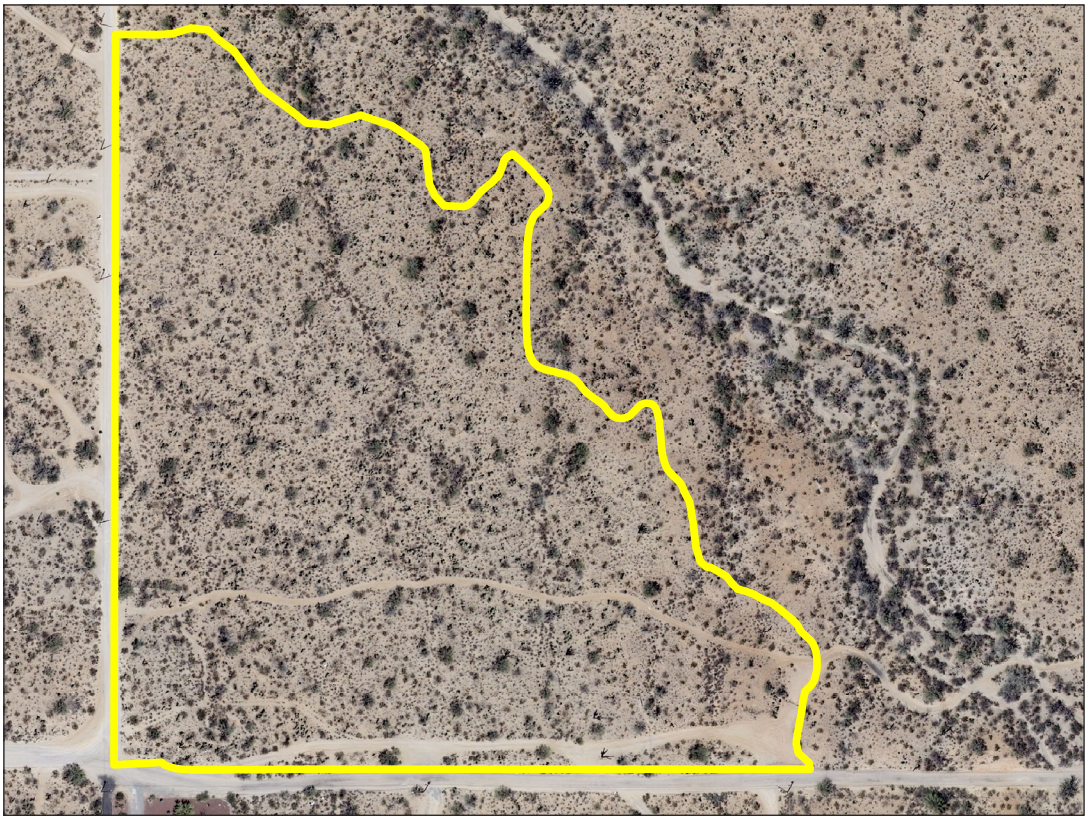
This community covers 12% (1,222 ha/3,020 ac) of the Tucson Mountain District, mainly along the west and northwestern boundaries. It typically occurs on very gravelly alluvial fans and low hillslopes in the district's lowest elevations. Elevation ranges up to 878 meters (2,880 ft). The geology of this association is generally a mix of old and new alluvium, though igneous inclusions underlay some hillslope examples.



Example of (*Parkinsonia microphylla*) / *Larrea tridentata* - Mixed Cacti / *Ambrosia deltoidea* Shrubland.



Distribution of (*Parkinsonia microphylla*) / *Larrea tridentata* - Mixed Cacti / *Ambrosia deltoidea* Shrubland across the district.



Example of satellite imagery for one polygon.

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

[Rough jointfir - Mariola - Creosote] Shrubland Association (P)

Common species

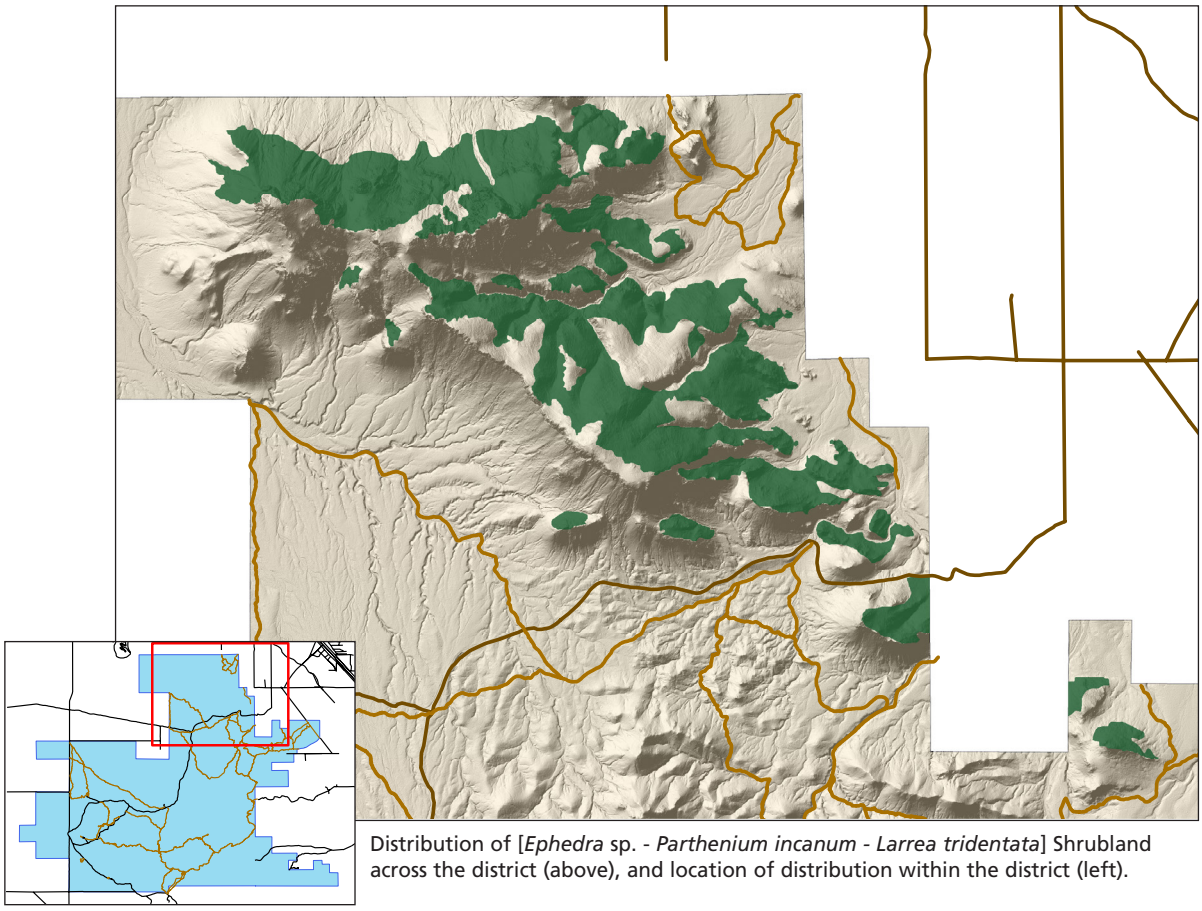
- *Larrea tridentata*
- *Ephedra aspera*
- *Parthenium incanum*

This shrubland association is characterized by a very open (<5% cover) 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, forming a relatively stunted shrubland with the majority of shrubs growing ≤1 meter tall. When present, yellow paloverde (*Parkinsonia microphylla*) is a short tree (2–3 m) that provides cover of 1–3%. Creosote (*L. tridentata*) provides consistent (1.0) cover of 5–15%, often recorded as a medium-sized (1–1.5 m) shrub. Other documented subcanopy species include Wright's beebrush (*Aloysia wrightii*), wolfberry (*Lycium* spp.), and buckhorn cholla (*Cylindropuntia acanthocarpa*). Rough jointfir (*E. aspera*) and mariola (*P. incanum*) present as co-dominants or with one becoming the sole dominant and the other a subdominant. Both species provide consistent (1.0), 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*), and shrubby thoroughwort (*Koanophyllon solidaginifolium)*.

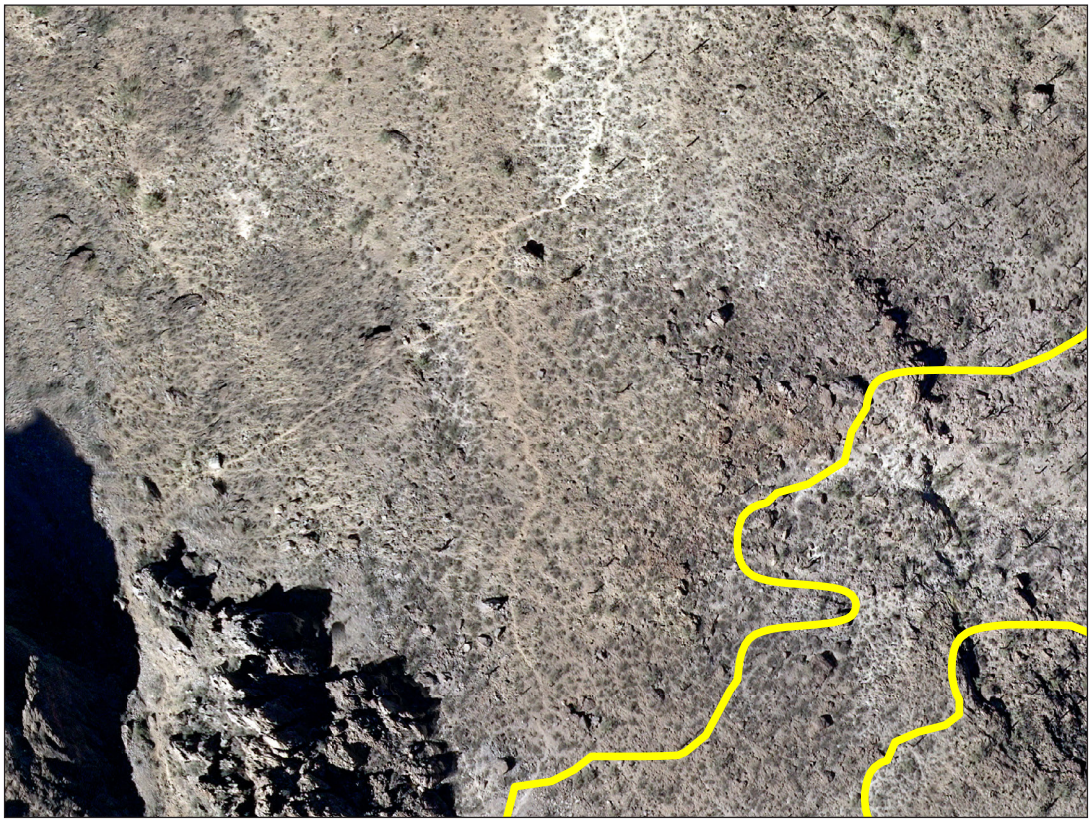
This community is contained within a two-association map class that covers 3% (295 ha/729 ac) of the Tucson Mountain District, exclusively in the vicinity of Safford Peak, in the northern portion of the district. It occurs on the northeast-facing, rocky backslopes at approximately 884–975 meters (2,900–3,200 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.



Example of [*Ephedra* sp. - *Parthenium incanum - Larrea tridentata*] Shrubland.



Distribution of [*Ephedra* sp. - *Parthenium incanum* - *Larrea tridentata*] Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

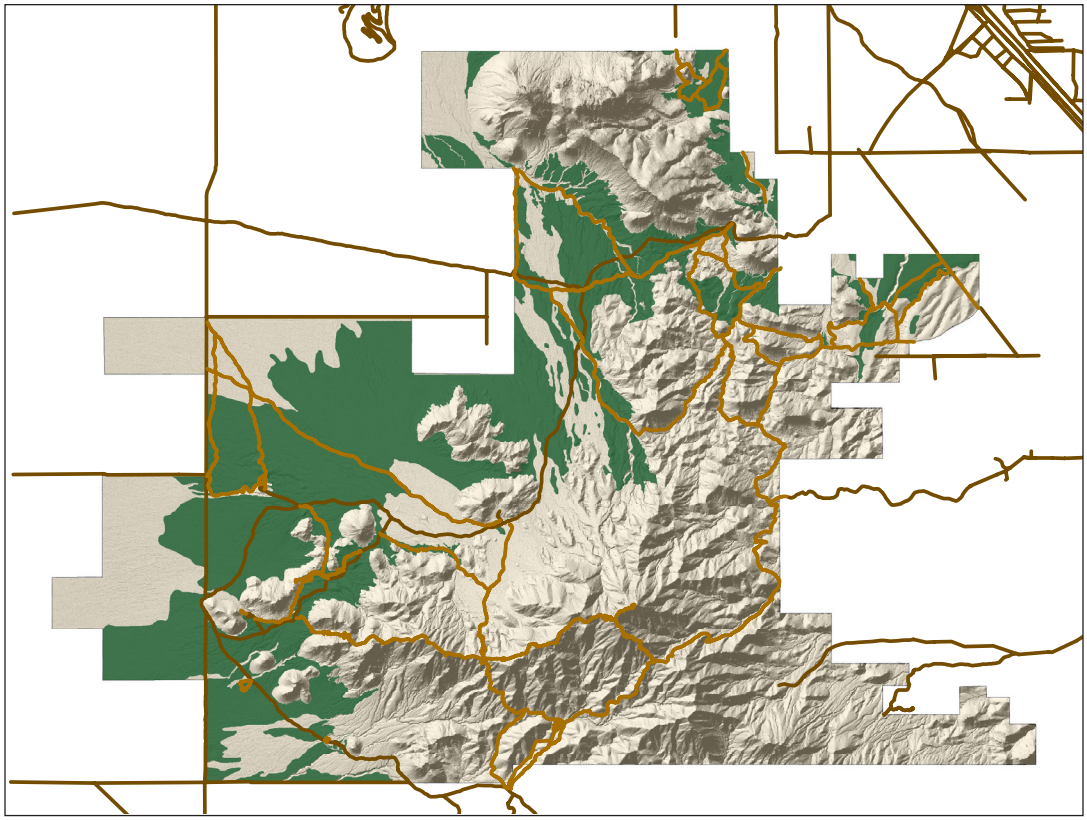
- *Carnegiea gigantea*
- *Parkinsonia microphylla*
- *Olneya tesota*
- *Ambrosia deltoidea*
- *Opuntia engelmannii*

This shrubland is characterized by an open (<10% cover) 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 cover and diversity. Yellow paloverde (*P. microphylla*) is a consistent (1.0), small (2–3 m) tree with average cover of around 3%, with some dense inclusions up to 10%. Desert ironwood (*O. tesota*) is a patchy (0.66) associate that, when present, contributes cover of 1–2%, with occasional dense inclusions where it outcompetes yellow paloverde (*P. microphylla*). Saguaro (*Carnegiea gigantea*) is documented in all examples of this community, typically providing cover of around 1%. The subcanopy (0.5–2 m) is characterized by a variable mix of succulents that, 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. The field stratum is dominated by triangle bur ragweed (*A. deltoidea*), typically with cover of 3–8%, including some dense inclusions up to 12%. This species often has the greatest cover of all species present and accounts for roughly 20% of the total cover.

This community covers 27% (2,728 ha/6,741 ac) of the Tucson Mountain District (TMD). It is restricted to alluvial landforms that predominate in the western half of the TMD, but are found in the northern, eastern, and southern areas of the park from 683 to 1,042 meters (2,240–3,420 ft). This community is generally found on lower to upper alluvial fans and lower toeslopes of hills, but is occasionally located on mountain slopes. Parent materials are most commonly a mix of new and old alluvium, and on slopes, also include mixed colluvium, extrusive, and intrusive igneous rock.



Example of *Carnegiea gigantea* / *Parkinsonia microphylla* (*Olneya tesota*) / *Ambrosia deltoidea* Shrubland.



Distribution of *Carnegiea gigantea* / *Parkinsonia microphylla* (*Olneya tesota*) / *Ambrosia deltoidea* Shrubland across the district.



Example of satellite imagery for one polygon.

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

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

Common species

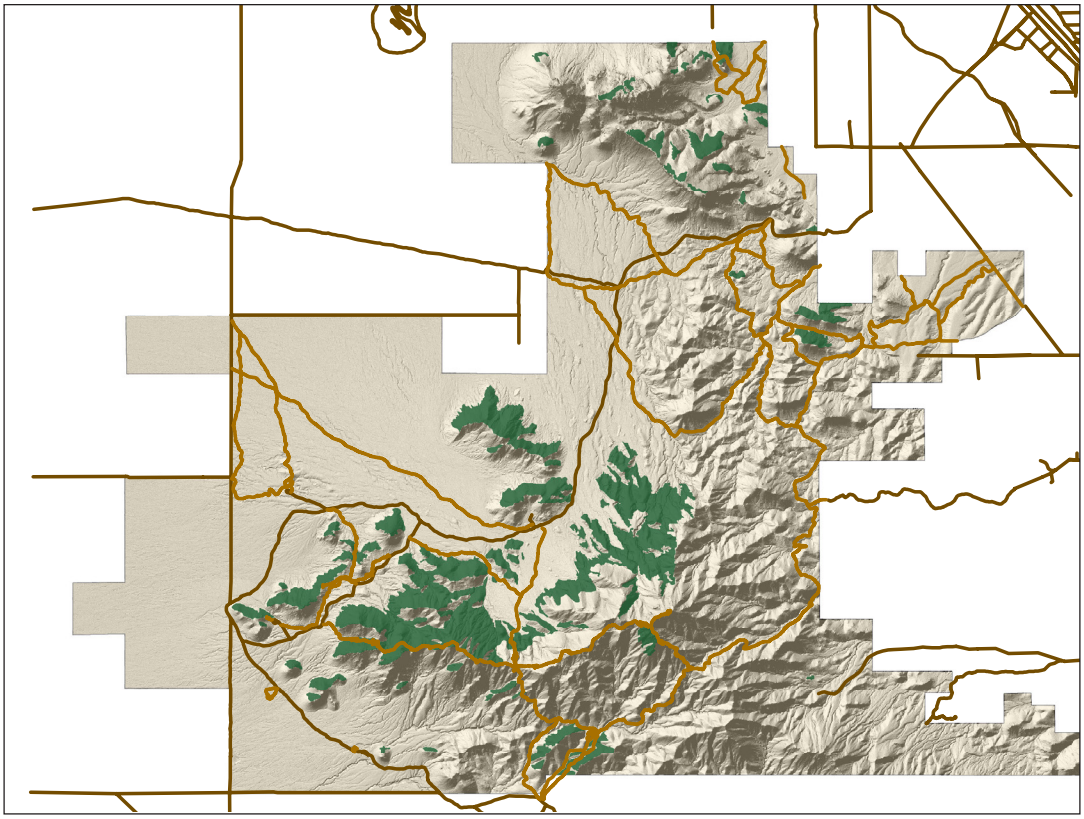
- *Parkinsonia microphylla*
- *Vachellia constricta*
- *Cylindropuntia acanthocarpa*
- *Calliandra eriophylla*
- *Cottsia gracilis*

This shrubland association is characterized by an open (<10% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a variable (5–20% cover) understory defined by a unique suite of microphyllus shrubs, most commonly dominated by whitethorn acacia (*Vachellia constricta*) and buckhorn cholla (*Cylindropuntia acanthocarpa*). Yellow paloverde (*P. microphylla*) is present in all examples of this association, typically growing as 2–3 meter tall trees, with cover of 1–3%. Saguaro (*Carnegiea gigantea*) and ocotillo (*Fouquieria splendens*) are consistent (>0.9), low-cover (<1%) associates. Buckhorn cholla (*C. acanthocarpa*) and whitethorn acacia (*V. constricta*) are consistent (>0.95) dominants that, when present, provide average cover of around 3% each, with some dense inclusions up to 10%. Berlandier's wolfberry (*Lycium berlandieri*), catclaw acacia (*Senegalia greggii*), creosote (*Larrea tridentata*), and prickly pear (*Opuntia* spp.) are low-cover (1%) associates that may appear locally dominant over small or topographically complex areas. 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.

This community covers 7.6% (762 ha/1,883 ac) of the Tucson Mountain District and is common along the north side of the Hugh Norris Trail ridgeline, surrounding Golden Gate Road, on both the higher backslopes and lower hillslopes. It 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.



Example of *Cylindropuntia acanthocarpa - Vachellia constricta / Calliandra eriophylla - Cottsia gracilis* Shrubland.



Distribution of *Cylindropuntia acanthocarpa - Vachellia constricta / Calliandra eriophylla - Cottsia gracilis* Shrubland across the district.



Example of satellite imagery for one polygon.

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

Yellow paloverde / Triangle bur ragweed Shrubland Association (P)

Common species

- *Parkinsonia microphylla*
- *Ambrosia deltoidea*

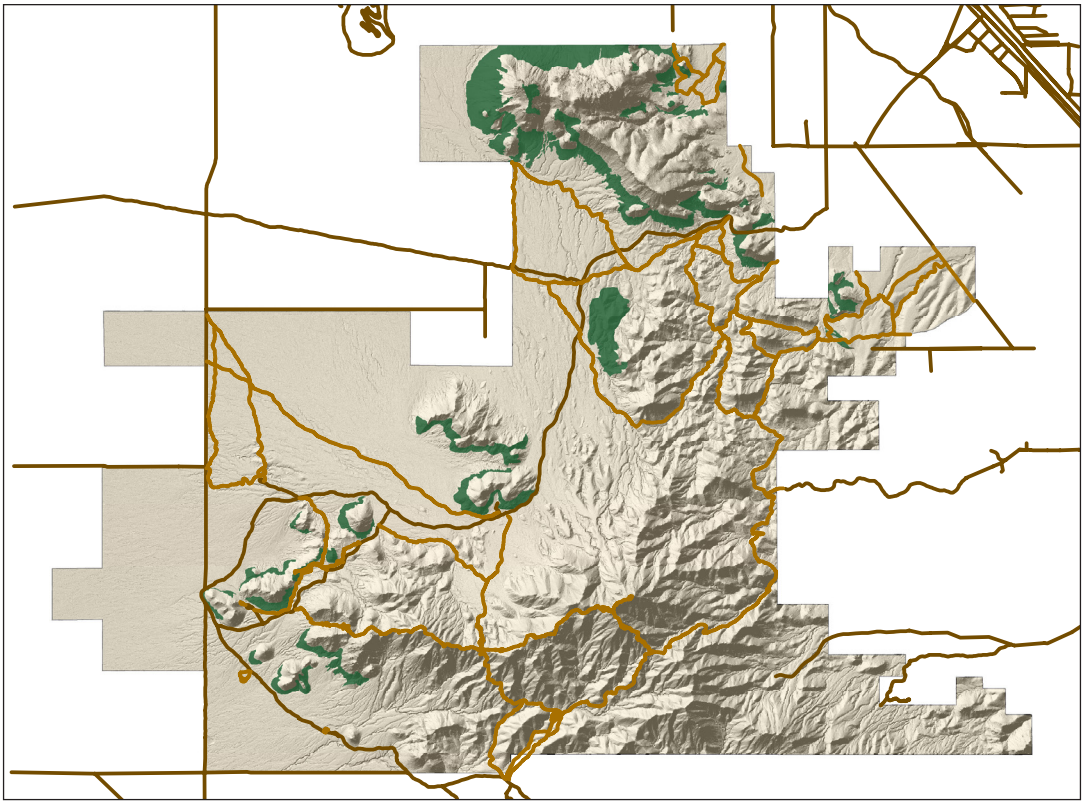
This shrubland community is characterized by a very sparse (<5% cover) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–40% cover) field layer (<0.5 m) solely dominated by triangle bur ragweed (*Ambrosia deltoidea*). Yellow paloverde (*P. microphylla*) is consistently (1.0) present as scattered, small (3–4 m), tree-like individuals with average cover of around 3%. The subcanopy composition is conspicuously different between the two districts. At the Rincon Mountain District (RMD), this species provides cover of around 5 [10]%. At the Tucson Mountain District (TMD), the subcanopy is a sparse (2–4% cover) mix of whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), and buckhorn cholla (*Cylindropuntia acanthocarpa*). The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, triangle bur ragweed (*A. deltoidea*). Throughout this association, this species provides cover of typically less than 10%.

This community covers 5% (493 ha/1,218 ac) of the TMD. It is spread throughout the northern and eastern portions of the district. It is found on small, low-angle (<25%), rolling hills of variable aspects from 820 to 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 are composed of a fine-grained metaquartzite with occasional areas of rhyolitic tuff.

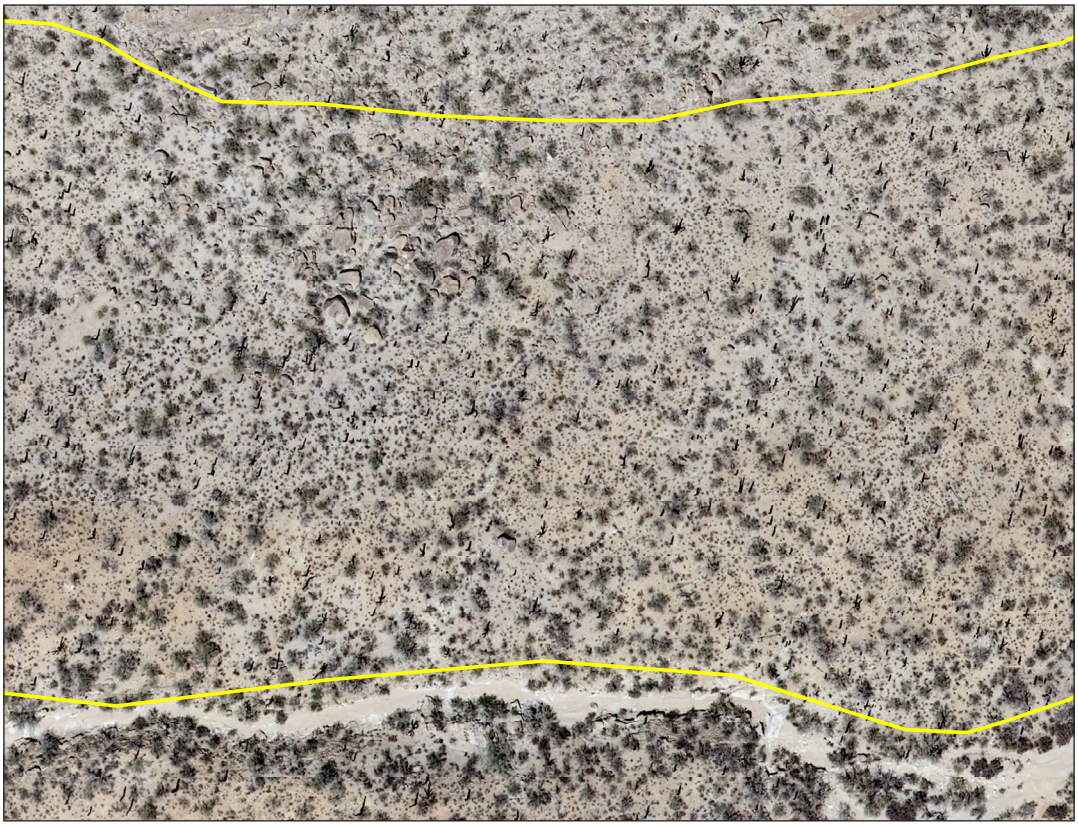
This association is one of five found in both the TMD and the Rincon Mountain District (see page 68).



Example of *Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland.



Distribution of *Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland across the district.



Example of satellite imagery for one polygon.

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

Yellow paloverde / Berlandier's wolfberry (Mixed Shrub) Rocky Shrubland Association (P)

Common species

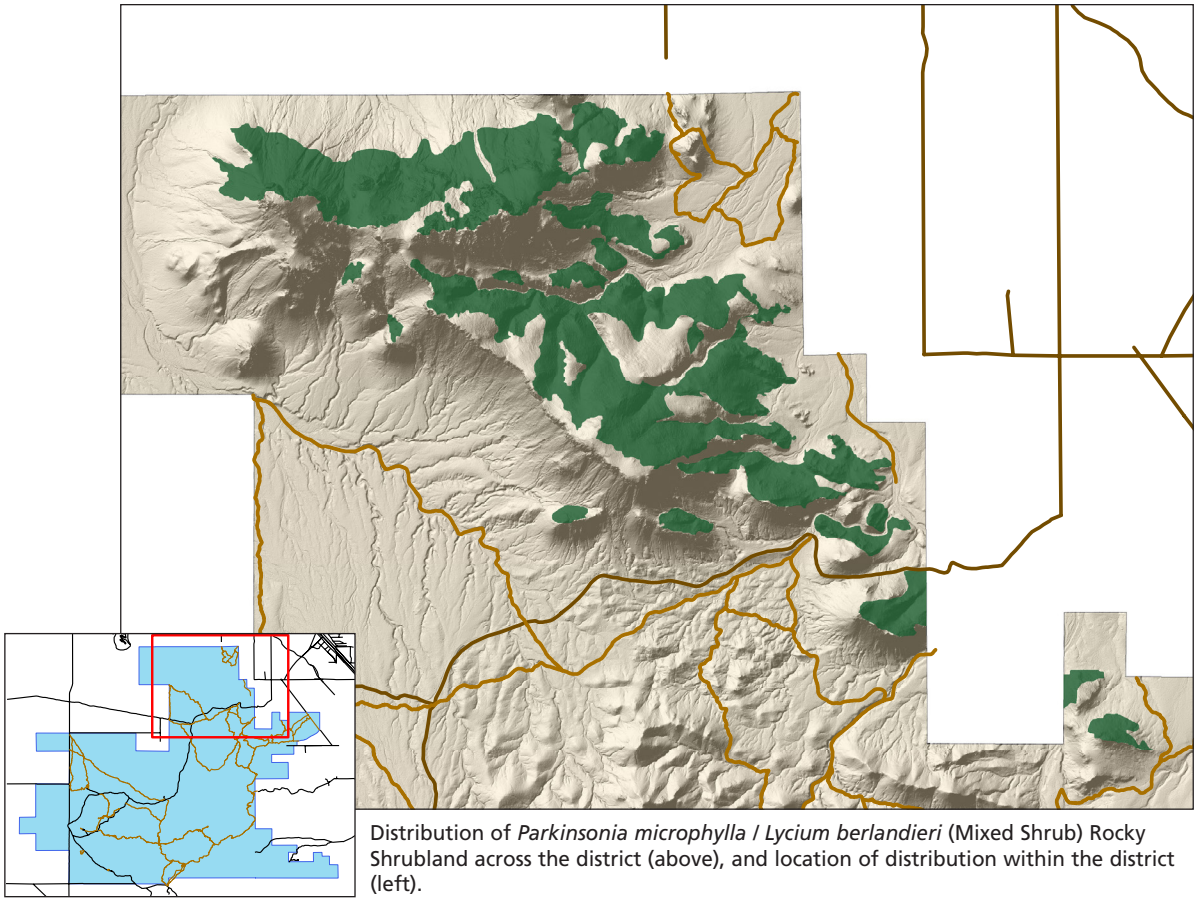
- *Parkinsonia microphylla*
- *Lycium berlandieri*
- *Vachellia constricta*
- *Celtis ehrenbergiana*

This shrubland community is characterized by an open (5–20% cover) 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. Yellow paloverde (*P. microphylla*) is present as a short (2 m) tree or tall shrub, with cover of 5–12 [20]%. In general, the most dominant and consistent species in the subcanopy (0.5–2 m) is wolfberry (*Lycium* spp.)—mostly Berlandier's wolfberry (*L. berlandieri*), but Arizona desert-thorn (*Lycium exsertum*) and water jacket (*Lycium andersonii*) were also documented. Berlandier's wolfberry (*L. berlandieri*) is a consistent and characteristic component of this community, generally with 2–3% 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 a 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%.

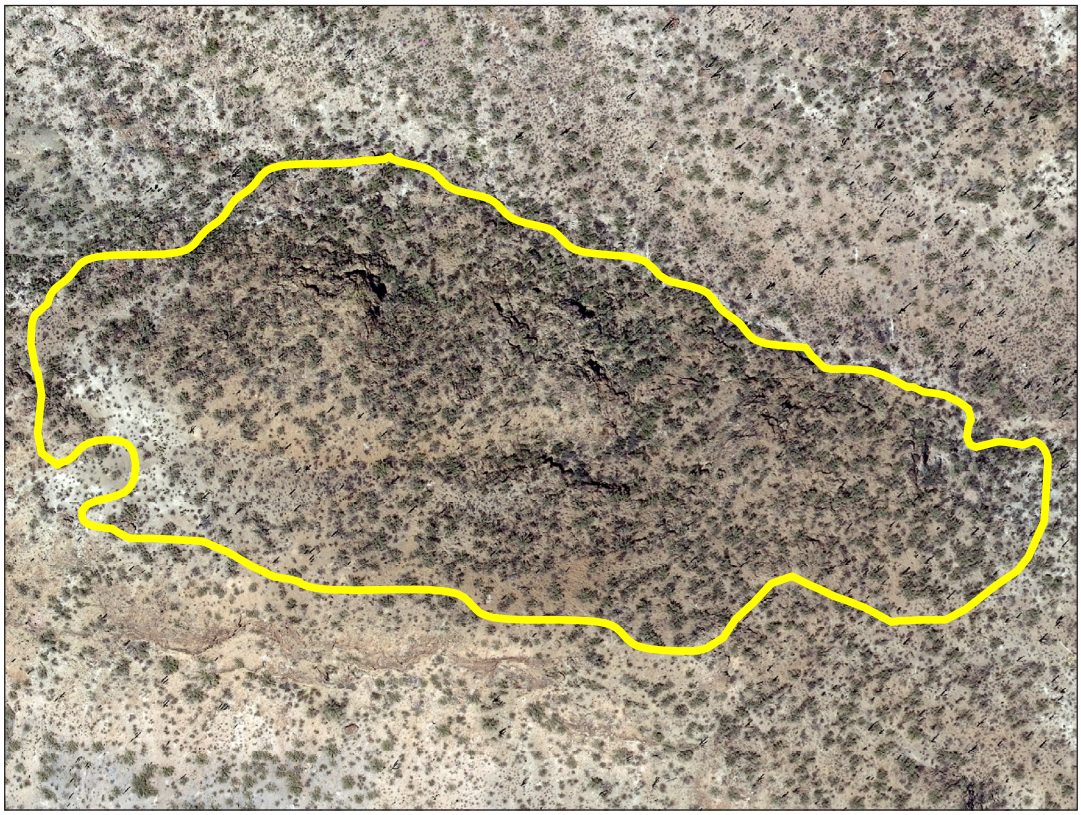
This community is contained within a two-association map class that covers 3% (295 ha/729 ac) of the Tucson Mountain District, mainly in the district's northernmost section, north of Picture Rocks Road. It occurs on very rocky north and northeast-facing crests, shoulders, and backslopes of steep mountain slopes. Gradients range from 35% slope upwards 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, leaving little space for plants to take hold.



Example of *Parkinsonia microphylla* / *Lycium berlandieri* (Mixed Shrub) Rocky Shrubland.



Distribution of *Parkinsonia microphylla / Lycium berlandieri* (Mixed Shrub) Rocky Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

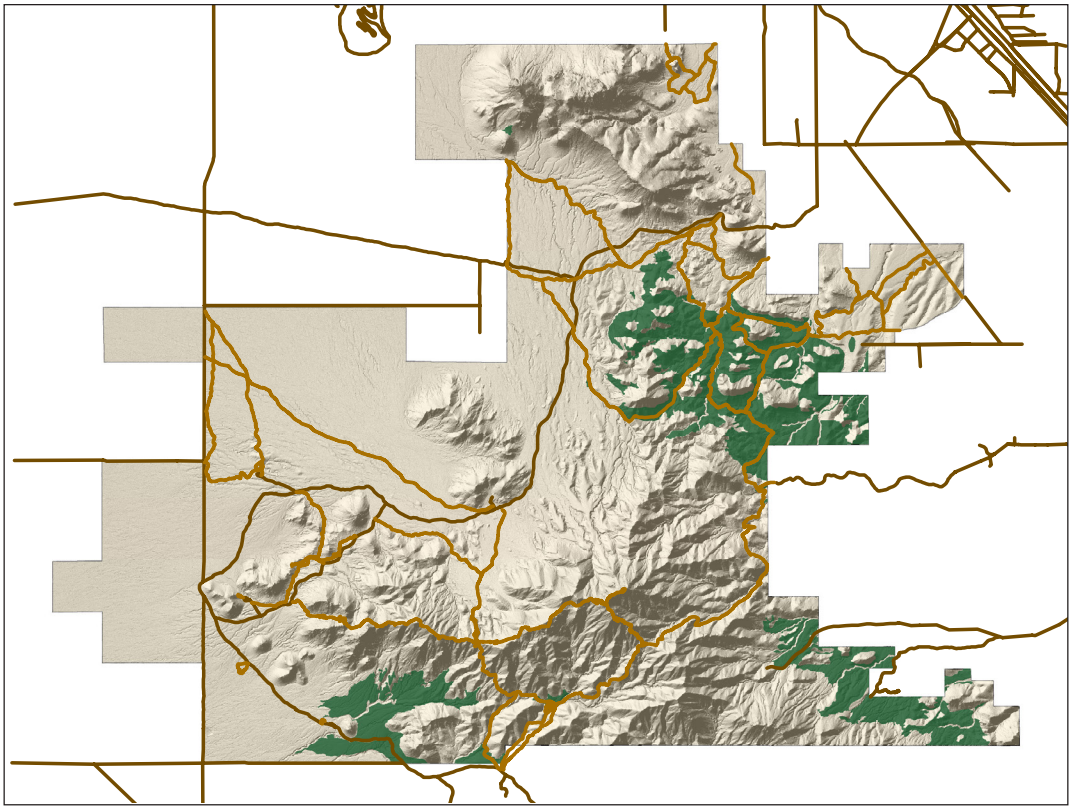
- *Carnegiea gigantea*
- *Parkinsonia microphylla*
- *Fouquieria splendens*
- *Simmondsia chinensis*
- *Ambrosia deltoidea*

This community is characterized by a very open (<5% cover) 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 (*P. microphylla*) is a consistent (1.0) canopy component, with cover ranging from scant inclusions (<1% cover) to areas of dominance (>5%). Saguaro (*Carnegiea gigantea*) and ocotillo (*Fouquieria splendens*) are consistent (1.0) components of this community, with average cover of around 1%. Jojoba (*S. chinensis*) is a diagnostic component that presents as consistent and evenly spaced medium-sized shrubs with cover of 1–3%. 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 5% cover, with some dense inclusions up to 15%. Triangle bur ragweed (*A. deltoidea*) is the most abundant and consistent (1.0) shrub in the field layer, with cover ranging from 2% to 5%.

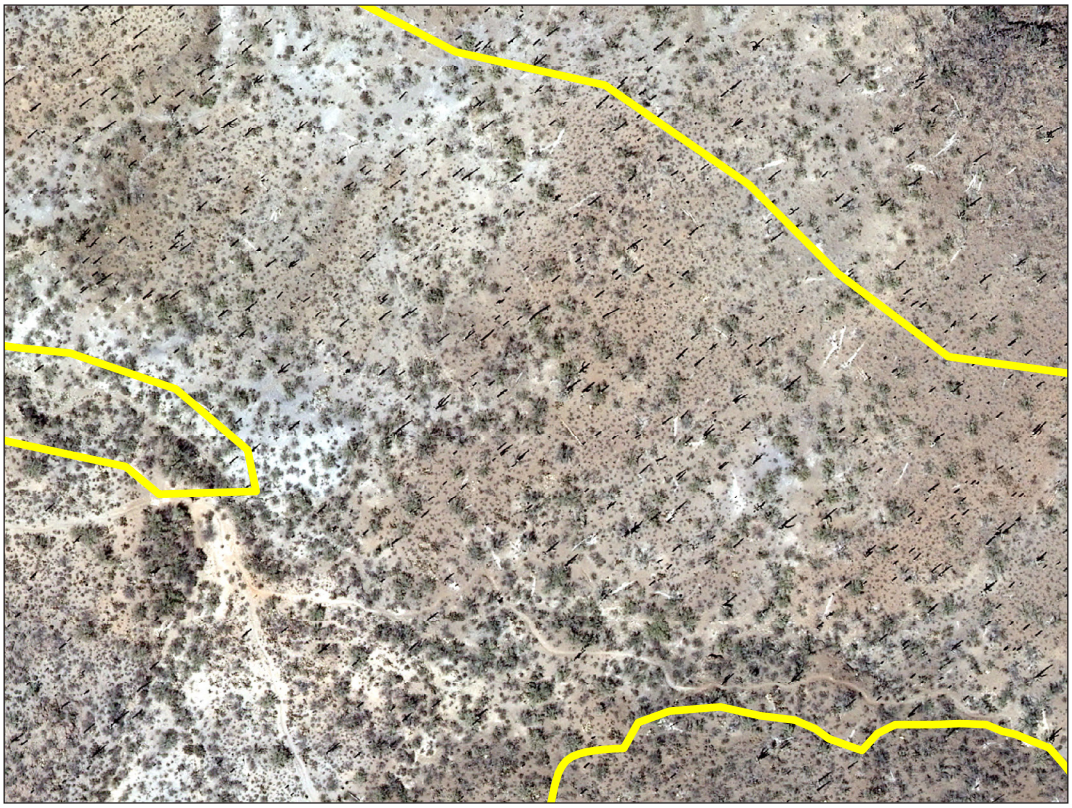
This community covers 9% (940 ha/2,323 ac) of the Tucson Mountain District, mainly on the hills to the northeast of Wasson Peak, as well as in scattered locations across the district's southwest and southeast areas. It spans both low-angle (<15%) alluvial fans and low slopes from 762 to 975 meters (2,500–3,200 ft). Gravel is often the primary ground cover in this community, most commonly made up of rhyolite tuff and megabreccia, with some areas composed of alluvium.



Example of *Simmondsia chinensis* - Mixed Cacti / *Ambrosia deltoidea* Shrubland.



Distribution of *Simmondsia chinensis* - Mixed Cacti / *Ambrosia deltoidea* Shrubland across the district.



Example of satellite imagery for one polygon.

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

Jojoba (Mixed Cacti) Shrubland Association (P)

Common species

- *Fouquieria splendens*
- *Prosopis velutina*
- *Simmondsia chinensis*
- *Opuntia engelmannii*
- *Aloysia wrightii*

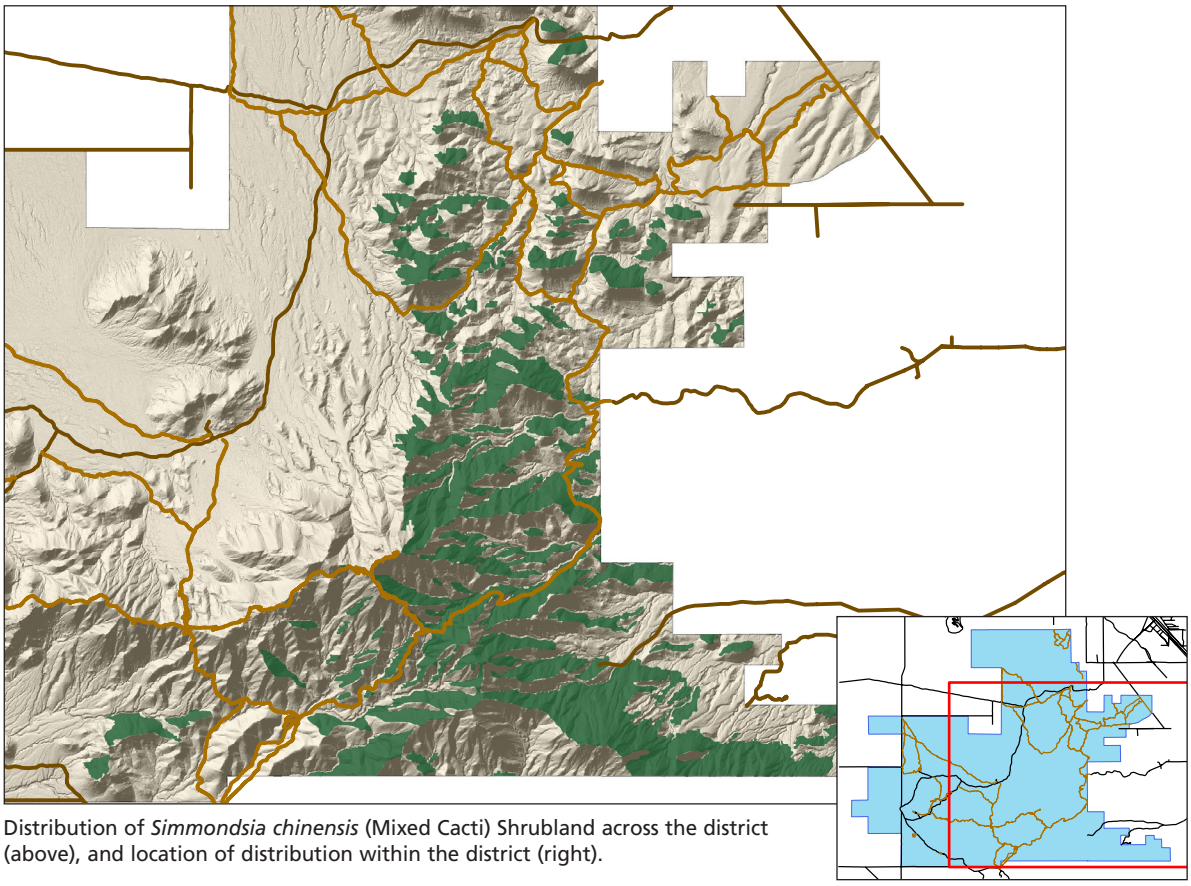
This shrubland association is characterized by an open (<5% cover) canopy (>2 m), with a subcanopy (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a variable mix of cacti that include buckhorn cholla (*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and tulip pricklypear (*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 cover of less than 5%. The moderately dense (15–30% cover) subcanopy is characterized by the consistent (1.0) dominance of jojoba (*S. chinensis*), with cover of 3–10 [20]%. This species is a diagnostic component of this community and commonly provides at least half of the total shrub cover in the stratum. The succulent cacti, buckhorn cholla (*C. acanthocarpa*), cactus apple (*O. engelmannii*), and tulip pricklypear (*O. phaeacantha*), are the second most-distinct and characteristic part of this community, providing about half of the shrub cover. The moderately sparse (10% cover) field layer is characterized by a diverse mix of small shrubs, subshrubs, perennial grasses, and spikemoss. Fairyduster (*Calliandra eriophylla*) and slender janusia (*Cottsia gracilis*) are the most consistent (>0.75) associates, each providing an average of 1–2% cover. At the Tucson Mountain District (TMD), the mat-forming Arizona spikemoss (*Selaginella arizonica*) may become a field dominant, especially on steeper, shadier slopes.

This community covers 9.5% (946 ha/2,337 ac) of the TMD. It is widespread throughout the slopes northeast of Wasson Peak. It is typically found on steep, north-facing backslopes from 890 to 970 meters (2,919–3,182 ft). In general, the surface cover is characterized by shallow, well-drained soils under a dominant layer of coarse gravel. Surface rock and exposed bedrock, primarily composed of gneissic granodiorite, are very common throughout this community.

This association is one of five found in both the TMD and the Rincon Mountain District (see page 82).



Example of *Simmondsia chinensis* (Mixed Cacti) Shrubland.



Distribution of *Simmondsia chinensis* (Mixed Cacti) Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

Jojoba / Brittlebush Shrubland Association (P)

Common species

- *Simmondsia chinensis*
- *Opuntia engelmannii*
- *Encelia farinosa*

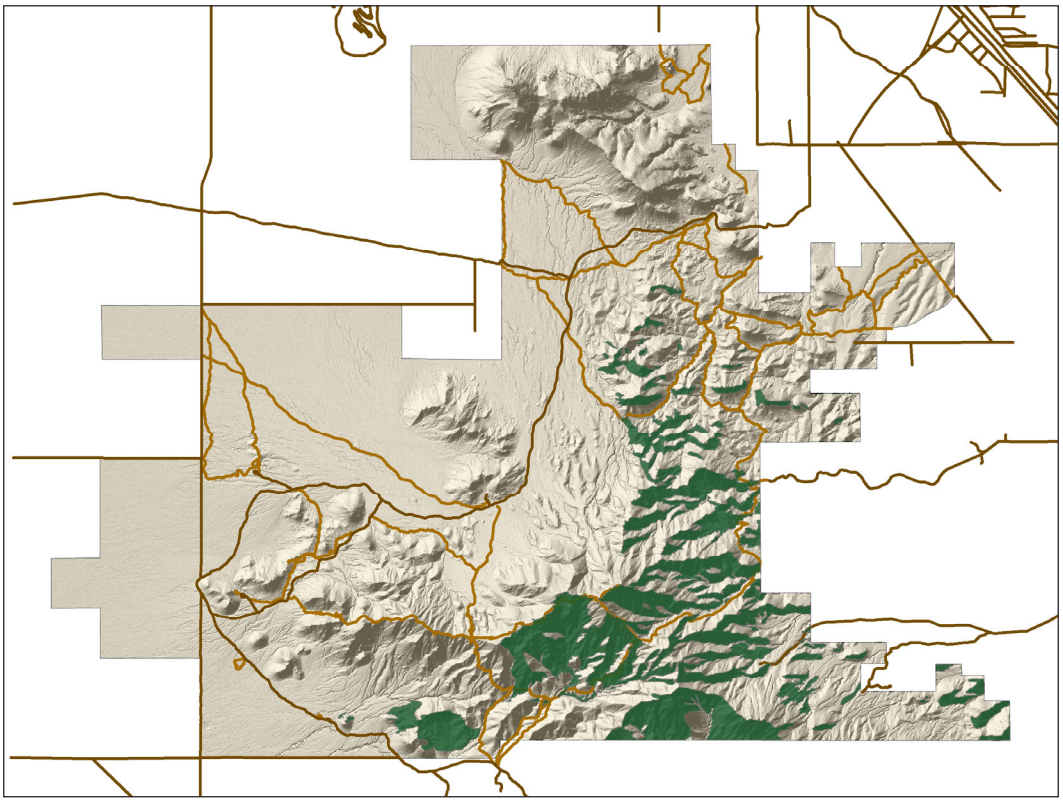
This shrubland association is characterized by a very open (<5% cover) canopy (>2 m), a variable (5–25% cover) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*), and a variable (5–30% cover) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*). Ocotillo (*Fouquieria splendens*) is a very consistent (~0.9) associate, providing 1–2% cover. The cover and consistency of yellow paloverde (*Parkinsonia microphylla*) and velvet mesquite (*Prosopis velutina*) depend on the district. The subcanopy stratum is defined by the dominance of jojoba (*S. chinensis*). This species is a diagnostic component of this community, typically providing cover of less than 10%. In the Tucson Mountain District (TMD), it averages 3%. Cactus apple (*Opuntia engelmannii*) is very uncommon (0.2) at the TMD, where it is typically outcompeted by the similar tulip pricklypear (*Opuntia phaeacantha*). The field stratum is characterized by the dominance of brittlebush (*E. farinosa*), which is the most consistent (1.0) and highest-cover species in this community. Other noteworthy species include slender janusia (*Cottsia gracilis*), fairyduster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*), spidergrass (*Aristida ternipes*), and rough menodora (*Menodora scabra*).

This shrubland covers 9.7% (972 ha/2,402 ac) of the TMD. It is widespread across the slopes to the east of Wasson Peak. This community is exclusively present on exposed, south-facing slopes of varying grade (5–40%) from 870 to 1,045 meters (2,854–3,428 ft).

This association is one of five found in both the TMD and Rincon Mountain District (see page 84).



Example of *Simmondsia chinensis* / *Encelia farinosa* Shrubland.



Distribution of *Simmondsia chinensis* / *Encelia farinosa* Shrubland across the district.



Example of satellite imagery for one polygon.

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

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

Common species

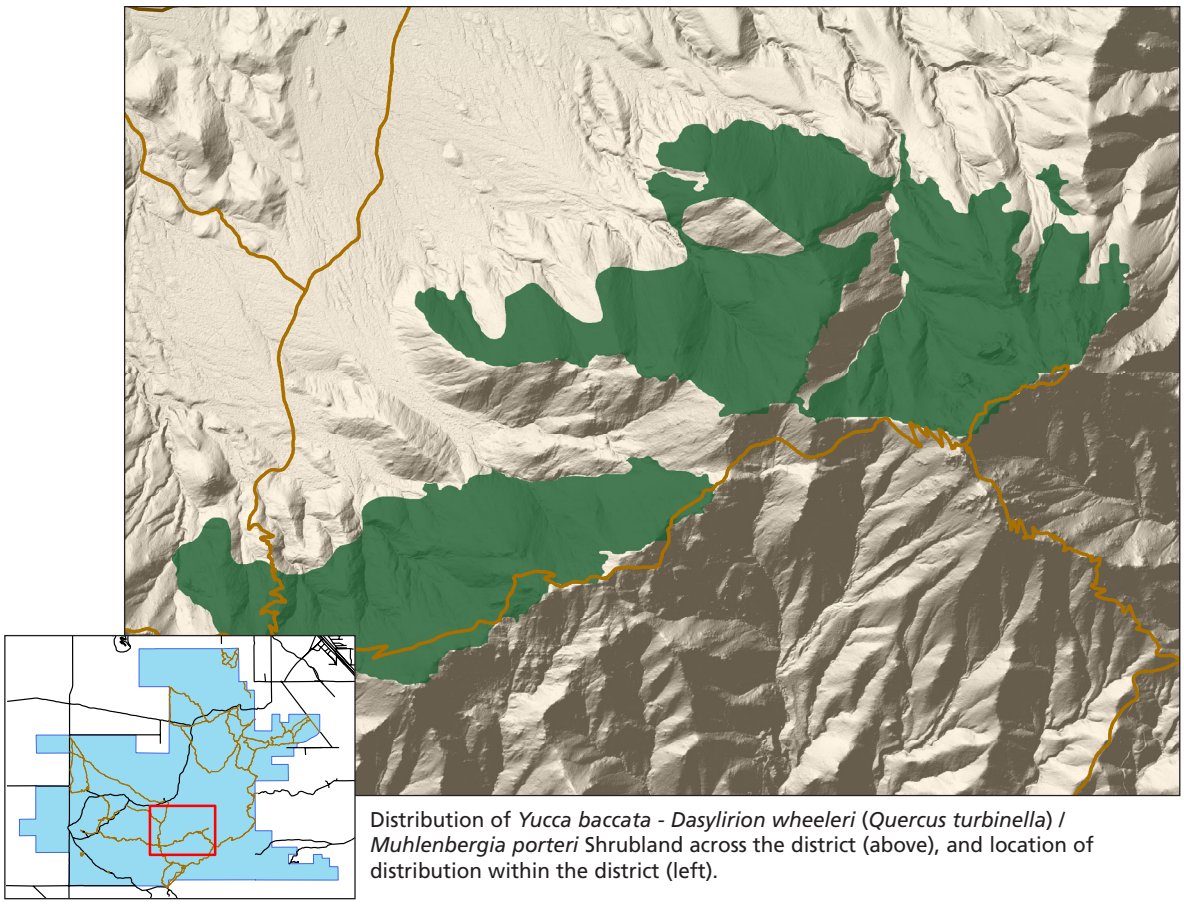
- *Yucca baccata*
- *Dasylirion wheeleri*
- *Aloysia wrightii*
- *Quercus turbinella*
- *Muhlenbergia porteri*

This shrubland community is characterized by a sparse (<5% cover) 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 (<0.5 m) dominated by bush muhly (*Muhlenbergia porteri*). Overall vegetative cover is estimated at 20–30%, with roughly equal contributions from shrubs, succulents, subshrubs, and perennial grasses. Banana yucca (*Y. baccata*) and common sotol (*D. wheeleri*) are consistent (1.0) dominants, with cover for 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 (*Y. baccata*) and common sotol (*D. wheeleri*). Other common shrubs and succulents in the subcanopy include buckhorn cholla (*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and catclaw acacia (*Senegalia greggii*). Bush muhly (*M. porteri*) is a consistent (1.0) dominant, with cover of 2–5%. Combined, sideoats grama (*Bouteloua curtipendula*) and Arizona cottontop (*Digitaria californica*) contribute an additional 3–5% cover.

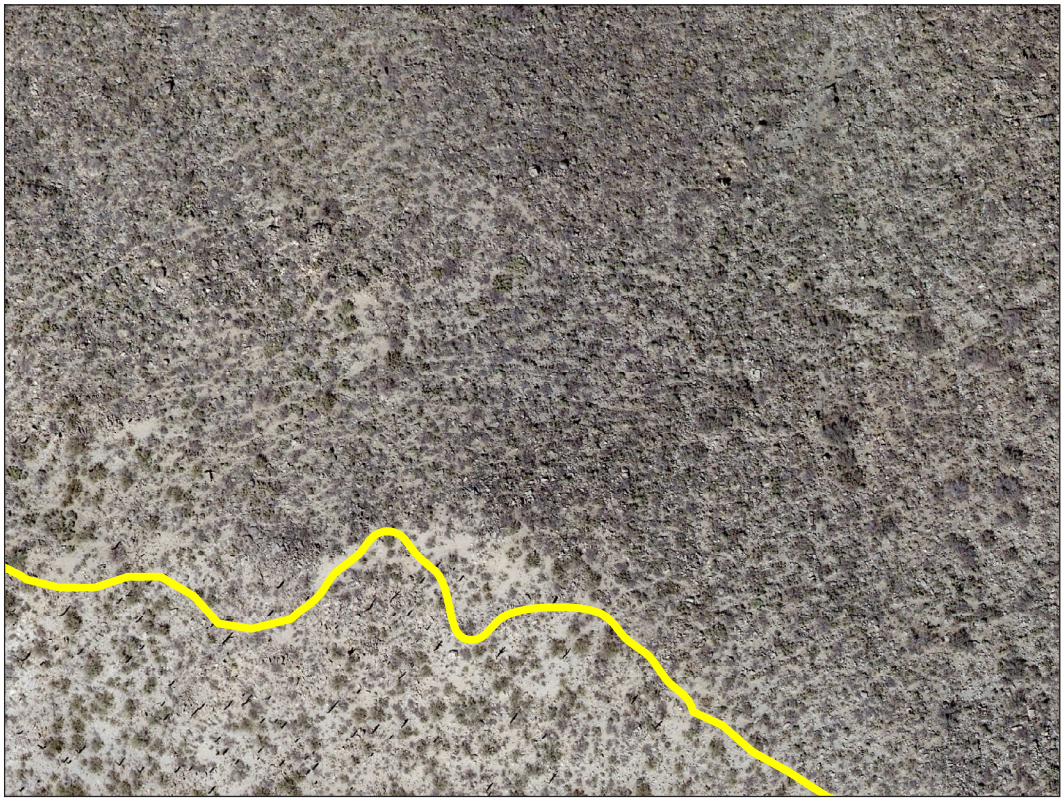
This community covers 1.5% (148 ha/366 ac) of the Tucson Mountain District, mainly in the vicinity of Wasson and Amole peaks. It occurs on steep (35–50%), north-trending mountain shoulders and backslopes from 1,100 to 1,310 m (3,600–4,300 ft). The surface cover is characterized by loose and coarse gravel with large embedded boulders composed of extrusive igneous rock.



Example of *Yucca baccata - Dasylirion wheeleri* (*Quercus turbinella*) / *Muhlenbergia porteri* Shrubland.



Distribution of *Yucca baccata - Dasylirion wheeleri* (*Quercus turbinella*) / *Muhlenbergia porteri* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

- *Prosopis velutina*
- *Vachellia constricta*
- *Larrea tridentata*
- *Senegalia greggii*

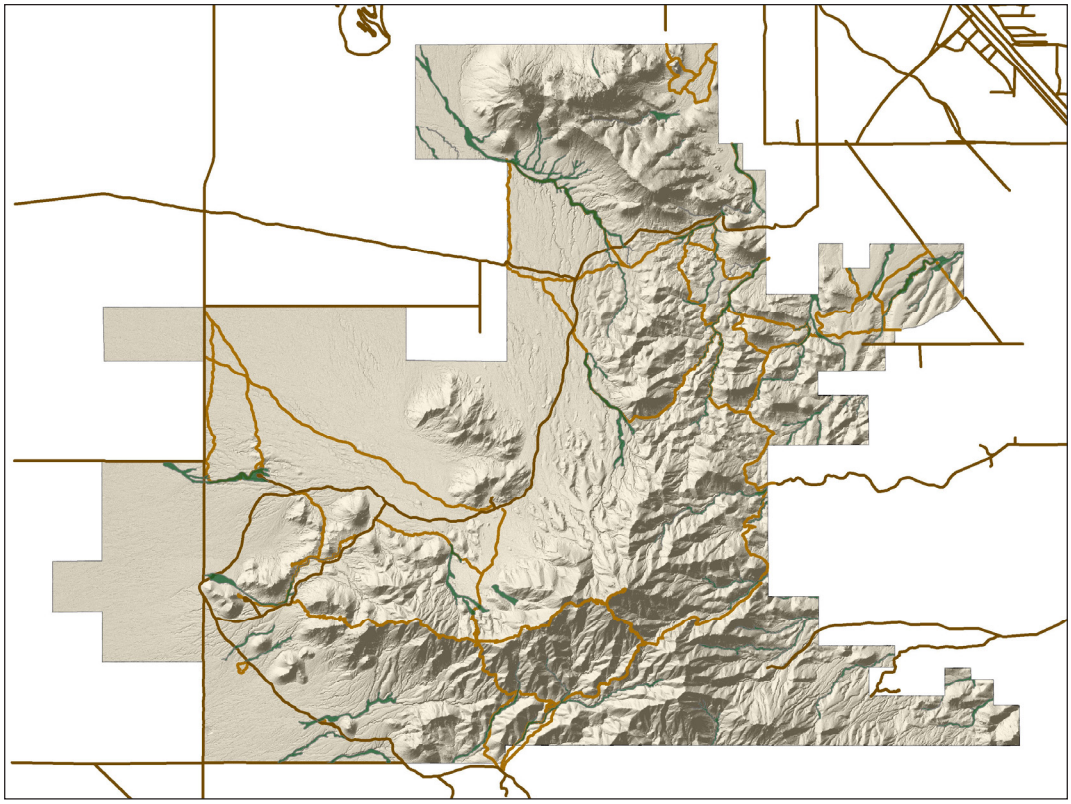
This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–40 [60]% cover) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*), with common associates creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*). Velvet mesquite (*P. velutina*) is a consistent (1.0) component, typically present as large (4 m) trees along the margins of the watercourse, with cover of around 6%. Yellow paloverde (*Parkinsonia microphylla*) and blue paloverde (*Parkinsonia florida*) are sparse (1–2% cover), inconsistent (0.5 and 0.4) associates that can co-occur or occasionally replace velvet mesquite (*P. velutina*) in the canopy. At the Tucson Mountain District (TMD), desert ironwood (*Olneya tesota*) is an occasional (0.57) associate tree that, when present, provides cover of up to 5%. The shrub layer is consistently (1.0) dominated by large (up to 3 m) whitethorn acacia (*V. 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 (*L. tridentata*) and catclaw acacia (*S. greggii*), with an average cover of 6% for each species. The field layer (<0.5 m) is extremely sparse (<5%), without any consistent dominants or common associates.

This community covers 2.6% (265 ha/655 ac) of the TMD. It is widespread throughout the alluvial fans. It is restricted to low-angle (<5%), typically north-flowing washes that bisect the broad alluvial fans and low hills from 820 to 935 meters (2,690–3,067 ft). The surface cover is characterized by deep, well-drained soils that, within the watercourse, are dominated by fine gravel and sand. The adjacent slopes are more commonly bare soil.

This association is one of five found in both the TMD and the Rincon Mountain District (see page 88).



Example of (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland.



Distribution of (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland across the district.



Example of satellite imagery for one polygon.

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

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

Common species

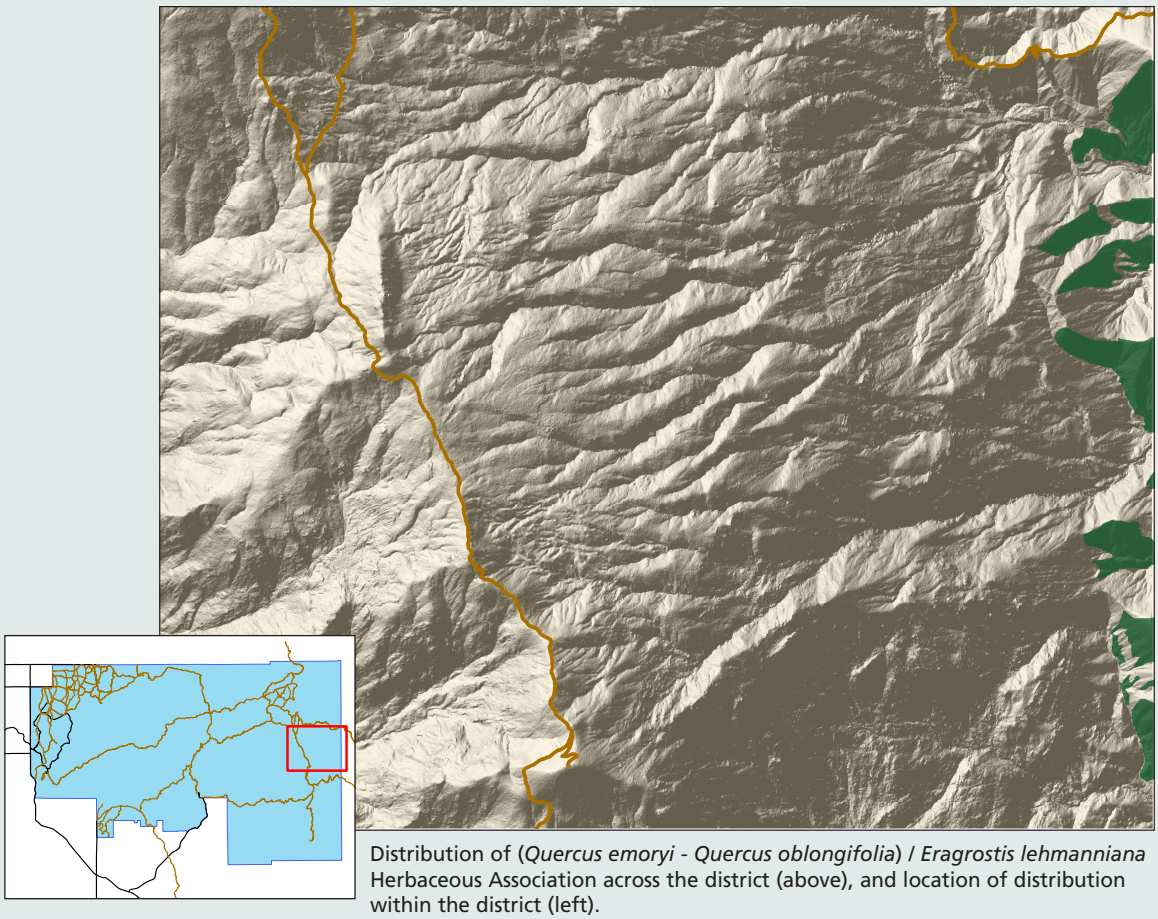
- *Quercus oblongifolia*
- *Quercus emoryi*
- *Eragrostis lehmanniana*

This herbaceous community is characterized by a very sparse (<<5% cover) tree canopy (>2 m) of Emory oak (*Quercus emoryi*) and/or Mexican blue oak (*Quercus oblongifolia*), with a dense (>40% cover) matrix of perennial grasses solely dominated by Lehmann lovegrass (*Eragrostis lehmanniana*). The canopy oaks are present as small (3–4 ft) trees that provide minimal (1–2%) cover. Alligator juniper (*Juniperus deppeana*) and velvet mesquite (*Prosopis velutina*) are the only other documented tree species. The subcanopy stratum (0.5–2 m) is characterized by a diverse but sparse (5% cover) mix of shrubs and succulents, 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% cover) matrix of Lehmann lovegrass (*E. lehmanniana*). This species accounts for virtually all cover in this stratum and only has one documented associate, Schott's century plant (*Agave schotti*).

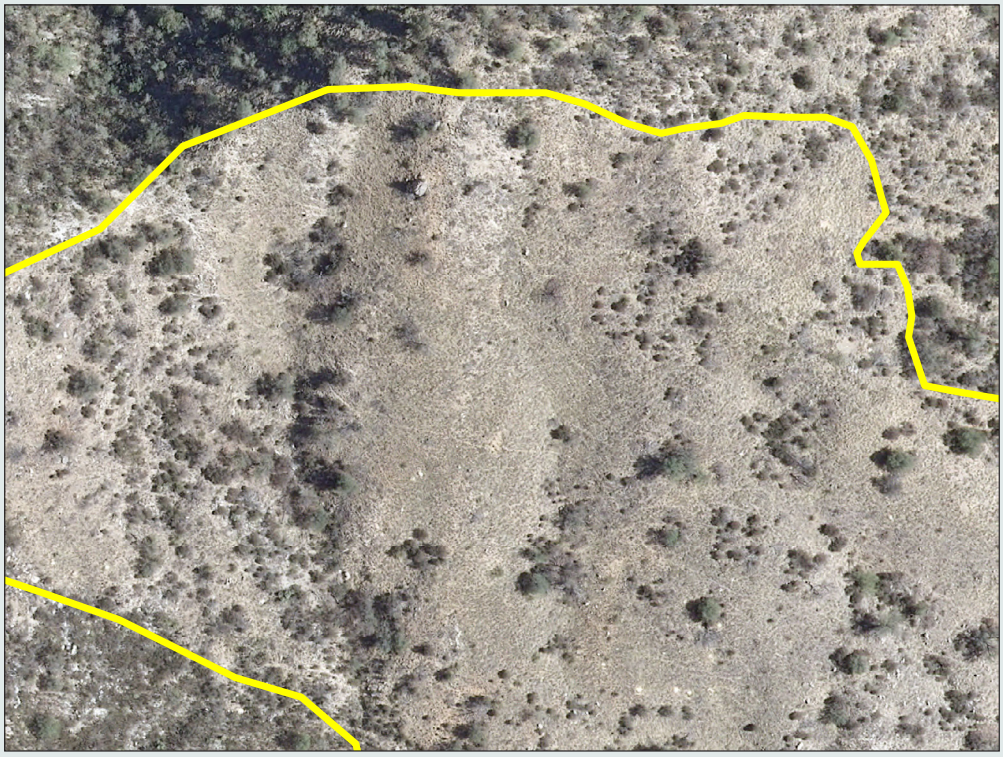
This herbaceous community covers 0.1% (30 ha/74 ac) of the Rincon Mountain District and is present on the low slopes along the eastern boundary of the park, mainly between the Miller and Turkey Creek trailheads. It is restricted to south-trending hills of varying grade (10–30%) from 1,350 to 1,600 meters (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.



Example of (*Quercus emoryi - Quercus oblongifolia*) / *Eragrostis lehmanniana* Herbaceous Association.



Distribution of (*Quercus emoryi - Quercus oblongifolia*) / *Eragrostis lehmanniana* Herbaceous Association across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

3. *Prosopis velutina* Woodland Association (P)

Velvet mesquite Woodland Association (P)

Common species

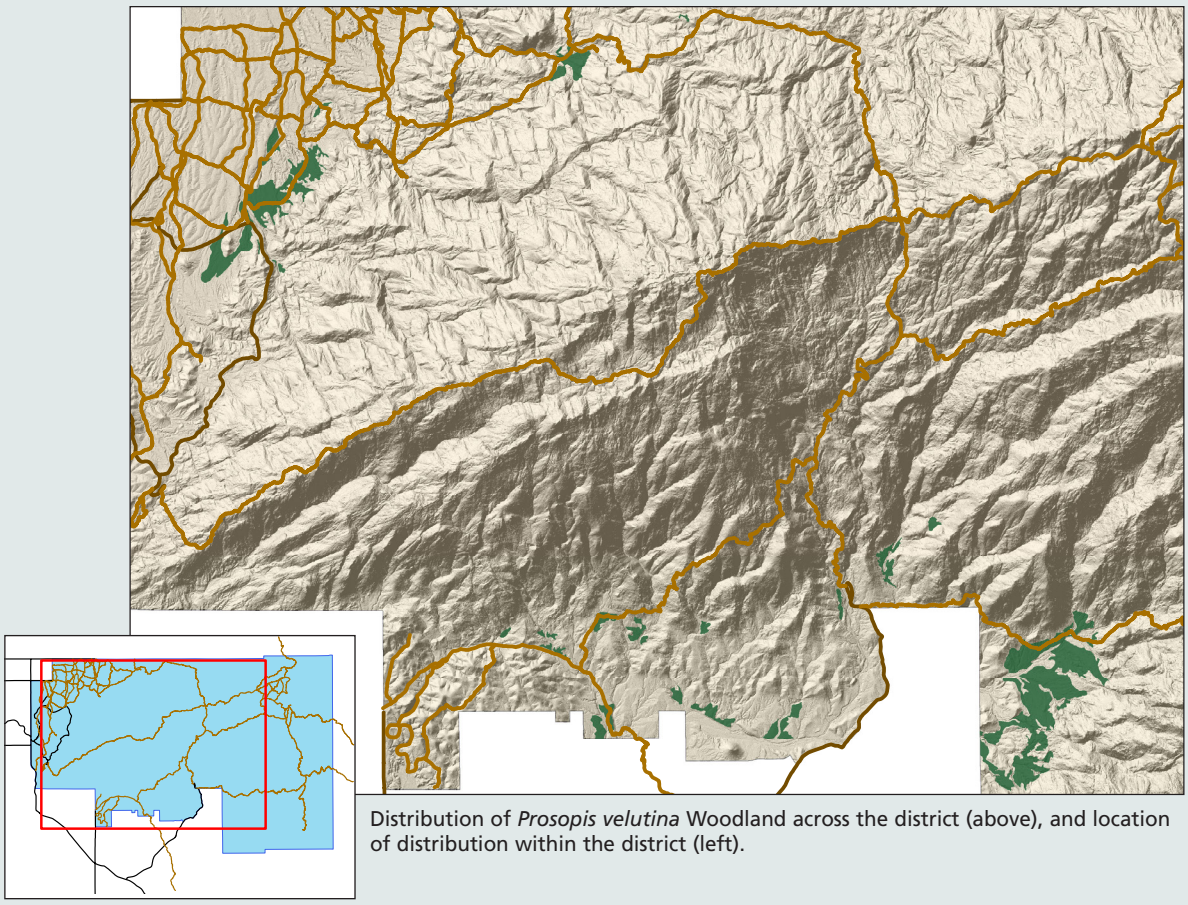
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Muhlenbergia porteri*
- *Isocoma tenuisecta*

This community is characterized by a moderately dense (10–20 [30]% cover) canopy stratum (>2 m) solely dominated by velvet mesquite (*Prosopis velutina*), with a variable (10–20% cover) understory most consistently dominated by bush muhly (*Muhlenbergia porteri*) and burroweed (*Isocoma tenuisecta*). Velvet mesquite (*P. velutina*) is present as large ([2] 4–5 m), single-stemmed trees that provide almost all cover in the canopy stratum. The subcanopy (0.5–2 m) contains a low-cover (<5%) mix of cactus apple (*Opuntia engelmannii*), longleaf jointfir (*Ephedra trifurca*), whitethorn acacia (*Vachellia constricta*), jumping cholla (*Cylindropuntia fulgida*), and staghorn cholla (*Cylindropuntia versicolor*). Bush muhly (*M. porteri*) is a consistent (0.75) grass that provides cover of around 3–5%. Burroweed is patchier (0.5), but when present can provide considerable (up to 18%) cover. Other noteworthy associates include Arizona cottontop (*Digitaria californica*), tulip prickly-pear (*Opuntia phaeacantha*), desert zinnia (*Zinnia acerosa*), and purple threeawn (*Aristida purpurea*).

This community is contained within a two-association map class that covers 1.3% (358 ha/884 ac) of the Rincon Mountain District and was documented within the Cactus Forest trail system. 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.



Example of *Prosopis velutina* Woodland.



Distribution of *Prosopis velutina* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

Velvet mesquite / Cactus apple - Turpentine bush / Bush muhly Wooded Shrubland Association (P)

Common species

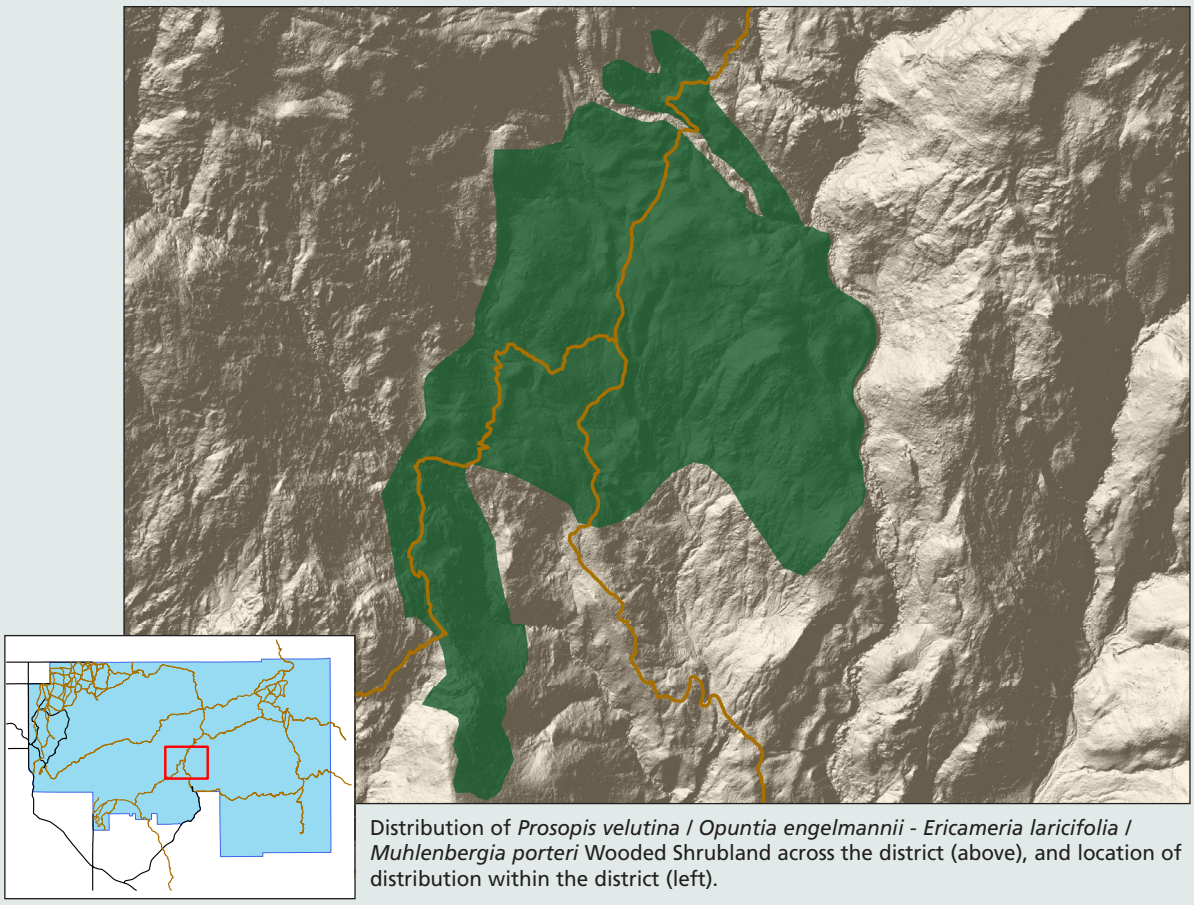
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Ericameria laricifolia*
- *Muhlenbergia porteri*

This community is characterized by a variable (15–30% cover) canopy stratum (>2 m) dominated by velvet mesquite (*Prosopis velutina*), a subcanopy dominated by cactus apple (*Opuntia engelmannii*) and turpentine bush (*Ericameria laricifolia*), and a field layer (<0.5 m) dominated by bush muhly (*Muhlenbergia porteri*). Velvet mesquite (*P. velutina*) is consistently (1.0) present as single-stem trees (4 m) with an average cover of around 15%. Cactus apple (*O. engelmannii*) and turpentine bush (*Ericameria laricifolia*) provide average cover of around 7% and 5%, respectively. Bush muhly (*M. porteri*) provides consistent (1.0) dominance, with average cover of around 10% and occasional dense inclusions of up to 18%. Other documented species include catclaw acacia (*Senegalia greggii*), staghorn cholla (*Cylindropuntia versicolor*), spiny hackberry (*Celtis ehrenbergiana*), sideoats grama (*Bouteloua curtipendula*), Arizona cottontop (*Digitaria californica*), and spidergrass (*Aristida ternipes*).

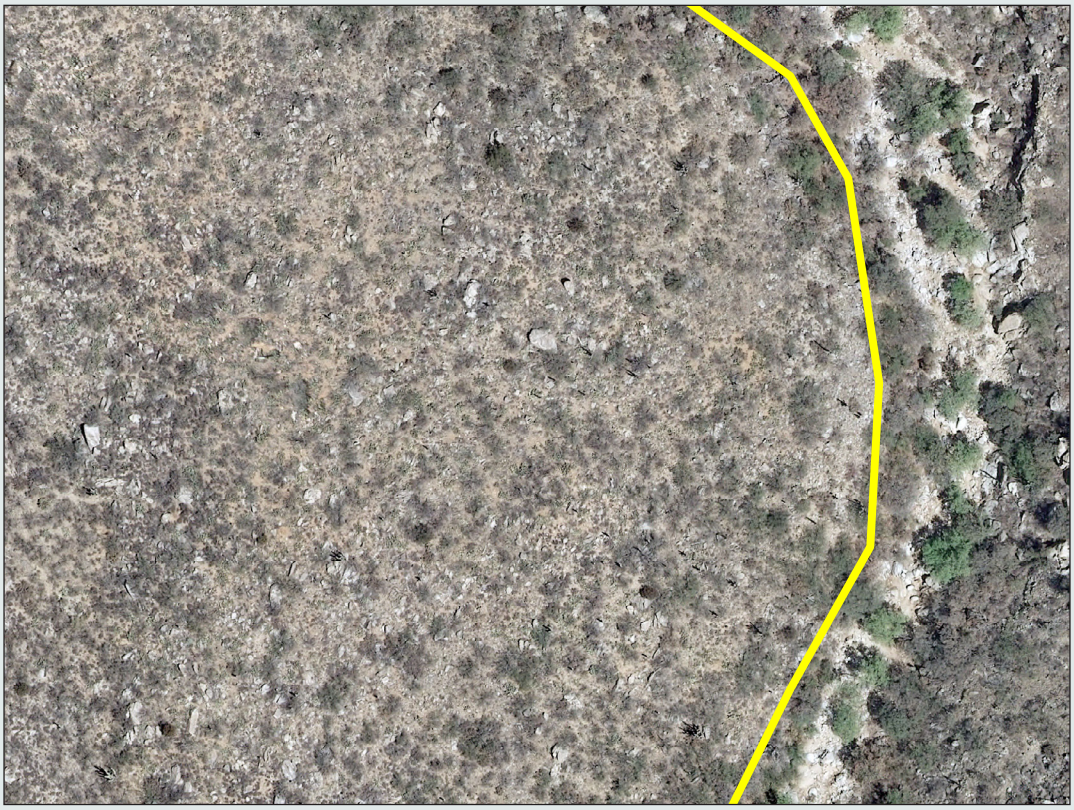
This community covers 0.6% (153 ha/378 ac) of the Rincon Mountain District and is primarily found along the lower portion of the Manning Camp Trail, near the junction with the Quilter Trail. It is typically present on low-angle (<20%) benches within broader mountain backslopes from 1,220 to 1,450 meters (4,000–4,700 ft). The surface cover is characterized by shallow, well-drained soil ranging from cobbles to skeletal loam covered with a dense layer of gravel.



Example of *Prosopis velutina / Opuntia engelmannii - Ericameria laricifolia / Muhlenbergia porteri* Wooded Shrubland.



Distribution of *Prosopis velutina / Opuntia engelmannii - Ericameria laricifolia / Muhlenbergia porteri* Wooded Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

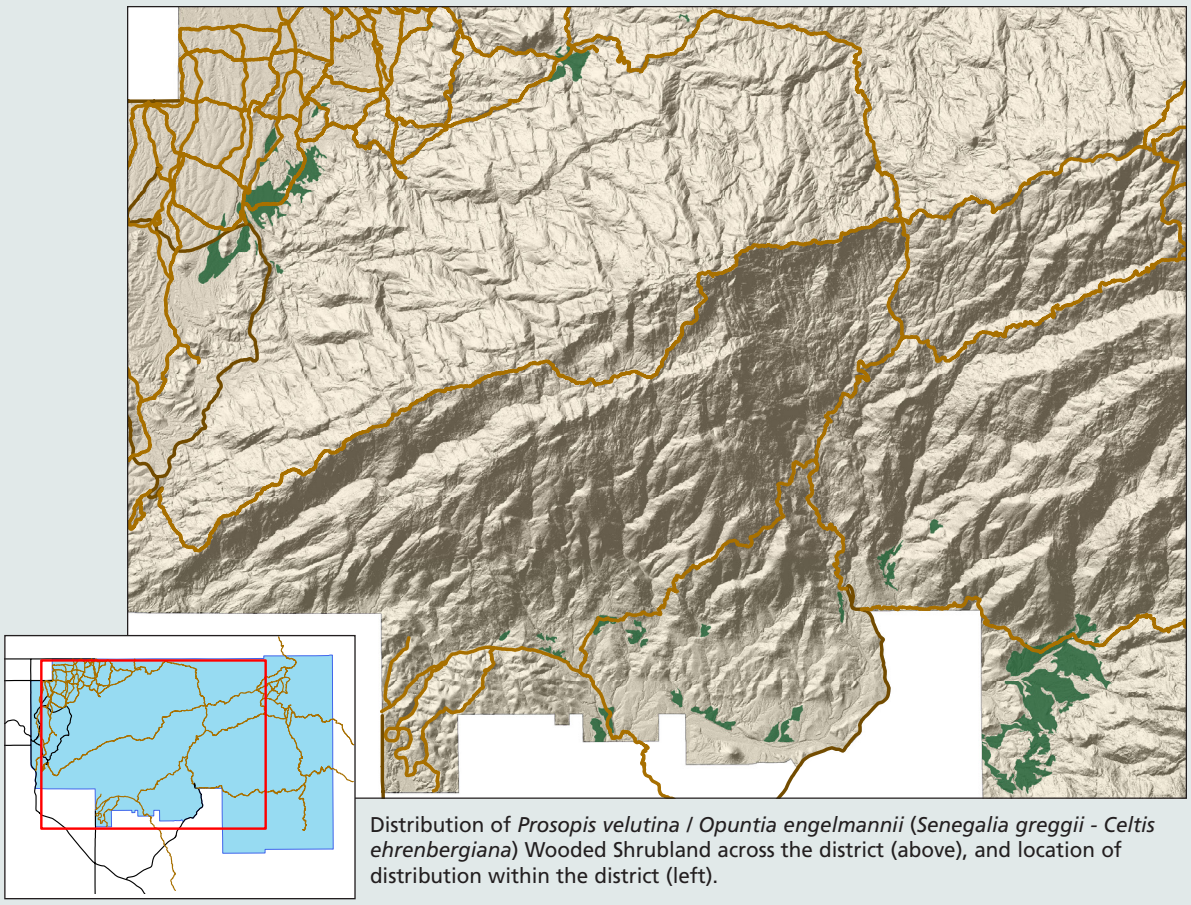
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Celtis ehrenbergiana*
- *Senegalia greggii*
- *Eragrostis lehmanniana*

This community is characterized by an open (5–15 [25]% cover) lower-canopy stratum (2–5 m) solely dominated by velvet mesquite (*Prosopis velutina*) and a variable ([5] 10–25% cover) subcanopy (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*) with catclaw acacia (*Senegalia greggii*) and spiny hackberry (*Celtis ehrenbergiana*). Velvet mesquite (*P. velutina*) contributes consistent (1.0) dominance as trees (3 [5] m) providing an average cover of 10%, with some areas up to 20%. Cactus apple (*O. engelmannii*) provides variable cover throughout, ranging from a scant 1% up to a very conspicuous 15%. Spiny hackberry (*C. ehrenbergiana*) and catclaw acacia (*S. greggii*) are consistent (0.70 and 0.88) associate shrubs, with cover rarely surpassing 5% each. On average, the native and non-native grasses provide similar cover, around 6–7%, but dominance can vary greatly across the community. 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*). The non-native component is solely composed of Lehmann lovegrass (*Eragrostis lehmanniana*).

This community is contained within a two-association map class that covers 1.3% (358 ha/884 ac) of the Rincon Mountain District. It 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. It 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, well-drained soil ranging from gravelly loam to skeletal loam and sometimes clay.



Example of *Prosopis velutina / Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland.



Distribution of *Prosopis velutina / Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

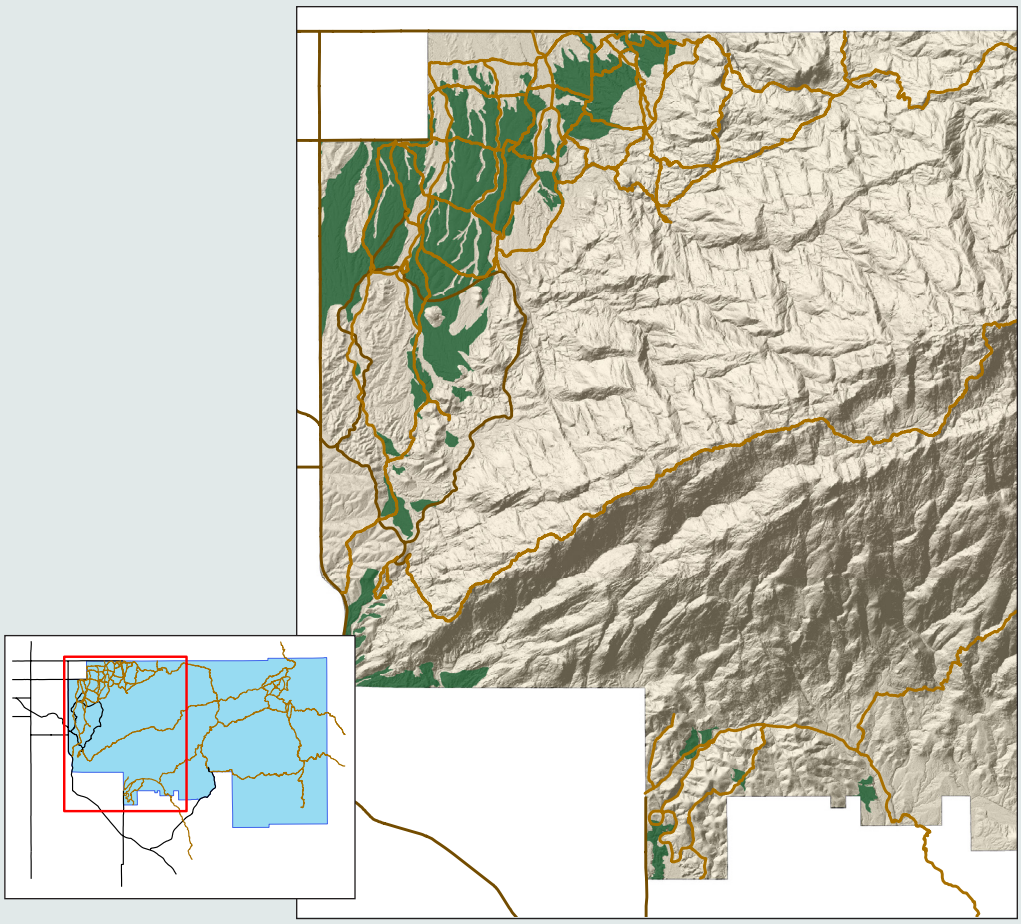
- *Parkinsonia microphylla*
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Larrea tridentata*
- *Vachellia constricta*
- *Ambrosia deltoidea*

This wooded shrubland community is characterized by a sparse (<10% cover) canopy stratum (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a variable (10–25% cover) subcanopy stratum (0.5–2 m) of cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), and creosote (*Larrea tridentata*), with a field stratum (<0.5 m) of 15–25% cover, dominated by triangle bur ragweed (*Ambrosia deltoidea*). Yellow paloverde (*P. microphylla*) is a consistent (1.0) dominant, typically present as scattered medium-sized (3–4 m), tree-like individuals with average cover of around 4%. Velvet mesquite (*Prosopis velutina*) is also a consistent (1.0) associate that can occasionally co-dominate with yellow paloverde (*P. microphylla*), with average cover of around 2–3%. The subcanopy is characterized by a diverse mix of shrubs and succulents, with cactus apple (*O. engelmannii*), creosote (*L. tridentata*), and whitethorn acacia (*V. constricta*) providing the most consistent presence (1.0) and dominance throughout. On average, cactus apple (*O. engelmannii*) provides the highest cover, with an average of 8% across the community, including some areas up to 15%. Creosote (*L. tridentata*) and whitethorn acacia (*V. constricta*) provide variable cover ranging from a scant 1% up to a dominant 5%. The field layer is characterized by the overwhelming dominance of triangle bur ragweed (*A. deltoidea*). This species provides cover ranging from 10% to 20%, with an average around 15%.

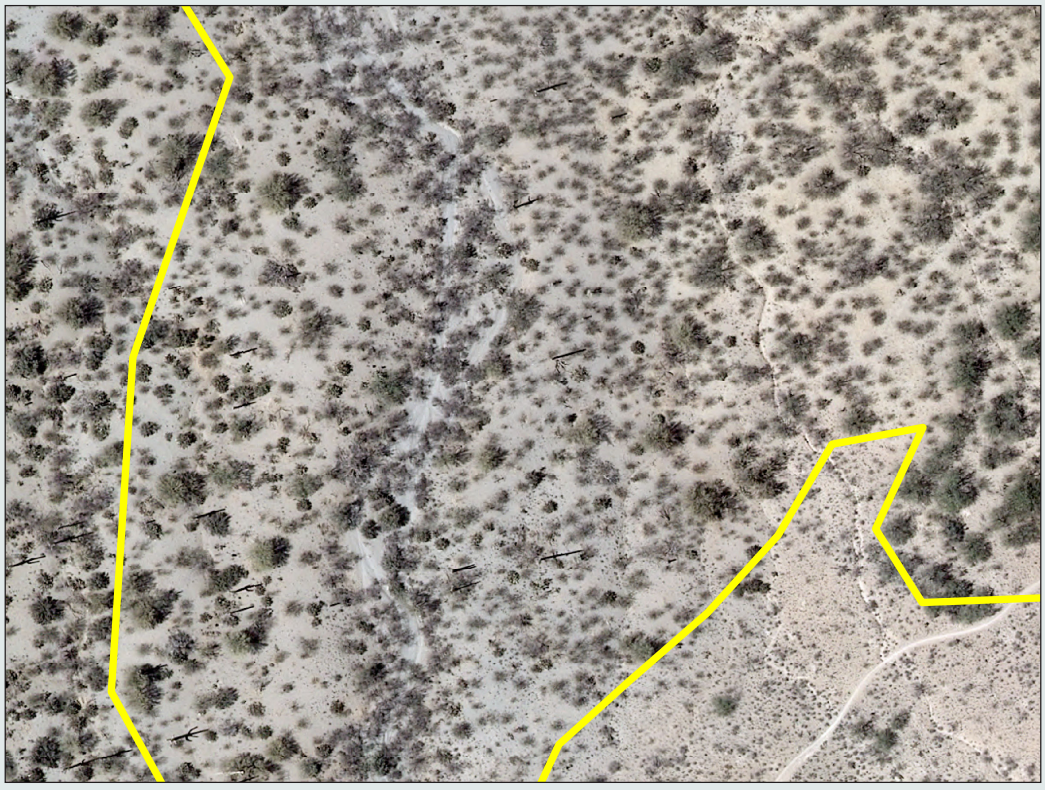
This restricted community is contained within a three-association map class that covers 3.6% (983 ha/2,429 ac) of the Rincon Mountain District and scattered throughout the Cactus Forest Loop Road and associated trail system. It is found exclusively on low-angle (1–6%) alluvial fans around 850 meters (2,788 ft), usually near the transition with low hills and/or pediment formations. 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.



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



Distribution of (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta* - *Larrea tridentata*) / *Ambrosia deltoidea* Wooded Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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

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

Common species

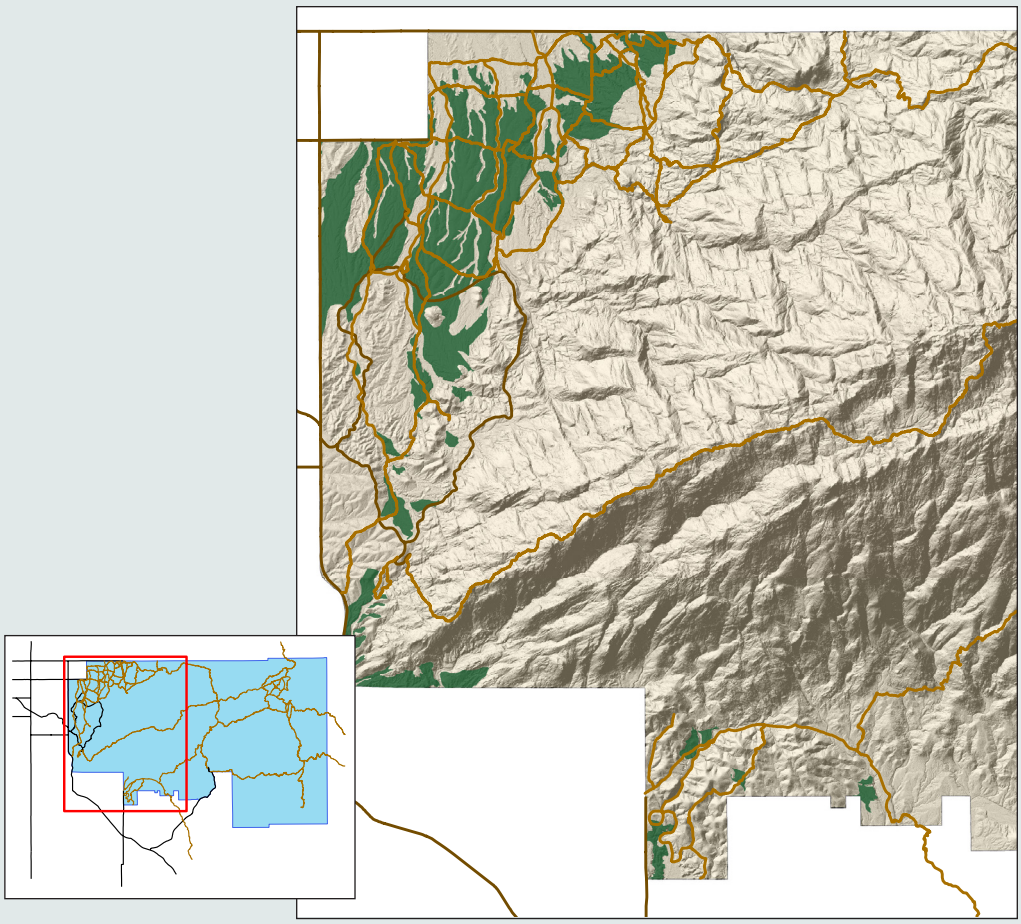
- *Parkinsonia microphylla*
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Larrea tridentata*
- *Vachellia constricta*

This wooded shrubland community is characterized by a canopy stratum (2–5 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a diverse subcanopy stratum (0.5–2 m) typically dominated by cactus apple (*Opuntia engelmannii*), whitethorn acacia (*Vachellia constricta*), and creosote (*Larrea tridentata*). The field stratum (<0.5 m) is sparse (<10% cover) and composed of a mix of subshrubs, succulents, and perennial grasses, with no consistent dominants. Yellow paloverde (*P. microphylla*) trees (4–5 m) provide an average cover of 6% (up to 20%). Velvet mesquite (*Prosopis velutina*) is a notable but inconsistent canopy species that can occasionally co-dominate with the yellow paloverde, or present as the sole canopy dominant, with up to 8% cover. Saguaro (*Carnegiea gigantea*) is a conspicuous and diagnostic component but provides very low cover (<1%). In the subcanopy, cactus apple (*O. engelmannii*) averages 7% cover across the community, with some areas up to 15%. Whitethorn acacia (*V. constricta*) and creosote (*L. tridentata*) provide variable (1–7%) cover. Desert zinnia (*Zinnia acerosa*) is the most consistent field associate, with average cover of around 2%, sometimes reaching a dominant 10%. Other notable associates include staghorn cholla (*Cylindropuntia versicolor*), chain-fruit cholla (*Cylindropuntia fulgida*), Warnock's snakewood (*Condalia warnockii*), spiny hackberry (*Celtis ehrenbergiana*), bush muhly (*Muhlenbergia porteri*), Arizona cottontop (*Digitaria californica*), and rough menodora (*Menodora scabra*).

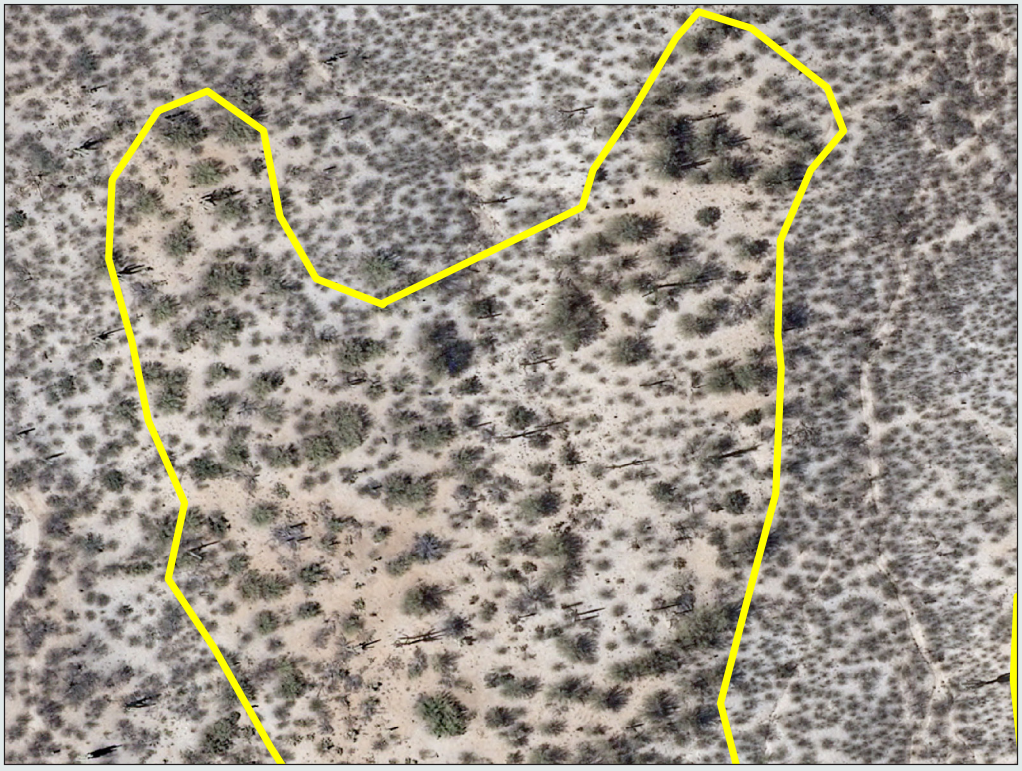
This wooded shrubland is contained within a three-association map class that covers 3.6% (983 ha/2,429 ac) of the Rincon Mountain District and is widespread throughout the Cactus Forest Loop Road area and the associated trail system. It is found exclusively on low-angle (1–6% [20]) alluvial fans from 820 to 945 meters (2,609–3,100 ft), usually on the interfluve between the numerous washes that crisscross this association. 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.



Example of (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta - Larrea tridentata*) Wooded Shrubland.



Distribution of (*Carnegiea gigantea*) / *Parkinsonia microphylla* / *Opuntia engelmannii* (*Vachellia constricta* - *Larrea tridentata*) Wooded Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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

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

Common species

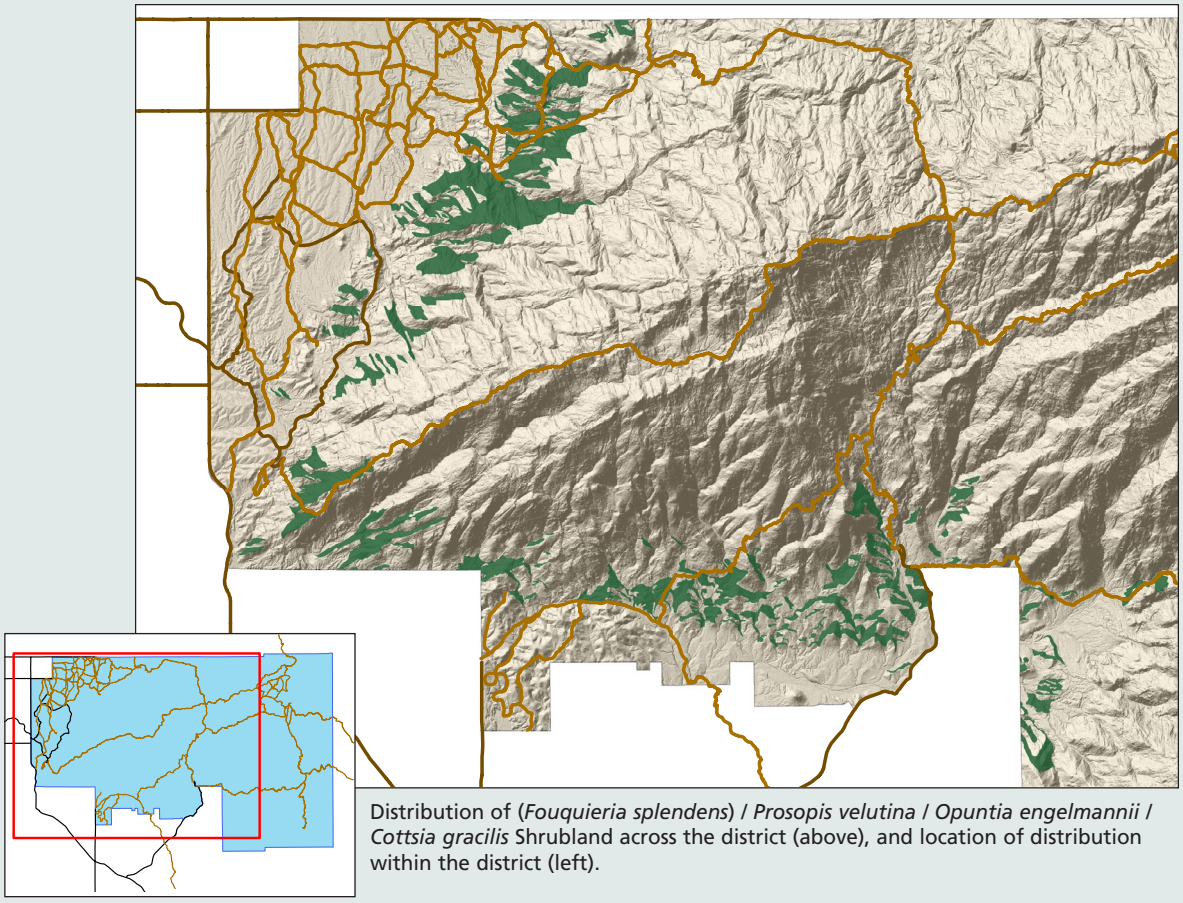
- *Fouquieria splendens*
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Cottsia gracilis*

This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) of ocotillo (*Fouquieria splendens*) and velvet mesquite (*Prosopis velutina*), an open (10–15% cover) subcanopy layer (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*), and a variable (1–25% cover) field layer (<0.5 m) most commonly dominated by slender janusia (*Cottsia gracilis*). Ocotillo and velvet mesquite are both consistent in the canopy and provide 2–5% cover each, occasionally reaching up to 10%. Saguaro (*Carnegiea gigantea*) is a conspicuous component, but only provides a scant 1% cover throughout. The subcanopy dominant, cactus apple (*O. engelmannii*), provides the most cover of any species, averaging 7% and sometimes reaching up to 18%. Catclaw acacia (*Senegalia greggii*) is a low-cover (~2%), but consistent associate shrub. 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 field layer is sparse and composed of a low-cover mix of small shrubs, subshrubs, and perennial grasses. The stratum is most commonly dominated by slender janusia (*C. gracilis*), which provides consistent cover at around 3%, up to 8%. Sangre de cristo (*Jatropha cardiophylla*) and fairyduster (*Calliandra eriophylla*) are consistent associates, with 1–2% cover each. Additional field associates include brittlebush (*Encelia farinosa*), Lehmann lovegrass (*Eragrostis lehmanniana*), Arizona spikemoss (*Selaginella arizonica*), and sideoats grama (*Bouteloua curtipendula*).

This community covers 4% (1,100 ha/2,719 ac) of the Rincon Mountain District and is widespread throughout the low slopes of Tanque Verde Ridge and northeast of the Madrona ranger station. It mainly occupies north-trending, low-angled to moderately steep (20–40%) backslopes. Its elevational range is 950–1,200 meters (3,120–3,940 ft). Surface rock and exposed bedrock are common throughout the community.



Example of (*Fouquieria splendens*) / *Prosopis velutina* / *Opuntia engelmannii* / *Cottsia gracilis* Shrubland.



Distribution of (*Fouquieria splendens*) / *Prosopis velutina* / *Opuntia engelmannii* / *Cottsia gracilis* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

- *Parkinsonia microphylla*
- *Fouquieria splendens*
- *Encelia farinosa*
- *Cottsia gracilis*

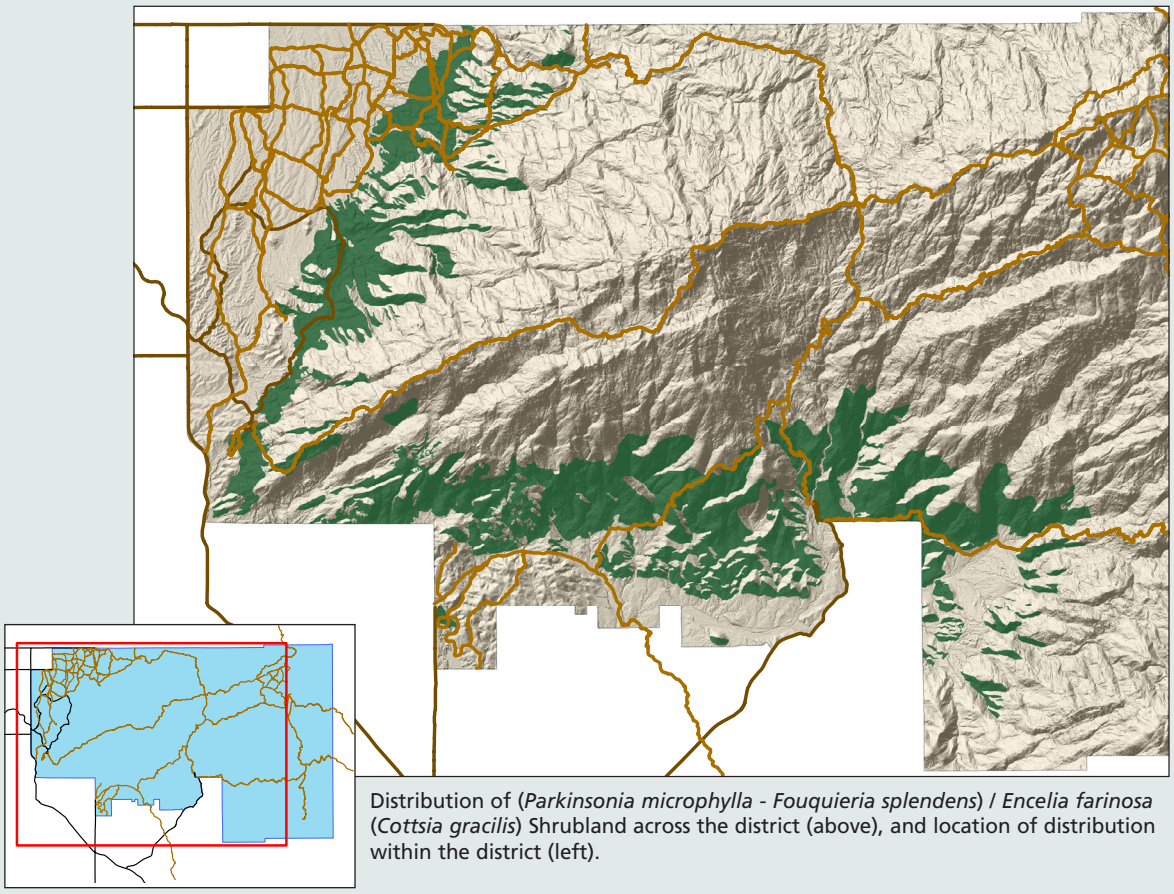
This shrubland association is characterized by a sparse (<10% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and ocotillo (*Fouquieria splendens*), with a variable (8–35% cover) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) and slender janusia (*Cottsia gracilis*). Ocotillo (*F. splendens*) is a very consistent (>0.9) common associate, with individuals 3–4 meters tall providing around 1–3 [8]% cover throughout. Yellow paloverde (*P. microphylla*) is also a consistent (1.0) associate that rarely surpasses 5% cover. Saguaros (*Carnegiea gigantea*) are present throughout this community (1.0) but contribute little (1%) to overall vegetation cover. The subcanopy stratum (0.5–2 m) is primarily characterized by a mix of low-cover associate shrubs and succulents. At the Rincon Mountain District (RMD), cactus apple (*O. engelmannii*) is a patchy (0.66) associate that, when present, provides cover ranging up to 5%. The field stratum is characterized by the dominance of brittlebush (*E. farinosa*), which is the most-consistent (1.0) and highest-cover (5–10 [20]%) species in this community. Slender janusia (*C. gracilis*) is the next most-dominant species, providing consistent (>0.8) cover averaging around 3% across the community.

This shrubland is contained within a two-association map class that covers 12% (3,225 ha/7,969 ac) of the RMD. At the RMD, this community is widespread throughout the low slopes of Tanque Verde Ridge and above the Madrona ranger station. This community prefers steep, exposed, south-facing slopes from 840 to 1,470 meters (2,755–4,822 ft). The ground surface is covered with very coarse gravel and rock with vast expanses of bedrock outcrops/shelves.

This association is one of five found in both the RMD and the Tucson Mountain District (see page 6).



Example of (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland.



Distribution of (*Parkinsonia microphylla - Fouquieria splendens*) / *Encelia farinosa* (*Cottsia gracilis*) Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

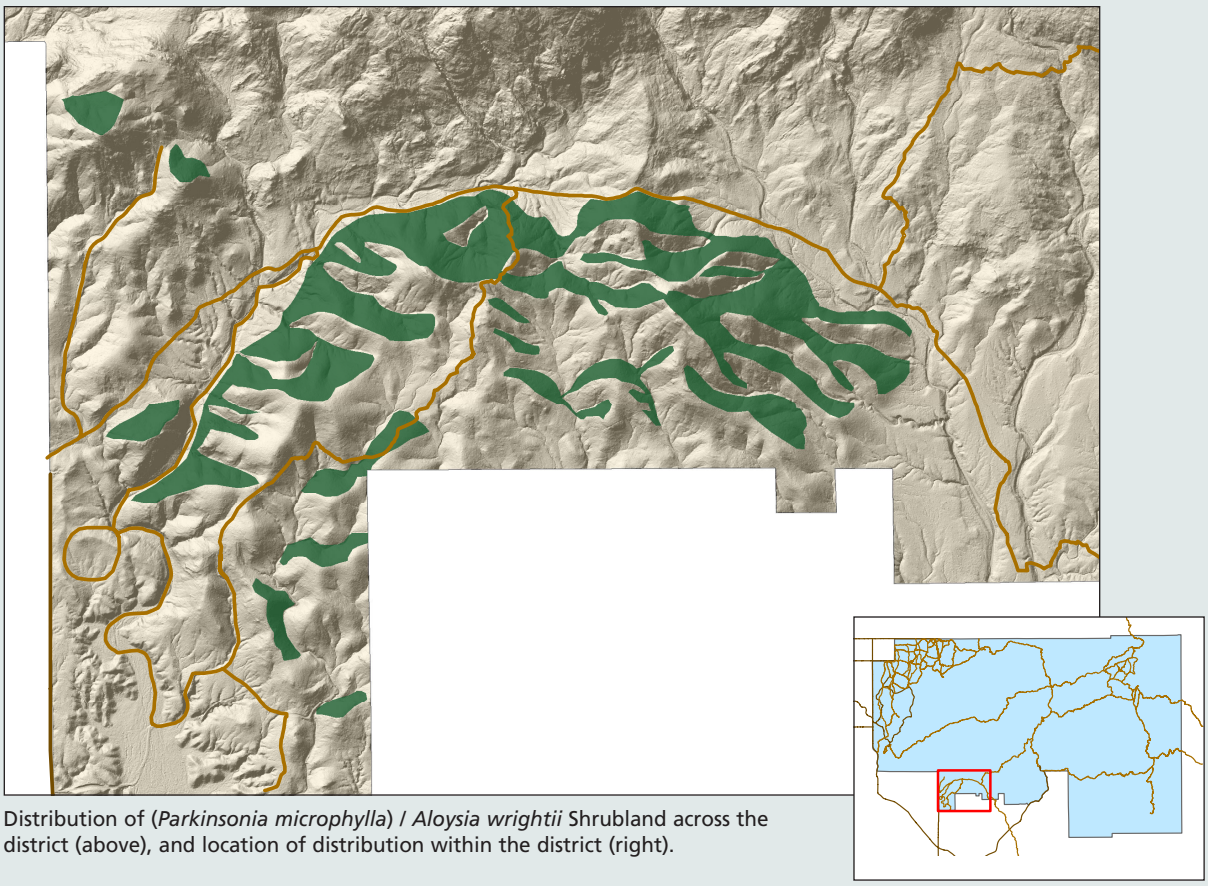
- *Parkinsonia microphylla*
- *Aloysia wrightii*
- *Parthenium incanum*

This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (15–25% cover) subcanopy (0.5–2 m) dominated by Wright's beebrush (*Aloysia wrightii*). Yellow paloverde (*P. microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m), with consistent cover of around 3%. The subcanopy is characterized by the sole dominance of Wright's beebrush (*A. wrightii*) 1–1.5 meters 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 1–3% cover each. The relatively sparse (<10% cover) field layer is characterized by the consistent presence (1.0) of mariola (*Parthenium incanum*), with 4–8% cover throughout. At times, in areas of high Wright's beebrush (*A. wrightii*) cover, mariola (*P. incanum*) may not be present. Brittlebush (*Encelia farinosa*) is an incidental component with sparse cover that predominately occurs at the margins of the community or on minor aspect shifts where the exposure trends more south.

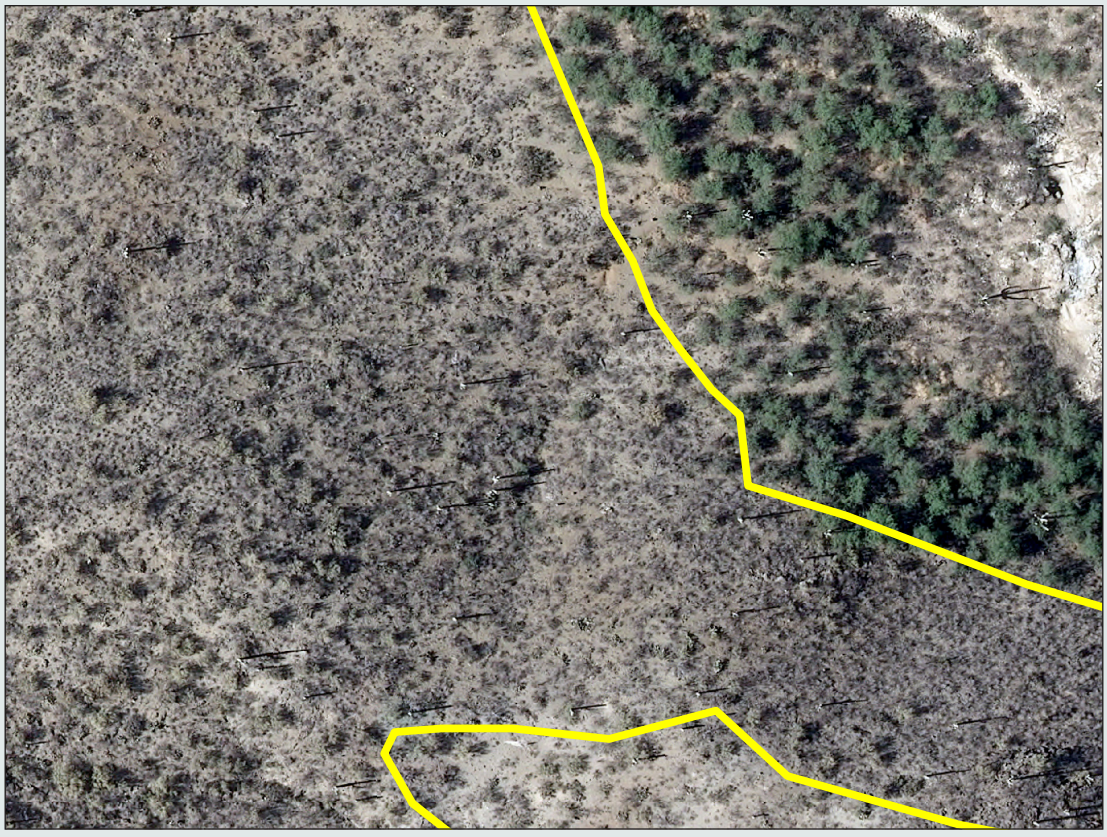
This community is contained within a two-association map class that covers 0.4% (113 ha/279 ac) and is present on the hills east of the Camino Loma Alta trailhead in the Rincon Mountain District. It is found exclusively on steep (30–50%), north-facing backslopes from 925 to 1,045 meters (3,030–3,428 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 that includes sandstone, shale, and limestone.



Example of (*Parkinsonia microphylla*) / *Aloysia wrightii* Shrubland.



Distribution of (*Parkinsonia microphylla*) / *Aloysia wrightii* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

(Yellow paloverde) / Teddybear cholla / Brittlebush Shrubland Association (P)

Common species

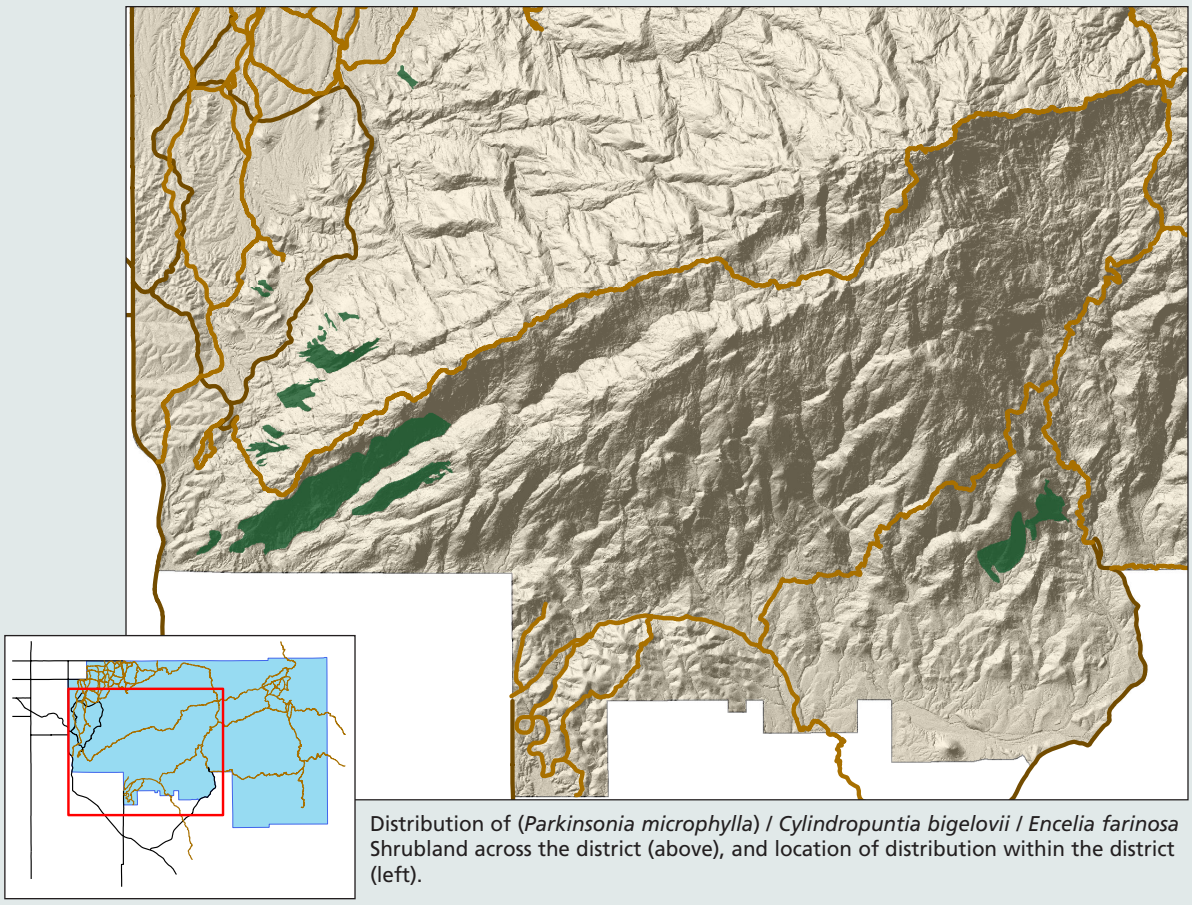
- *Parkinsonia microphylla*
- *Cylindropuntia bigelovii*
- *Encelia farinosa*

This shrubland is characterized by a subcanopy layer (0.5–2 m) consistently dominated by teddybear cholla (*Cylindropuntia bigelovii*) at 5–15% cover, and a field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) at an average of 15% cover. The canopy layer (>2 m) is sparse, with ocotillo (*Fouquieria splendens*) and yellow paloverde (*Parkinsonia microphylla*) providing consistent, low cover averaging 2% and 4%, respectively. Velvet mesquite (*Prosopis velutina*) is inconsistent, ranging from absent to 3% cover. Saguaros (*Carnegiea gigantea*) are present throughout, but only account for <1% cover. The characteristic teddybear cholla can appear locally patchy but should be distributed uniformly across the broader landscape. The species typically prefers areas of exposed bedrock or high surface-rock cover. The remainder of the subcanopy is composed of a mix of associate shrubs and succulents that, when present, contribute <4% cover each. These include staghorn cholla (*Cylindropuntia versicolor*), whitethorn acacia (*Vachellia constricta*), creosote (*Larrea tridentata*), and cactus apple (*Opuntia engelmannii*). The field dominant, brittlebush, is the most-consistent and highest-cover species in the community, reaching up to 30%. Remaining field cover is generated by a diverse mix of species. Slender janusia (*Cottsia gracilis*) is the most consistent, averaging 2% cover. Other noteworthy species include bush muhly (*Muhlenbergia porteri*), fairyduster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*), and American threefold (*Trixis californica*). Non-native buffelgrass (*Cenchrus ciliaris*) is an inconsistent species that ranges from absent up to 18% cover. Arizona spikemoss (*Selaginella arizonica*) can be present at up to 20% cover, in areas with dominant bedrock.

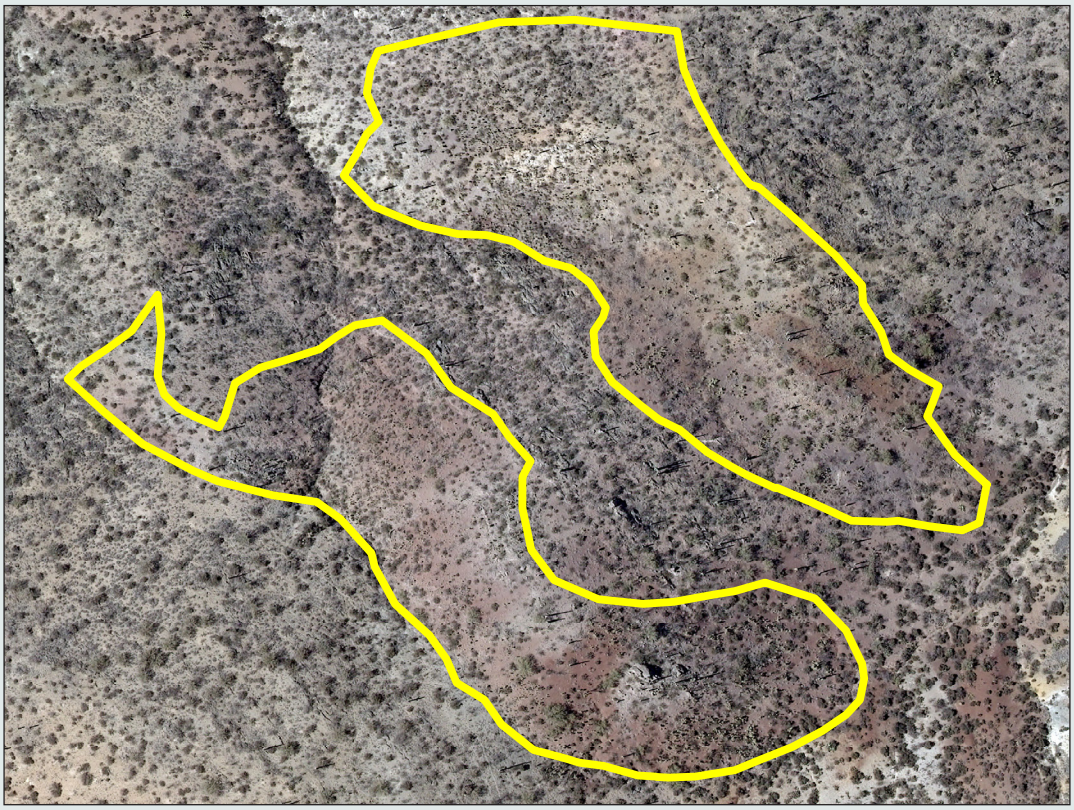
This shrubland covers 0.9% (241 ha/595 ac) of the Rincon Mountain District and is present throughout the exposed, south-facing slopes of the lower Tanque Verde Ridge, especially around Box Canyon. It occurs on slopes of varying grade, from 15% to 50%, and occupies an elevational range from 934 to 1,144 meters (3,064–3,753 ft). The ground surface is covered with coarse gravel, exposed rock, and vast expanses of bedrock outcrops/shelves.



Example of (*Parkinsonia microphylla*) / *Cylindropuntia bigelovii* / *Encelia farinosa* Shrubland.



Distribution of (*Parkinsonia microphylla*) / *Cylindropuntia bigelovii* / *Encelia farinosa* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

(Yellow paloverde) / Creosote Shrubland Association (P)

Common species

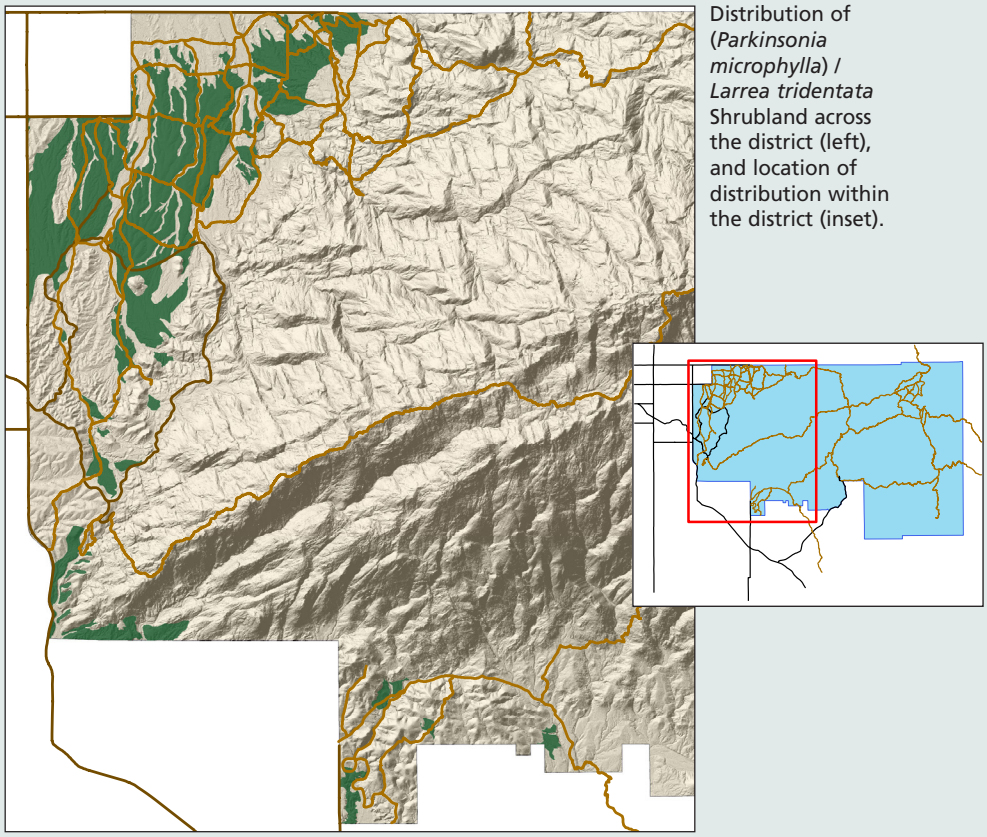
- *Parkinsonia microphylla*
- *Larrea tridentata*

This shrubland community is characterized by a sparse (<5% cover) canopy (>2 m) of yellow paloverde (*Parkinsonia microphylla*) and a variably dense (10–30% cover) shrub layer (0.5–2 m) solely dominated by creosote (*Larrea tridentata*). Yellow paloverde (*P. microphylla*) is consistently present (1.0) as large (4 m), scattered trees with average cover of around 3%, but reaching toward 15% in some examples. Creosote (*L. tridentata*) provides consistent (1.0) dominance throughout the subcanopy stratum (0.5–2 m), with average cover of around 20% and up to 30% in some areas. The field layer (<0.5 m) within the community is extremely sparse (<5% cover), with associates that include desert zinnia (*Zinnia acerosa*), rough menodora (*Menodora scabra*), Christmas cactus (*Cylindropuntia leptocaulis*), and brittlebush (*Encelia farinosa*).

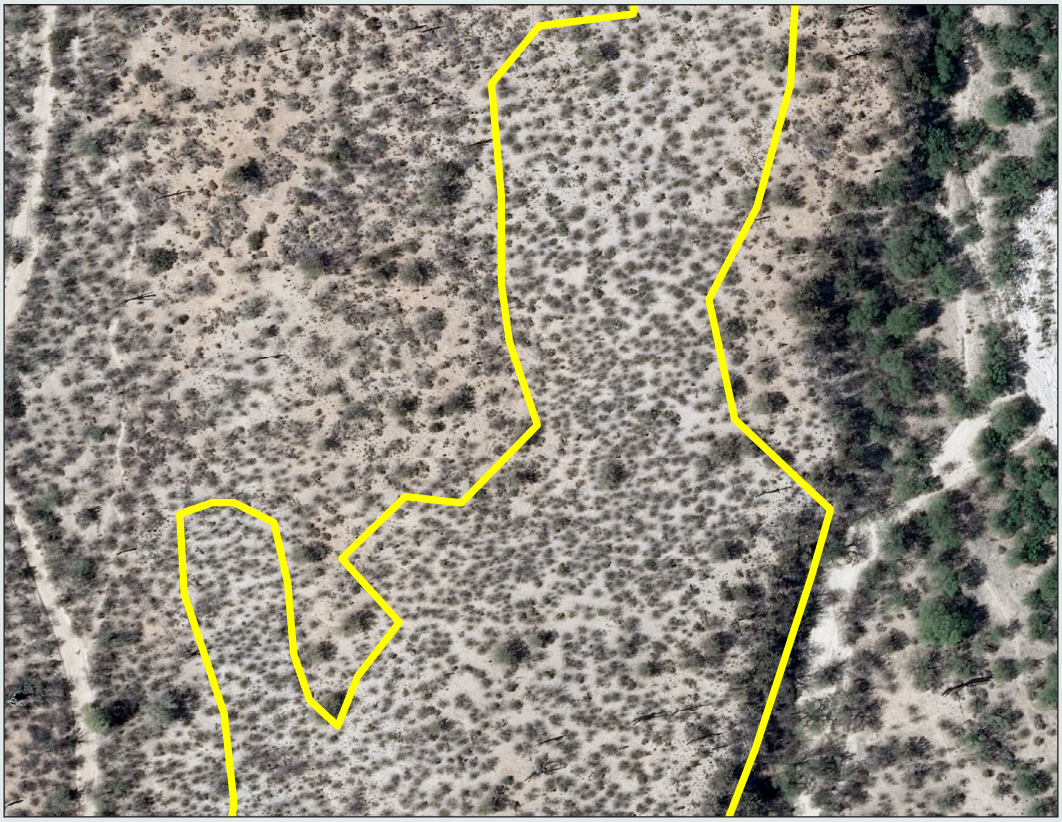
This community is contained within a three-association map class that covers 3.6% (983 ha/2,429 ac) of the Rincon Mountain District and is mainly distributed throughout the northwest corner of the park, north of the Cactus Forest Loop Road, between the Broadway and Douglas Spring trailheads. It is restricted 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.



Example of (*Parkinsonia microphylla*) / *Larrea tridentata* Shrubland.



Distribution of (*Parkinsonia microphylla*) / *Larrea tridentata* Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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

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

Common species

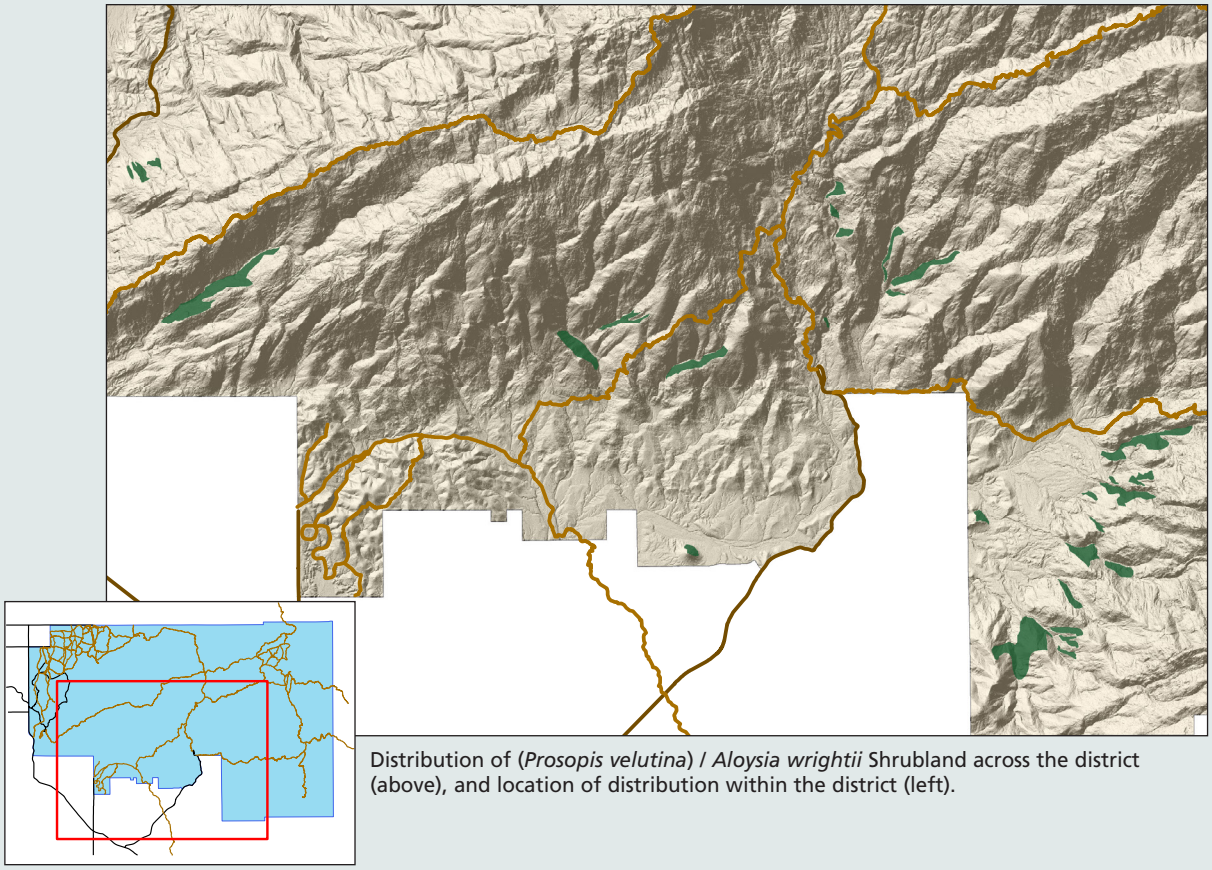
- *Prosopis velutina*
- *Aloysia wrightii*

This shrubland association is characterized by a sparse (<10% cover) 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 (*P. velutina*) is typically present as a short (2–3 m) tree that provides consistent (1.0) cover of around 4%. Wright's beebrush (*Aloysia wrightii*) accounts for the majority of cover within this community, ranging from 15 to 30%. As this species is strongly associated with sheltered northern slopes, cover tends to decrease as aspects become more exposed. Other documented species include staghorn cholla (*Cylindropuntia versicolor*), Berlandier's wolfberry (*Lycium berlandieri*), climbing wartclub (*Boerhavia scandens*), black grama (*Bouteloua eriopoda*), sideoats grama (*Bouteloua curtipendula*), bush muhly (*Muhlenbergia porteri*), and slender janusia (*Cottsia gracilis*).

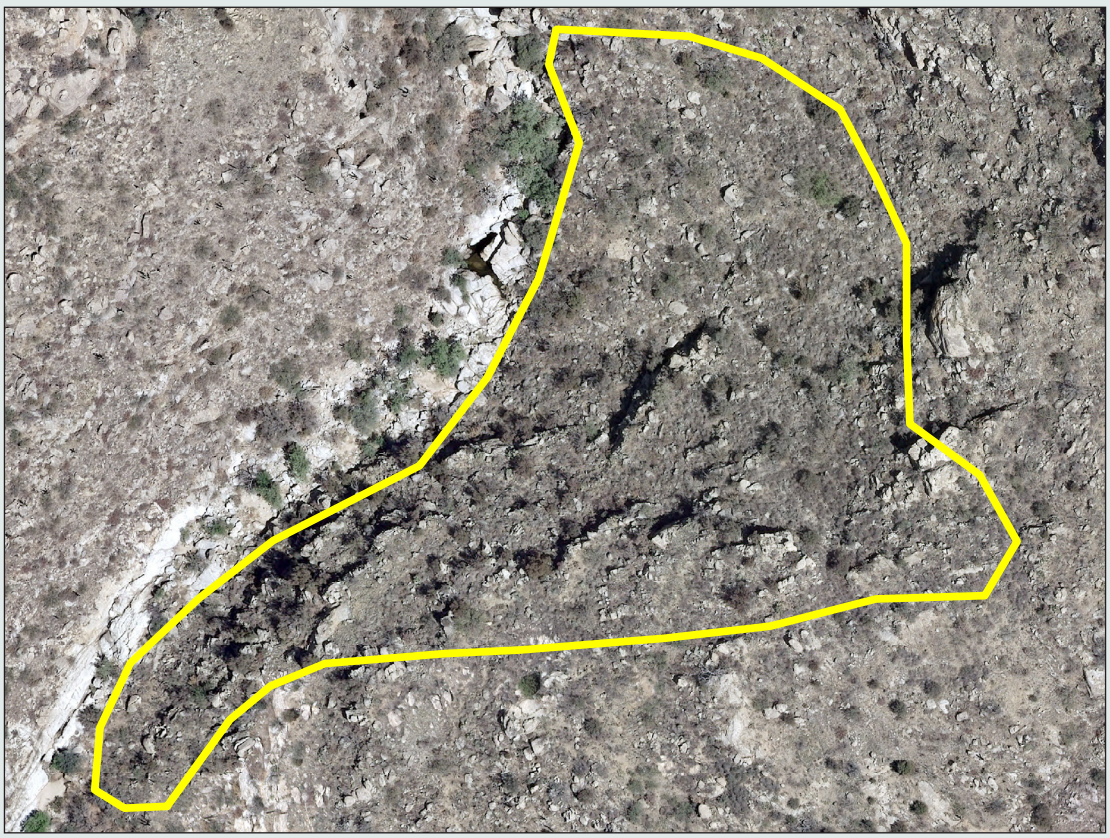
This community covers 0.6% (175 ha/432 ac) of the Rincon Mountain District and is widespread throughout the low slopes of Tanque Verde Ridge and northeast of the Madrona ranger station. It is typically found on very steep (50+%), exclusively north-facing backslopes from 900 to 1,200 meters (2,950–3,900 ft). In general, the surface cover is dominated by coarse gravel and rock with considerable outcrops of exposed bedrock.



Example of (*Prosopis velutina*) / *Aloysia wrightii* Shrubland.



Distribution of (*Prosopis velutina*) / *Aloysia wrightii* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

(Velvet mesquite) / Creosote Shrubland Association (P)

Common species

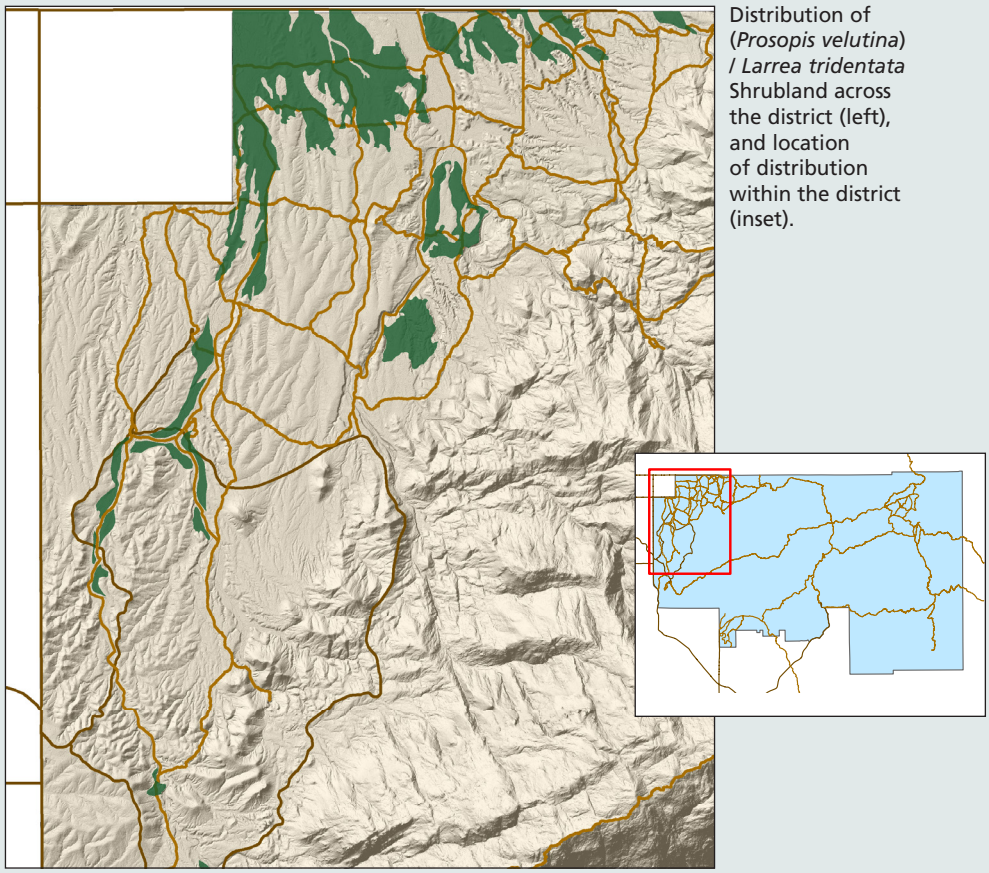
- *Prosopis velutina*
- *Larrea tridentata*
- *Vachellia constricta*

This shrubland is characterized by a sparse (<5% cover) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a variably dense (10–30% cover) subcanopy (0.5–2 m) solely dominated by creosote (*Larrea tridentata*). Velvet mesquite (*P. velutina*) is a consistent dominant that grows as a large tree (4 m), providing an average of 3% cover but reaching up to 15% in some examples. These areas of higher canopy cover are typically associated with adjacent wash communities. Creosote (*L. tridentata*) is also a consistent dominant, with average cover of around 20%, sometimes reaching up to 30%. Whitethorn acacia (*Vachellia constricta*) is the most consistent associate shrub, often providing 1–2% cover. Other noteworthy associates in the subcanopy include cactus apple (*Opuntia engelmannii*), tulip pricklypear (*Opuntia phaeacantha*), and chain-fruit cholla (*Cylindropuntia fulgida*). The field stratum (<0.5 m) in this community is extremely sparse (<5% cover) and is often composed of a mix of native and non-native grasses and forbs, most notably Mediterranean grass (*Schismus* sp.), redstem storksbill (*Erodium cicutarium*), and fiddleneck (*Amsinckia* sp.).

This shrubland covers 1% (262 ha/648 ac) of the Rincon Mountain District and occurs mainly in the northwest corner of the district, between the Broadway and Douglas Spring trailheads. It occupies low-angle (<5%) lower alluvial fans and the nearly flat floodplains along some of the larger wash systems. The community's elevational range is from 860 to 905 meters (2,820–2,970 ft). Surface cover is defined by very deep, well-drained soils, commonly composed of fine silt with sparse to non-existent gravel and rock.



Example of (*Prosopis velutina*) / *Larrea tridentata* Shrubland.



Distribution of (*Prosopis velutina*) / *Larrea tridentata* Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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

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

Common species

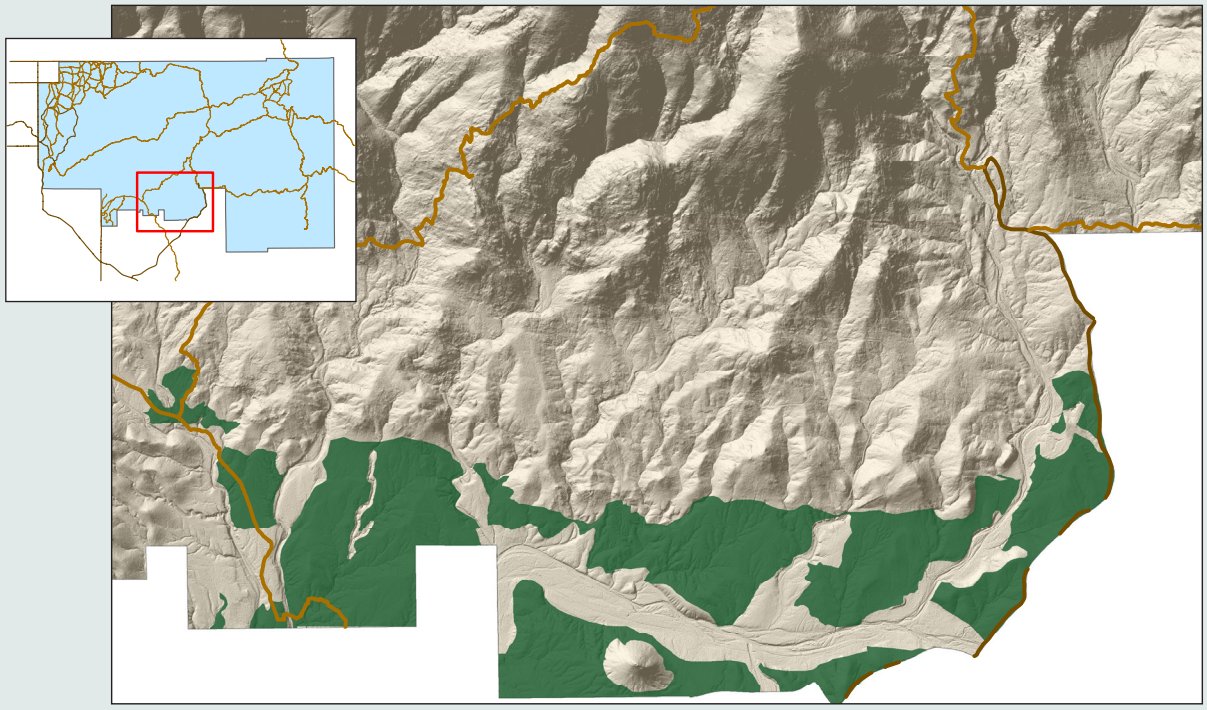
- *Prosopis velutina*
- *Vachellia constricta*
- *Opuntia engelmannii*
- *Zinnia acerosa*

This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–30% cover) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*) and cactus apple (*Opuntia engelmannii*). Velvet mesquite (*P. velutina*) is a consistent (1.0) component, typically present as small (2 m) shrubby trees with low (~5%) cover. The shrub layer is consistently (1.0) dominated by small (1.5 m) whitethorn acacia (*V. constricta*) that provide an evenly distributed 10–15% cover throughout. Areas of high cover typically occur within and along the numerous minor drainages that cross this community. Overall, cactus apple (*O. engelmannii*) is slightly less common, with a far patchier distribution. Cover for this species ranges from sparse areas with less than 5% cover to dense patches of up to 20%. The field layer (<0.5 m) is characterized by variable cover of 1–10%, most commonly dominated by desert zinnia (*Zinnia acerosa*). When present, this species provides cover less than 5%, but may occasionally reach toward 10%.

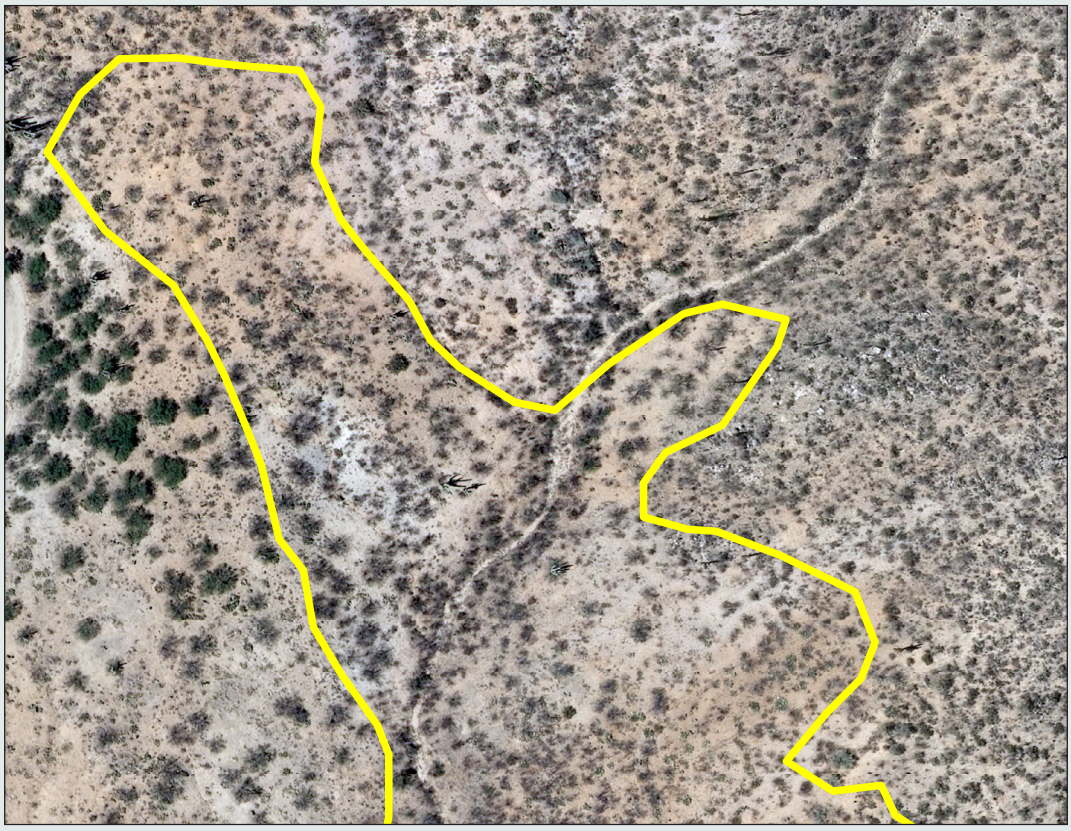
This shrubland community covers about 1% (270 ha/668 ac) of the Rincon Mountain District and is exclusively present in the Rincon Valley, on the alluvial fans east of Hope Camp. It is restricted to very low-angle (<5%), typically south-trending alluvial fans and minor washes at elevations around 960 meters (3,150 ft). The surface cover is characterized by very shallow, well-drained soils that underlie a mix of fine gravel and sandy loam. Biological soil crusts are widespread throughout this community.



Example of *Prosopis velutina / Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland.



Distribution of *Prosopis velutina / Opuntia engelmannii* (*Senegalia greggii - Celtis ehrenbergiana*) Wooded Shrubland across the district (above), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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

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

Common names

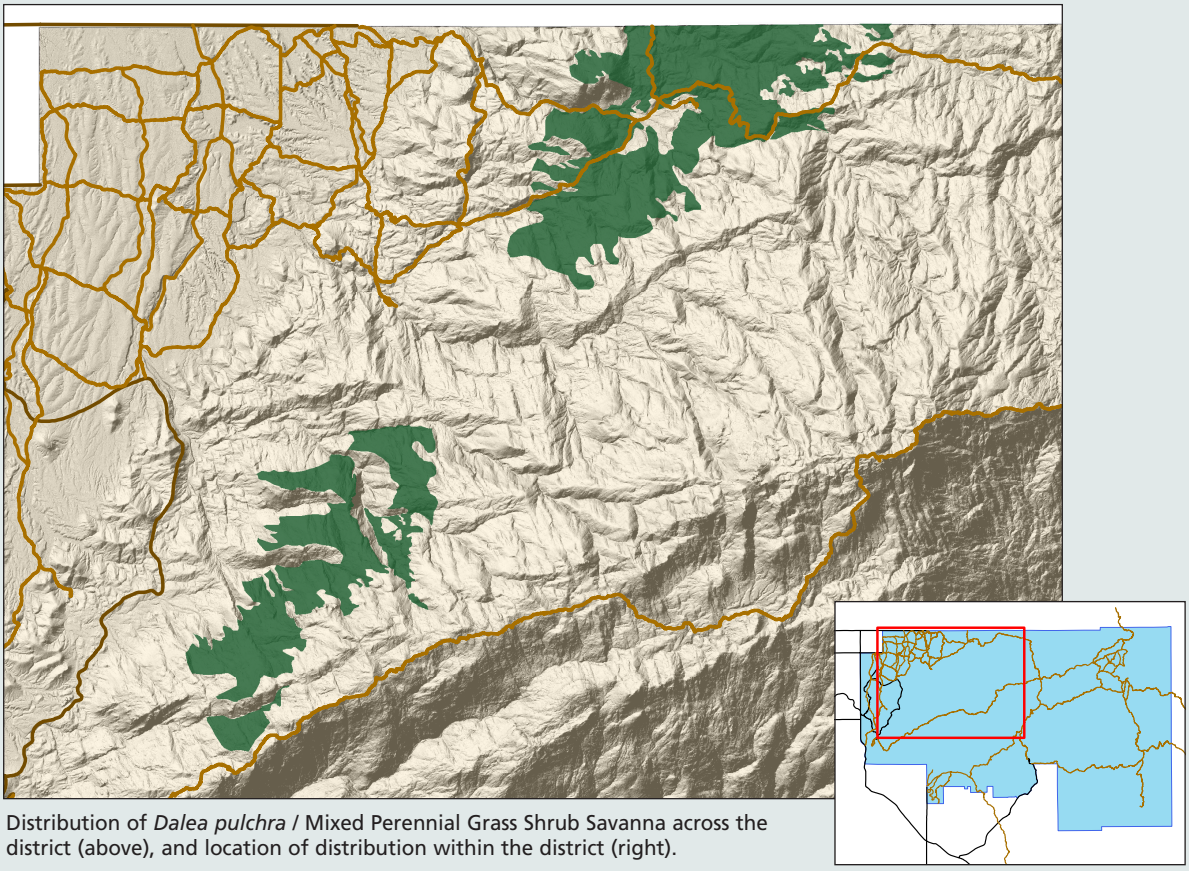
- *Dalea pulchra*
- *Dasylirion wheeleri*
- *Opuntia engelmannii*
- *Eragrostis lehmanniana*
- *Agave schottii*

This community is characterized by a moderately open (>20% cover) subcanopy stratum (0.5–2 m) dominated by Santa Catalina prairie clover (*Dalea pulchra*) and a variable (15–40%) field stratum (<0.5 m) of mixed perennial grasses. 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. Overall, Santa Catalina prairie clover (*D. pulchra*) is the most dominant (0.88) and consistent (1.0) species, with average cover of around 10%, locally ranging 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 of 2–3%. Perennial grass cover includes Lehmann lovegrass (*Eragrostis lehmanniana*), 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*).

This community covers 2.4% (654 ha/1,616 ac) of the Rincon Mountain District and is primarily located on the slopes around Bridal Wreath Falls, but was documented in other scattered locations throughout Tanque Verde Ridge. It is commonly found on slopes of moderate (24%) grade, 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/interspersed with the soil is a dominant layer of gravel and cobble with occasional exposed bedrock. Parent material is typically composed of metagranodiorite.



Example of *Dalea pulchra* / Mixed Perennial Grass Shrub Savanna.



Distribution of *Dalea pulchra* / Mixed Perennial Grass Shrub Savanna across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

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

Common species

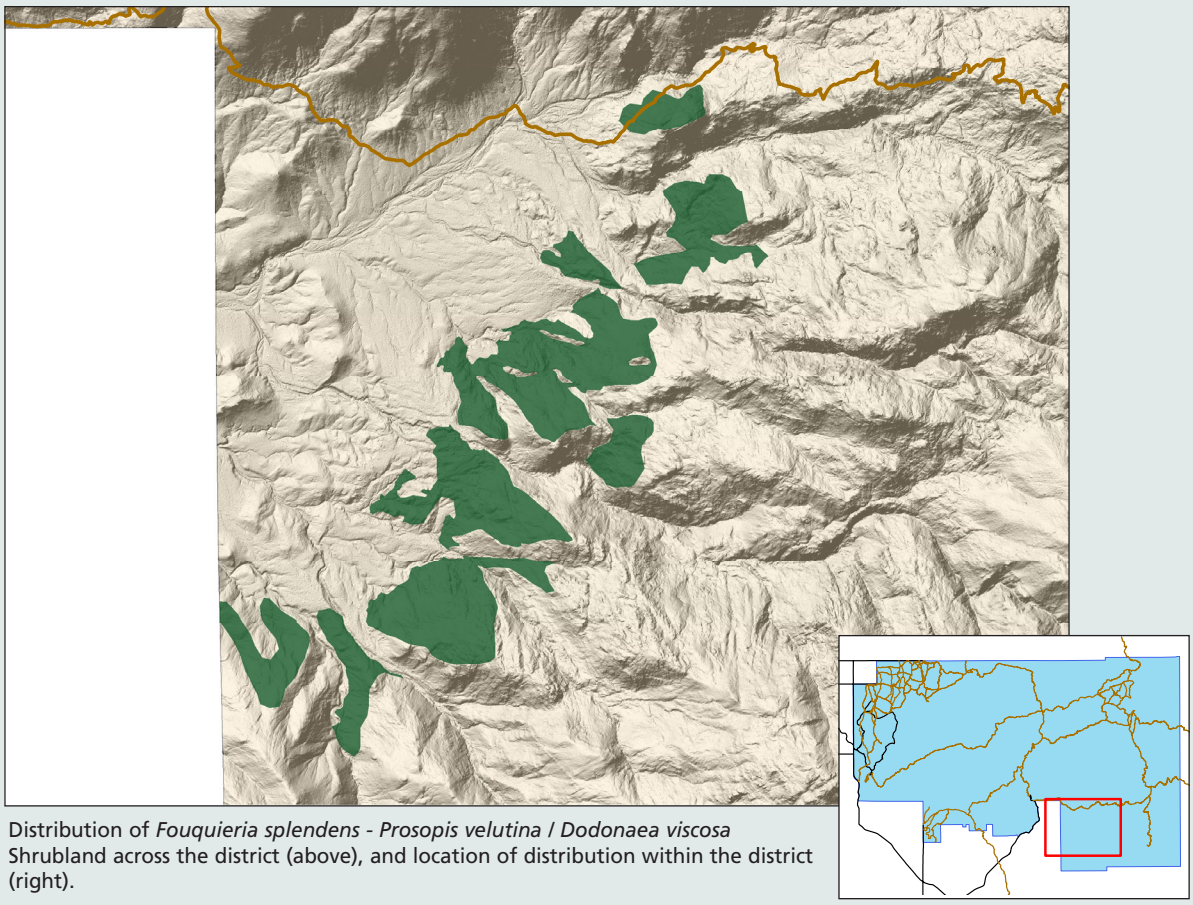
- *Fouquieria splendens*
- *Prosopis velutina*
- *Dodonaea viscosa*
- *Selaginella rupincola*
- *Calliandra eriophylla*

This shrubland is characterized by a canopy stratum (>2 m) (10–20% cover) of ocotillo (*Fouquieria splendens*) and velvet mesquite (*Prosopis velutina*), a subcanopy stratum (0.5–2 m) (15–25% cover) dominated by Florida hopbush (*Dodonaea viscosa*), and a variable (15–30% cover) field layer (<0.5 m) dominated by fairyduster (*Calliandra eriophylla*) and/or rockloving spikemoss (*Selaginella rupincola*). Ocotillo (*F. splendens*) consistently provides 5–10% cover, occasionally up to 15%. Velvet mesquite (*P. velutina*) is a less-consistent dominant, ranging from 1% to 12% cover. The subcanopy is dominated by Florida hopbush (*D. viscosa*), which provides 5–15% cover, sometimes up to 20%. The dominance of this species is diagnostic of this community. Cactus apple (*Opuntia engelmannii*) is a consistent associate that can occasionally be dominant, with up to 5% cover. Other noteworthy associates 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 (*Lysiloma watsonii*), showy goldeneye (*Heliomeris multiflora*), and Thurber's cotton (*Gossypium thurberi*). The field layer is a diverse mix of subshrubs, perennial grasses, and spikemoss. Rockloving spikemoss (*S. rupincola*) cover ranges from absent to a dominant 25% cover; this species is most common where bedrock is high. Fairyduster (*C. eriophylla*) can also range from absent to a dominant 10% cover. In areas of lower bedrock, or at higher elevations, native perennial grasses can provide a noteworthy 5–10% cover. Common associates include sideoats grama (*Bouteloua curtipendula*), alkali sacaton (*Sporobolus airoides*), and slender grama (*Bouteloua repens*).

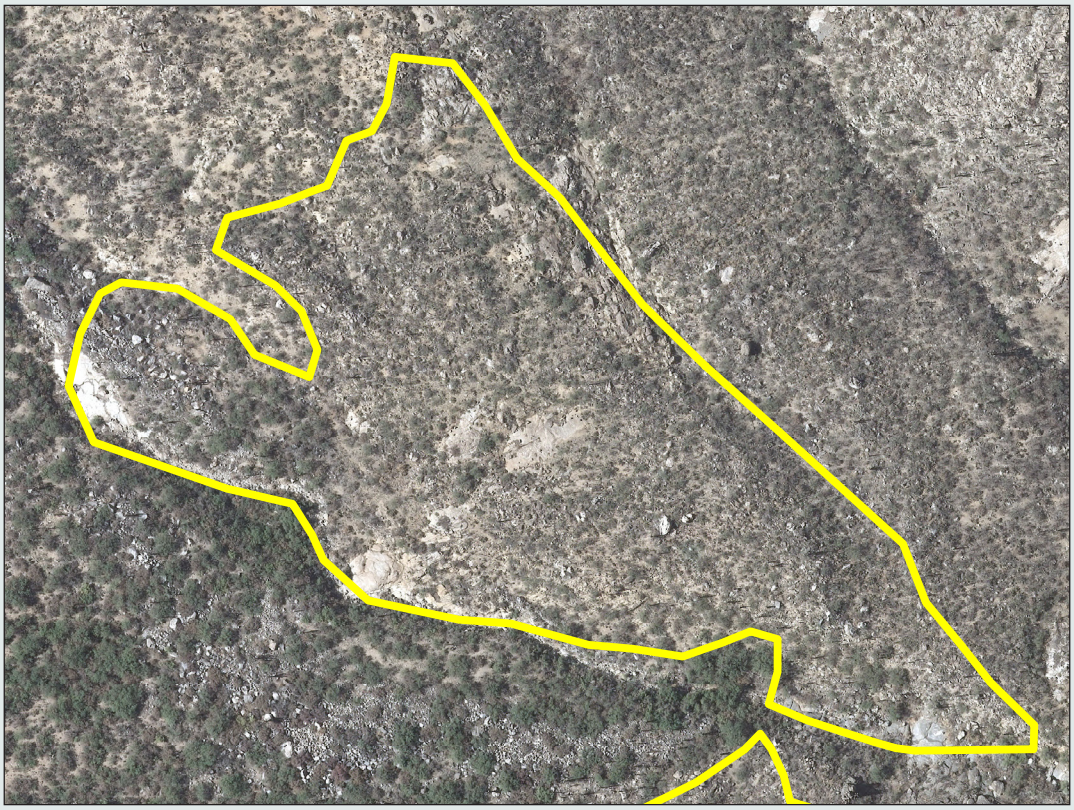
This shrubland community covers about 0.5% (147 ha/364 ac) of the Rincon Mountain District and occurs on the western slopes just above Rincon Valley. It mainly occupies low, moderately steep backslopes from 1,036 to 1,280 meters (3,400–4,200 ft). The surface cover is often dominated by expanses of bedrock, boulders, and coarse gravel, with shallow and well-drained soils.



Example of *Fouquieria splendens - Prosopis velutina / Dodonaea viscosa* Shrubland.



Distribution of *Fouquieria splendens - Prosopis velutina / Dodonaea viscosa* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

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

Common species

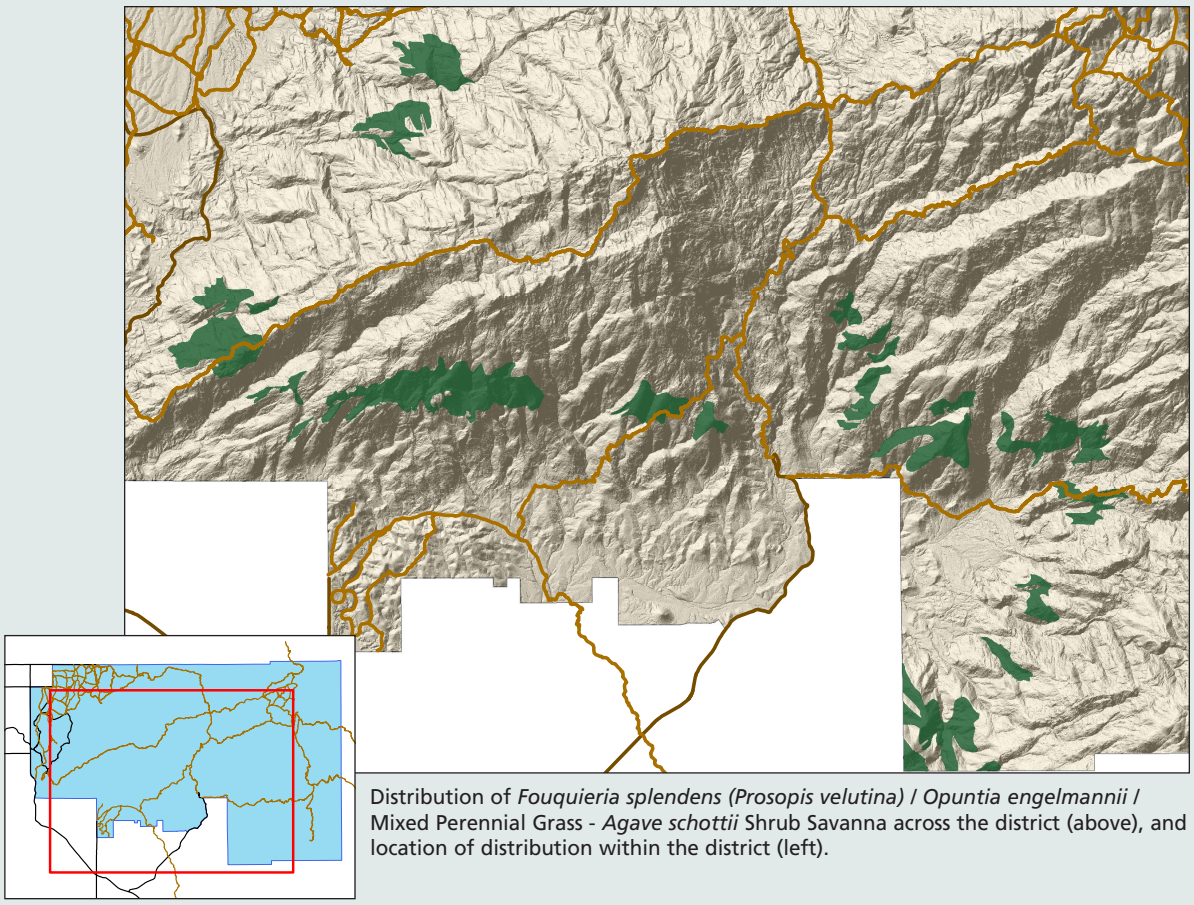
- *Fouquieria splendens*
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Ericameria laricifolia*
- *Agave schottii*

This community is characterized by an open (5–15% cover) canopy stratum (>2 m) dominated by ocotillo (*Fouquieria splendens*) with velvet mesquite (*Prosopis velutina*), a variable (5–20% cover) subcanopy (0.5–2 m) dominated by cactus apple (*Opuntia engelmannii*), and a highly variable ([10] 20–50% cover) field stratum (<0.5 m) dominated by perennial grasses and Schott's century plant (*Agave schottii*). Ocotillo (*F. splendens*) is consistently (1.0) present, with cover ranging from 2% to 10 [20]%, averaging of around 6%. Cactus apple (*O. engelmannii*) ranges from a sparse (1% cover) associate to, more commonly, a dominant with average cover of around 5% and dense inclusions approaching 20%. Other documented species 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*), yellow trumpetbush (*Tecoma stans*), sideoats grama (*Bouteloua curtipendula*), tanglehead (*Heteropogon contortus*), spidergrass (*Aristida ternipes*), bush muhly (*Muhlenbergia porteri*), cane bluestem (*Bothriochloa barbinodis*), and bullgrass (*Muhlenbergia emersleyi*).

This community covers 3.5% (946 ha/2,337 ac) of the Rincon Mountain District and is widespread throughout the low slopes of Tanque Verde Ridge, Mica Mountain, and Rincon Peak. It 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.



Example of *Fouquieria splendens (Prosopis velutina)* / *Opuntia engelmannii* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna.



Distribution of *Fouquieria splendens (Prosopis velutina)* / *Opuntia engelmannii* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

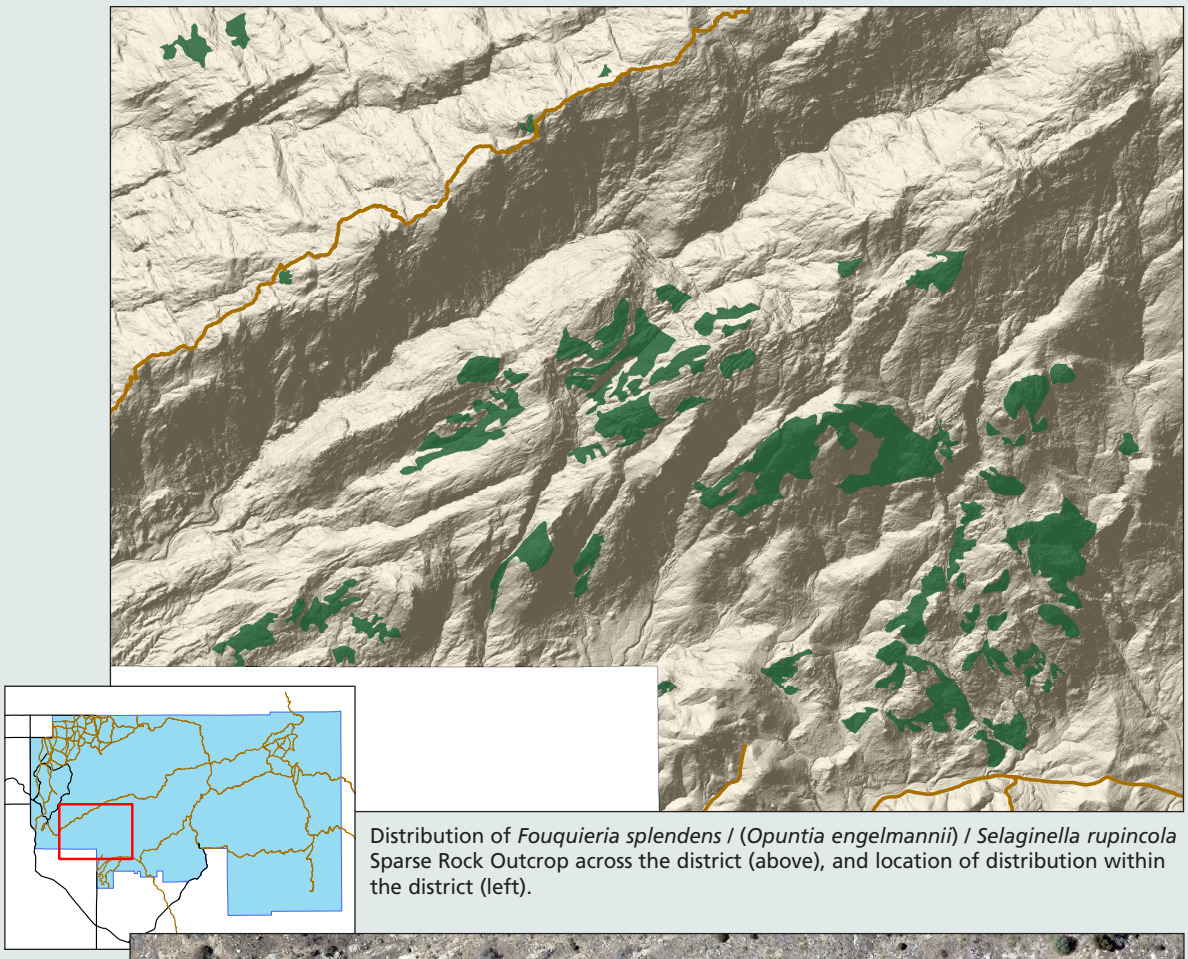
- *Fouquieria splendens*
- *Opuntia engelmannii*
- *Selaginella rupincola*
- *Selaginella arizonica*

This community is characterized by a very sparse (<6% cover) canopy stratum (>2 m) dominated by ocotillo (*Fouquieria splendens*), a sparse (<8% cover) subcanopy (0.5–2 m) of cactus apple (*Opuntia engelmannii*), and a variable (14–35% cover) field stratum (<0.5 m) dominated by rockloving spikemoss (*Selaginella rupincola*). Ocotillo (*F. splendens*) is consistently (1.0) present, with variable cover ranging from 3–8%, averaging around 6%. Cactus apple (*O. engelmannii*) is present as small, stunted individuals more or less limited to the vegetated islands scattered throughout the bedrock. Rockloving spikemoss (*S. rupincola*) accounts for around half of the total relative cover documented in this community, or around 10–30%. Other documented species include jumping cholla (*Cylindropuntia fulgida*), staghorn cholla (*Cylindropuntia versicolor*), turpentine bush (*Ericameria laricifolia*), common sotol (*Dasylirion wheeleri*), Schott's century plant (*Agave schottii*), slender bouteloua (*Bouteloua repens*), and rose natal grass (*Melinis repens*).

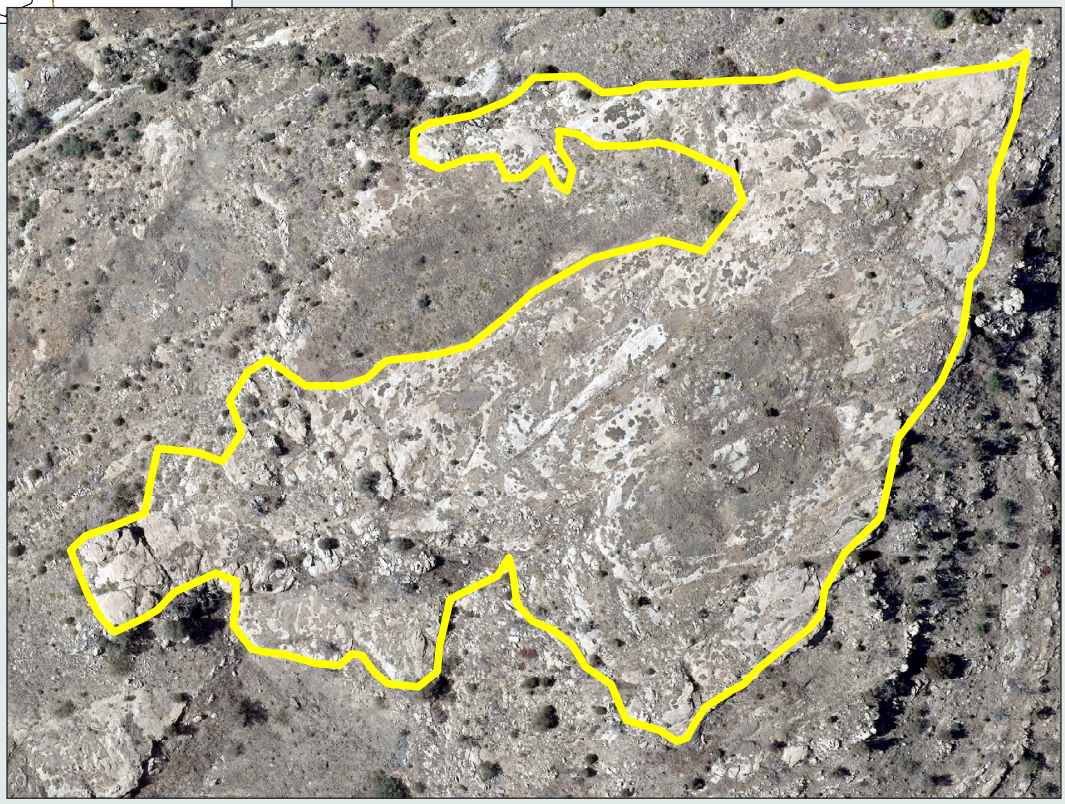
This community covers 0.5% (133 ha/328 ac) of the Rincon Mountain District and is distributed throughout the low-elevation regions of the park, especially on the southern slopes of Tanque Verde Ridge. It is typically restricted to south-trending expanses of exposed bedrock from 984 to 1,400 meters (3,228–4,593 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.



Example of *Fouquieria splendens* / (*Opuntia engelmannii*) / *Selaginella rupincola* Sparse Rock Outcrop.



Distribution of *Fouquieria splendens* / (*Opuntia engelmannii*) / *Selaginella rupincola* Sparse Rock Outcrop across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

Beargrass / Mixed Perennial grass - Schott's century plant Shrub Savanna Association (P)

Common species

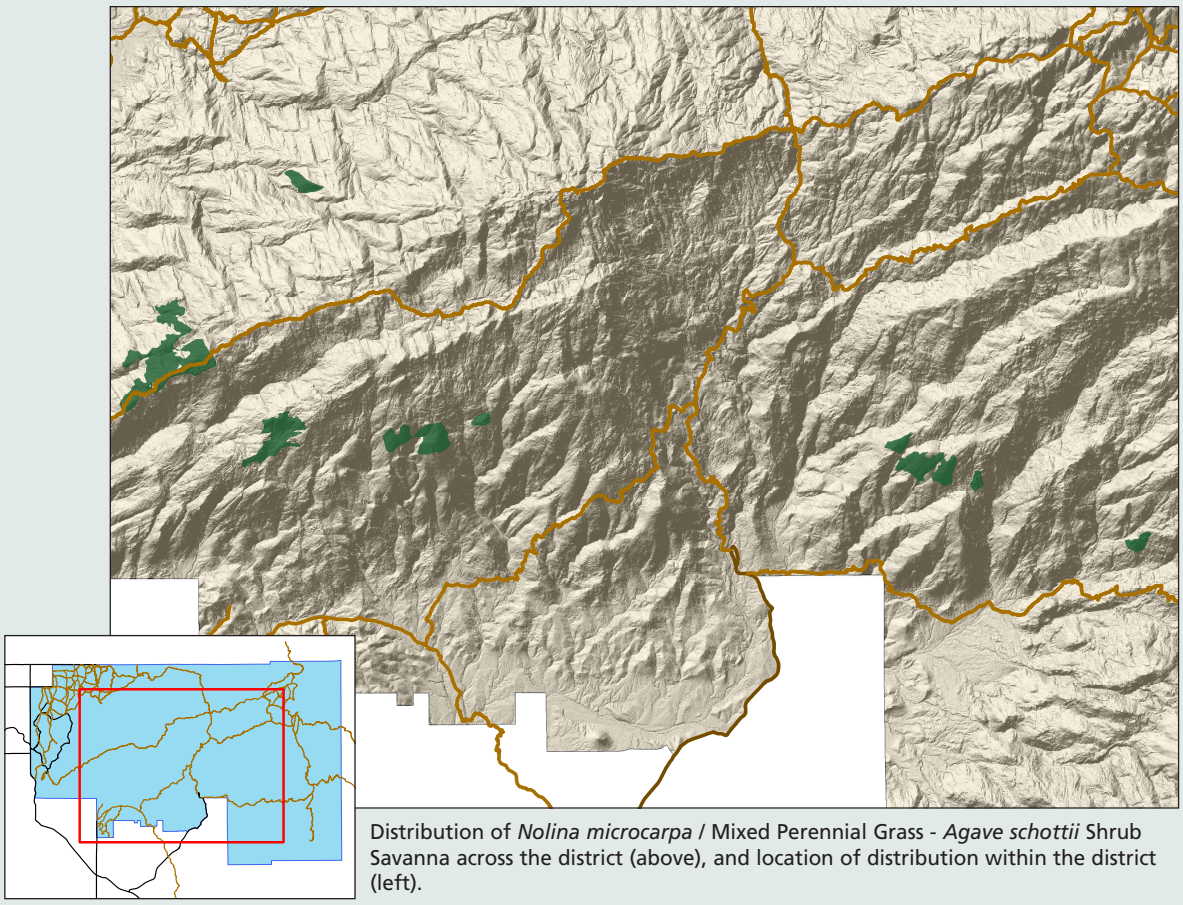
- *Nolina microcarpa*
- *Agave schottii*
- *Eragrostis lehmanniana*

This community is characterized by a moderately sparse (<15% cover) subcanopy (0.5–2 m) dominated by beargrass (*Nolina microcarpa*) and a highly variable (10–40% cover) field stratum (<0.5 m) dominated by perennial grasses and Schott's century plant (*Agave schottii*). The canopy strata (>2 m) are extremely sparse (<<5%), 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 1–2% cover. Distribution of beargrass (*N. microcarpa*) is variable, ranging from scattered, small individuals to large, dense clumps. Locally, cover can be as low as 1% or reach to 10% in some areas. 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*). Schott's agave (*A. schottii*) is the most consistent (1.0) field component, providing 2–10% cover. Overall, the grasses are mainly dominated by a single non-native, Lehmann lovegrass (*Eragrostis lehmanniana*). Other documented species include sideoats grama (*Bouteloua curtipendula*), bullgrass (*Muhlenbergia emersleyi*), tanglehead (*Heteropogon contortus*), and prairie acacia (*Acacia angustissima*).

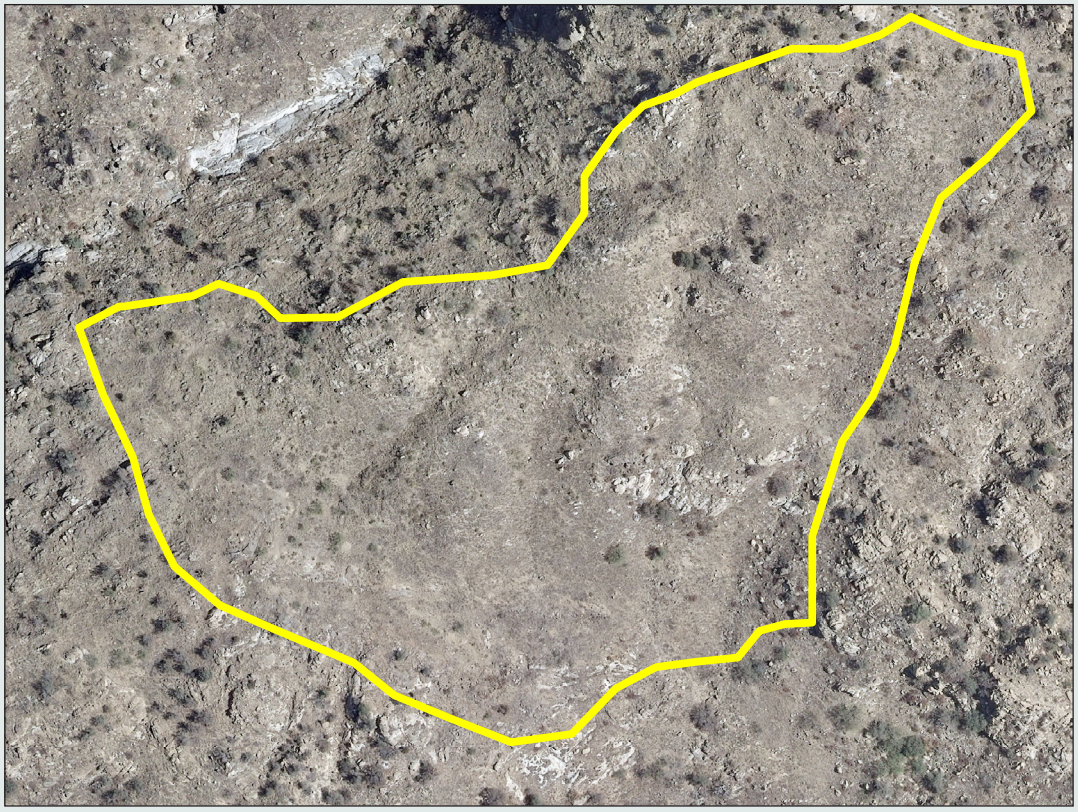
This community covers 0.6% (168 ha/415 ac) of the Rincon Mountain District and is widespread across Tanque Verde Ridge and on the western slopes of Rincon Peak, especially within the boundaries of the Box Canyon Fire of 1999. It is restricted to low-angle (5–20%) ridges and benches from 1,200 to 1,700 meters (4,100–5,577 ft).



Example of *Nolina microcarpa* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna.



Distribution of *Nolina microcarpa* / Mixed Perennial Grass - *Agave schottii* Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

Yellow paloverde / Triangle bur ragweed Shrubland Association (P)

Common species

- *Parkinsonia microphylla*
- *Ambrosia deltoidea*

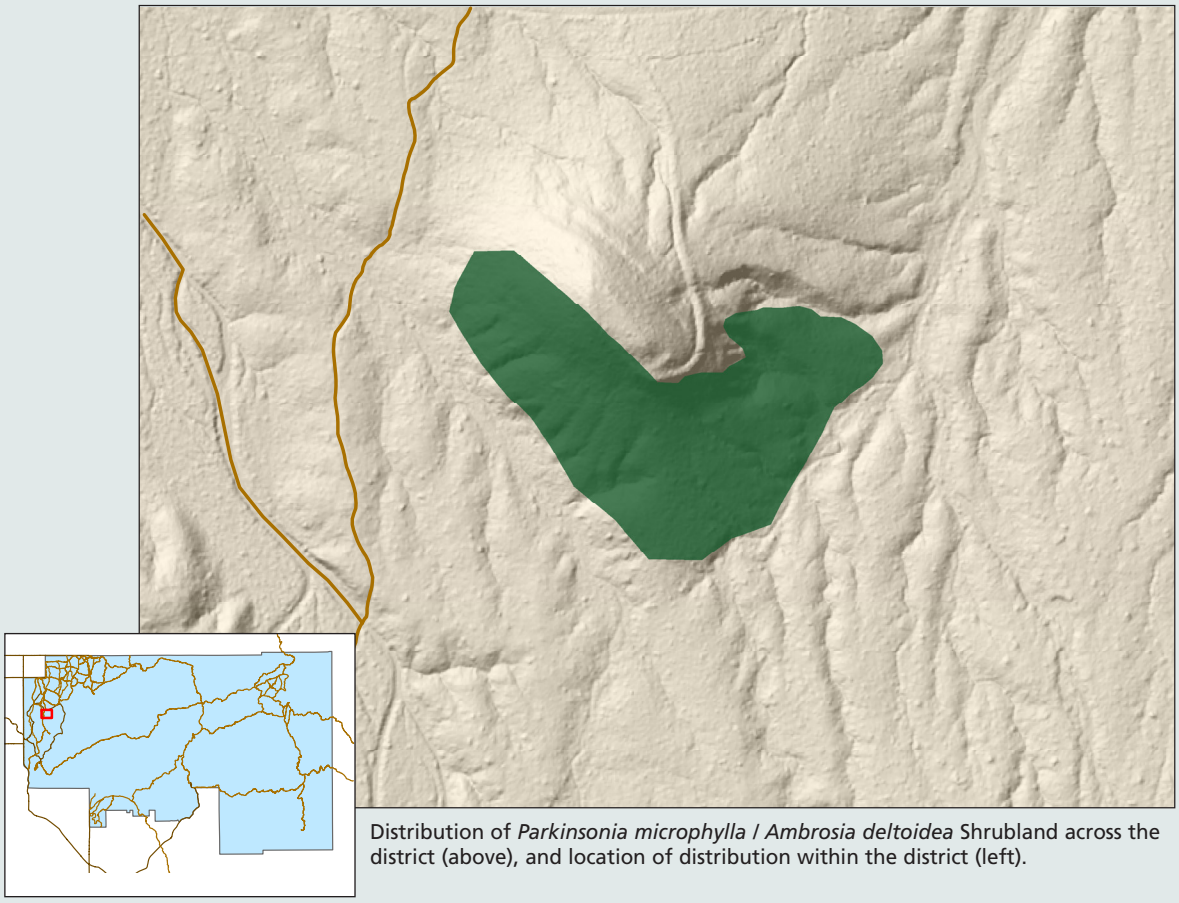
This shrubland community is characterized by a very sparse (<5% cover) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–40% cover) field layer (<0.5 m) solely dominated by triangle bur ragweed (*Ambrosia deltoidea*). Yellow paloverde (*P. microphylla*) is consistently (1.0) present as scattered, small (3–4 m), tree-like individuals with average cover of around 3%. The subcanopy (0.5–2 m) composition is conspicuously different between the two districts. At the Rincon Mountain District (RMD), the subcanopy is characterized by the presence and typical dominance of creosote (*Larrea tridentata*), with no other noteworthy associates. This species provides around 5 [10]% cover. The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, triangle bur ragweed (*A. deltoidea*). Throughout this association, this species typically provides <10% cover.

This community covers 0.01% (3.5 ha/6.5 ac) of the RMD, where it is limited to one hill toward the northern end of the Cactus Forest Loop Road. It is found on small, low-angle (<25%), rolling hills of variable aspects from 820 to 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 are composed of a fine-grained metaquartzite with occasional areas of rhyolitic tuff.

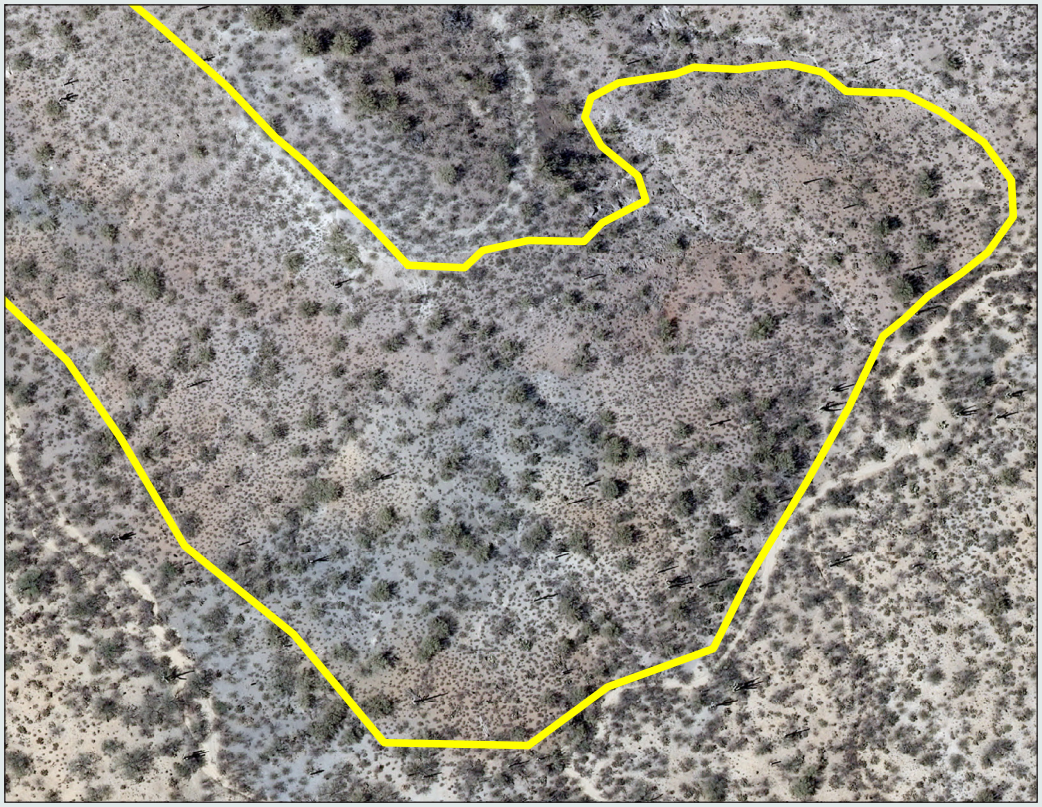
This association is one of five found in both the RMD and the Tucson Mountain District (see page 16).



Example of *Parkinsonia microphylla* / *Ambrosia deltoidea* Shrubland.



Distribution of *Parkinsonia microphylla / Ambrosia deltoidea* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

Yellow paloverde / Brittlebush - Paleface Shrubland Association (P)

Common species

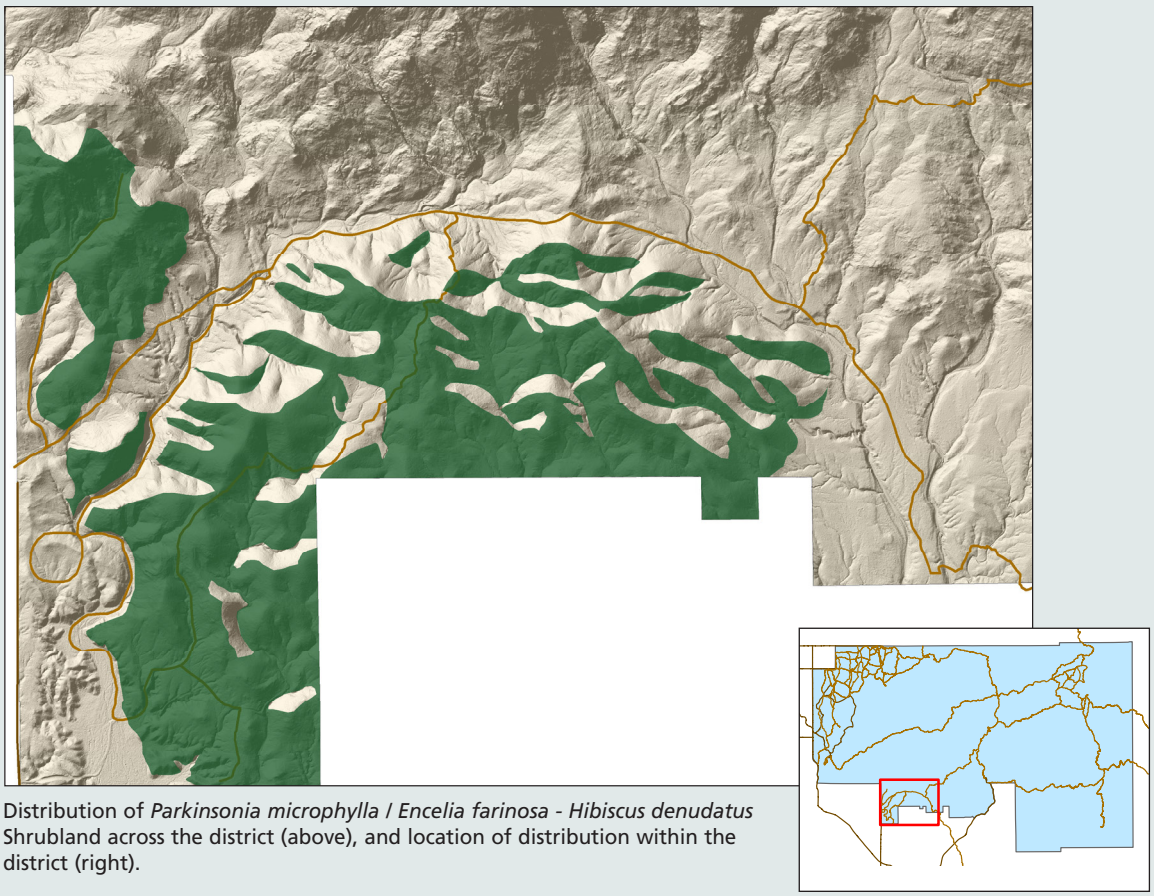
- *Parkinsonia microphylla*
- *Opuntia engelmannii*
- *Encelia farinosa*
- *Hibiscus denudatus*

This shrubland community is characterized by a moderately sparse (<15% cover) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20% cover) field layer (<0.5 m) co-dominated by brittlebush (*Encelia farinosa*) and paleface (*Hibiscus denudatus*). Yellow paloverde (*P. microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m) with average cover of around 10%, including some areas up to 15% and down to a sparse 3%. Ocotillo (*Fouquieria splendens*) is a fairly consistent (0.71) low-cover associate, with cover mainly less than 5%. The subcanopy (0.5–2 m) 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 can provide up to 6% cover; in many others, it is absent. The field layer is consistently dominated by the low subshrubs, brittlebush (*E. farinosa*) and paleface (*H. denudatus*). Brittlebush (*E. farinosa*) is the more consistent of the two, with an average of 10% with some areas up to 20%. Paleface (*H. denudatus*) ranges from a co-dominant or sole dominant, with 5–10% cover, to a common associate, with <5%.

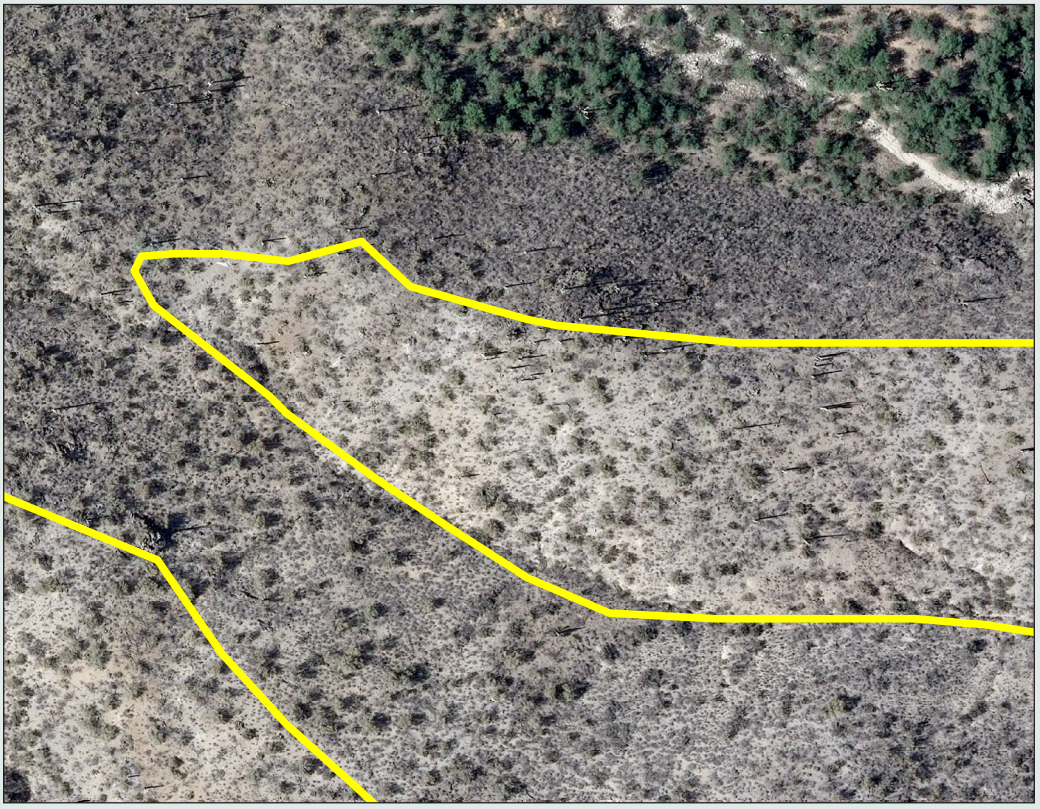
This community is contained within a two-association map class that covers 1% (268 ha/667 ac) of the Rincon Mountain District and is widespread on the hills east of the Camino Loma Alta trailhead. It is often found on low-angle (<25%) rolling hills, typically with a southern aspect, from 970 to 1,070 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 that includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.



Example of *Parkinsonia microphylla / Encelia farinosa - Hibiscus denudatus* Shrubland.



Distribution of *Parkinsonia microphylla / Encelia farinosa - Hibiscus denudatus* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

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

Common species

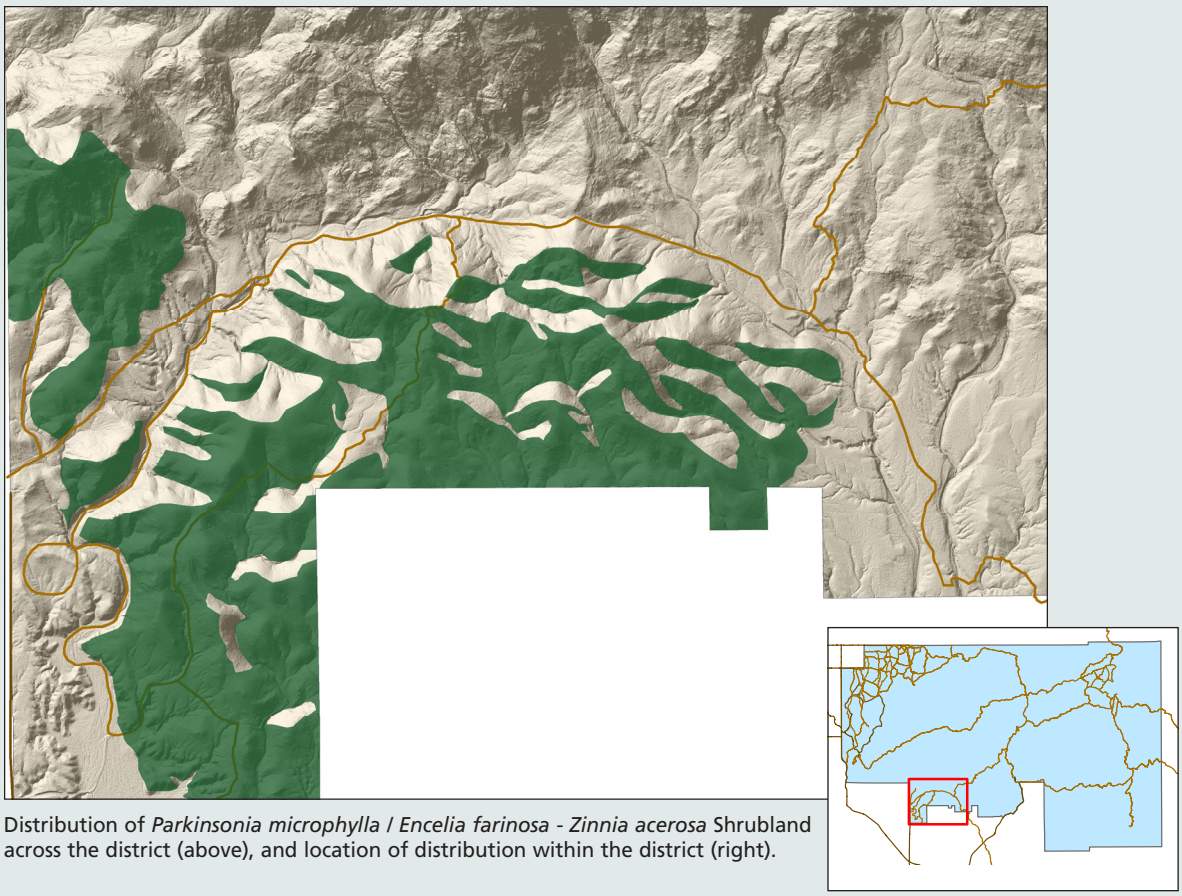
- *Parkinsonia microphylla*
- *Opuntia engelmannii*
- *Encelia farinosa*
- *Zinnia acerosa*

This shrubland community is characterized by a moderately sparse (<15% cover) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a field layer (<0.5 m) of 10–20% cover, co-dominated by brittlebush (*Encelia farinosa*) and desert zinnia (*Zinnia acerosa*). Yellow paloverde (*P. microphylla*) is typically present as small (3 m), tree-like individuals or small, shrubby individuals (<2 m) with average cover of around 10%, including some areas up to 15% and down to a sparse 3%. Brittlebush (*E. farinosa*) is a consistent dominant that provides cover typically ranging from 5% to 10%, with some areas up to 20%. Desert zinnia (*Zinnia acerosa*) is a less-consistent dominant that provides cover of 5–10%. Other documented species include teddybear cholla (*Cylindropuntia bigelovii*), whitethorn acacia (*Vachellia constricta*), Berlandier's wolfberry (*Lycium berlandieri*), creosote (*Larrea tridentata*), staghorn cholla (*Cylindropuntia versicolor*), slender janusia (*Cottsia gracilis*), rough menodora (*Menodora scabra*), black grama (*Bouteloua eriopoda*), and slim tridens (*Tridens muticus*).

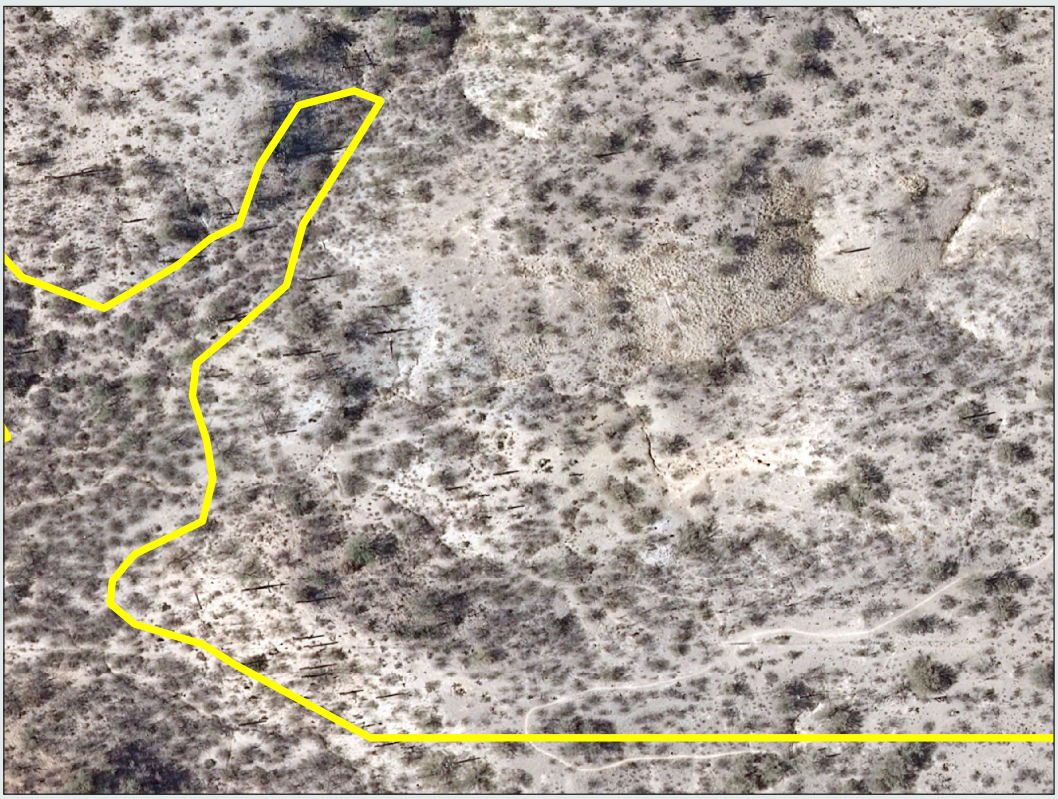
This community is contained within a two-association map class that covers 1% (270 ha/667 ac) of the Rincon Mountain District and is widespread on the hills east of the Camino Loma Alta trailhead. It is often found on low-angle (<25%) rolling hills, typically with a southern aspect from 970–1,070 meters (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 that includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.



Example of *Parkinsonia microphylla / Encelia farinosa - Zinnia acerosa* Shrubland.



Distribution of *Parkinsonia microphylla / Encelia farinosa - Zinnia acerosa* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

Yellow paloverde / Cactus apple / Brittlebush Shrubland Association (P)

Common species

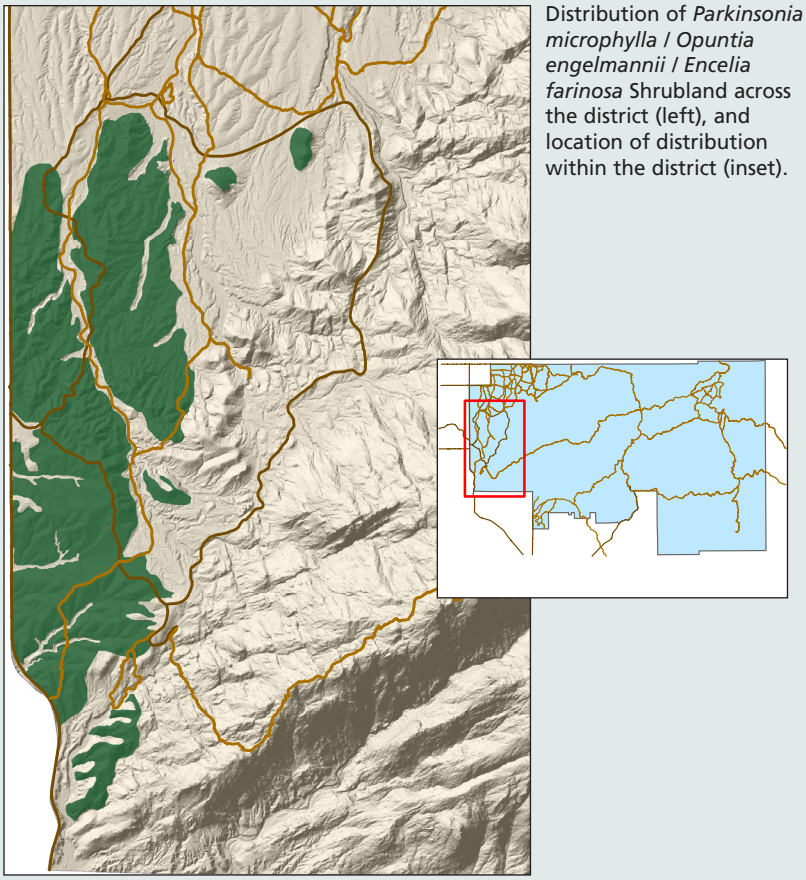
- *Parkinsonia microphylla*
- *Opuntia engelmannii*
- *Larrea tridentata*
- *Encelia farinosa*

This shrubland community is characterized by a sparse (<10% cover) canopy (2–5 m) of yellow paloverde (*Parkinsonia microphylla*), a variable (5–25% cover) subcanopy (0.5–2 m) of cactus apple (*Opuntia engelmannii*), and a moderately dense (15–30% cover) field layer (<0.5 m) solely dominated by brittlebush (*Encelia farinosa*). Yellow paloverde (*P. microphylla*) is consistently (1.0) present as scattered, large (4 m), tree-like individuals with average cover of around 5%, including some areas up to 15%. Occasionally (0.60), velvet mesquite (*Prosopis velutina*) can co-occur with yellow paloverde (*P. microphylla*), with cover of around 1%, or present as the sole canopy tree with up to 5% cover. The subcanopy is characterized by a diverse mix of shrubs and succulents, with creosote (*Larrea tridentata*) and cactus apple (*O. engelmannii*) providing the most cover throughout. Cactus apple (*O. engelmannii*) is a fairly consistent (0.80) dominant, averaging 7% cover across the community, including areas up to 16%. Creosote (*L. tridentata*) is a less-consistent (0.70) associate that typically provides sparse (<1%) cover, occasional pockets of co-dominance with cactus apple (*O. engelmannii*), or sole dominance within the stratum, often with 10–20% cover. The field layer (<0.5 m) is consistently dominated (1.0) by the low subshrub, brittlebush (*E. farinosa*), which 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.

This community covers 1.8% (478 ha/1,181 ac) of the Rincon Mountain District and is widespread across the rolling hills within the Cactus Forest Loop Road area, especially along the western boundary. It is often found on small, 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 are composed of a fine-grained metaquartzite with occasional areas of rhyolitic tuff.



Example of *Parkinsonia microphylla* / *Opuntia engelmannii* / *Encelia farinosa* Shrubland.



Distribution of *Parkinsonia microphylla / Opuntia engelmannii / Encelia farinosa* Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

31. *Parkinsonia microphylla* / *Parthenium incanum* Shrubland Association (P)

Yellow paloverde / Mariola Shrubland Association (P)

Common species

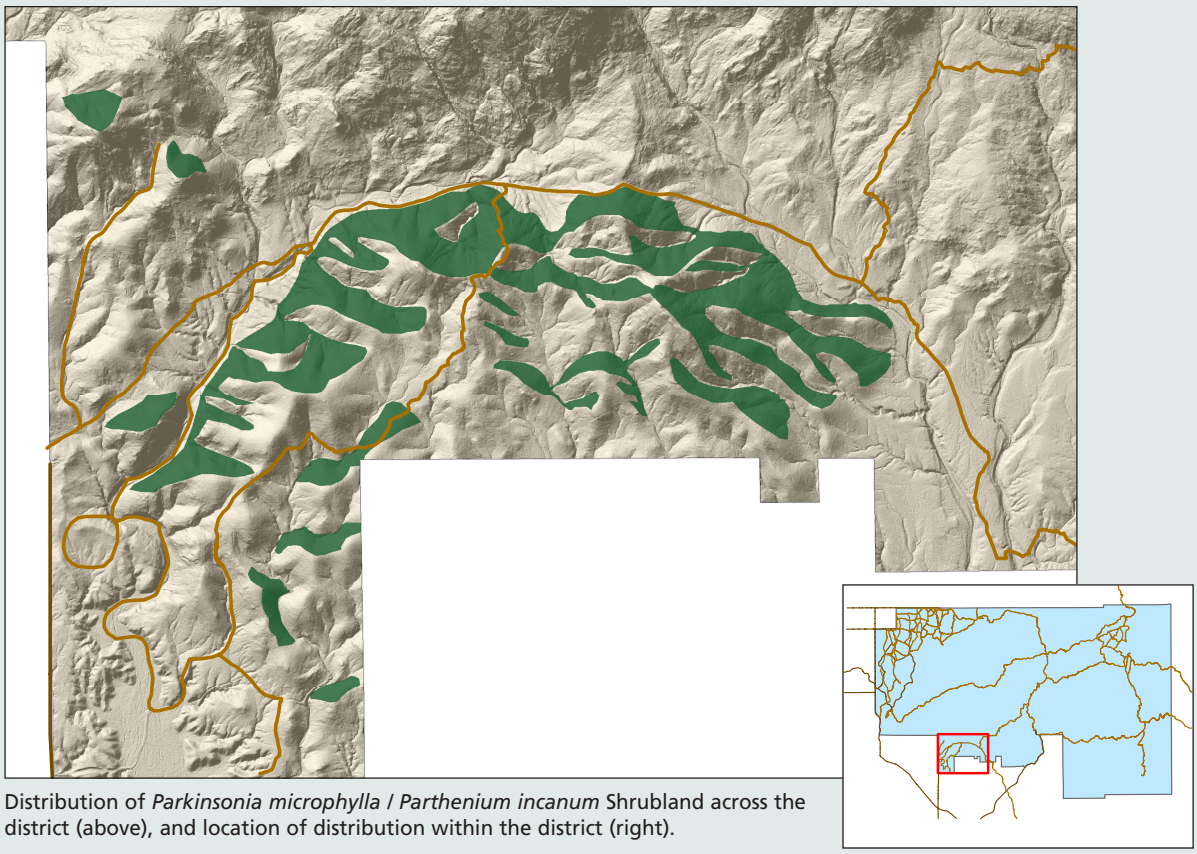
- *Parkinsonia microphylla*
- *Opuntia engelmannii*
- *Parthenium incanum*

This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (20–30% cover) field layer (<0.5 m) solely dominated by mariola (*Parthenium incanum*). Yellow paloverde (*P. microphylla*) is a consistent (1.0) dominant, typically present as small (3 m), tree-like individuals or large (<2 m), shrubby individuals with variable cover of 5–20%. The subcanopy (0.5–2 m) 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), variable associate; it provides occasional inclusions of dominance, with around 5% cover, or can be absent. The field layer is consistently (1.0) dominated by a moderately dense (15–25% cover) layer of mariola (*P. incanum*). Brittlebush (*Encelia farinosa*), woody crinklemat (*Tiquilia canescens*), paleface (*Hibiscus denudatus*), and rough menodora (*Menodora scabra*) are all low-cover but conspicuous associates.

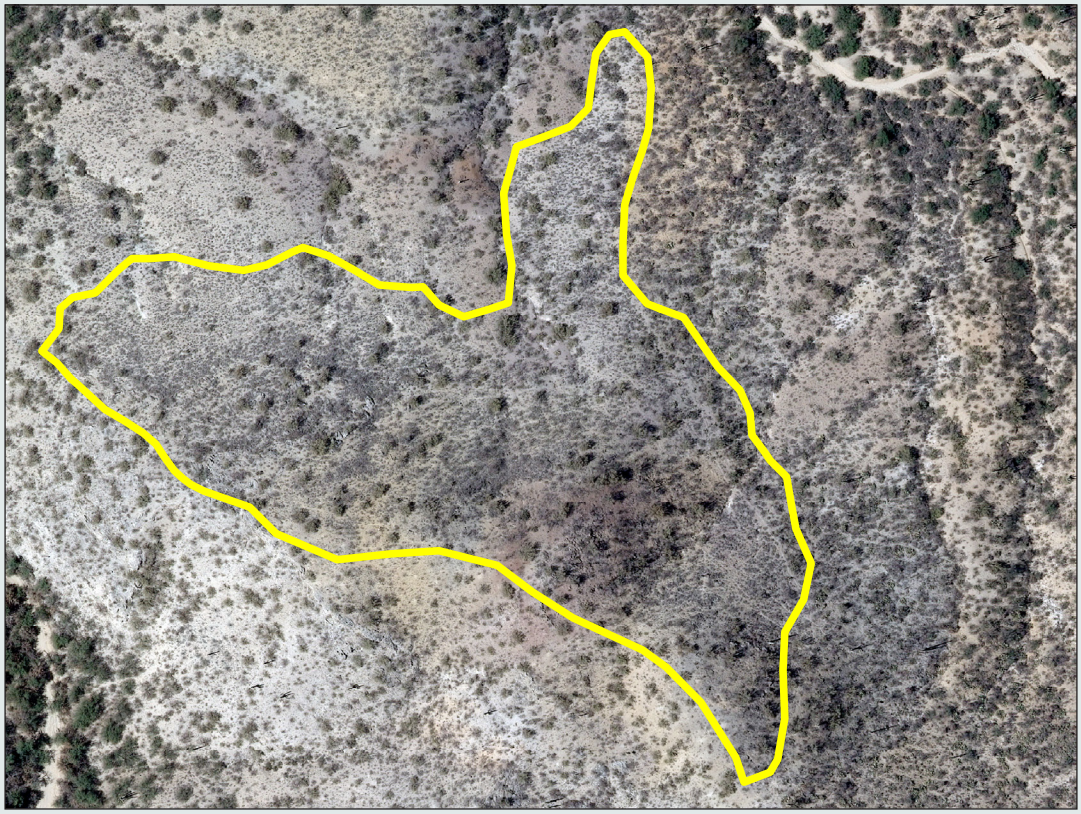
This community is contained within a two-association map class that covers 0.4% (113 ha/279 ac) of the Rincon Mountain District and is widespread on the hills east of the Camino Loma Alta trailhead. It is found exclusively on steep (30–50%), north-facing backslopes from 925 to 1,045 meters (3,030–3,428 ft). The surface cover is defined by shallow, well-drained soils underlying a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group that includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.



Example of *Parkinsonia microphylla* / *Parthenium incanum* Shrubland.



Distribution of *Parkinsonia microphylla* / *Parthenium incanum* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

32. *Parkinsonia microphylla* / *Tiquilia canescens* (*Zinnia acerosa*) Shrubland Association (P)

Yellow paloverde / Woody crinklemat (Desert zinnia) Shrubland Association (P)

Common species

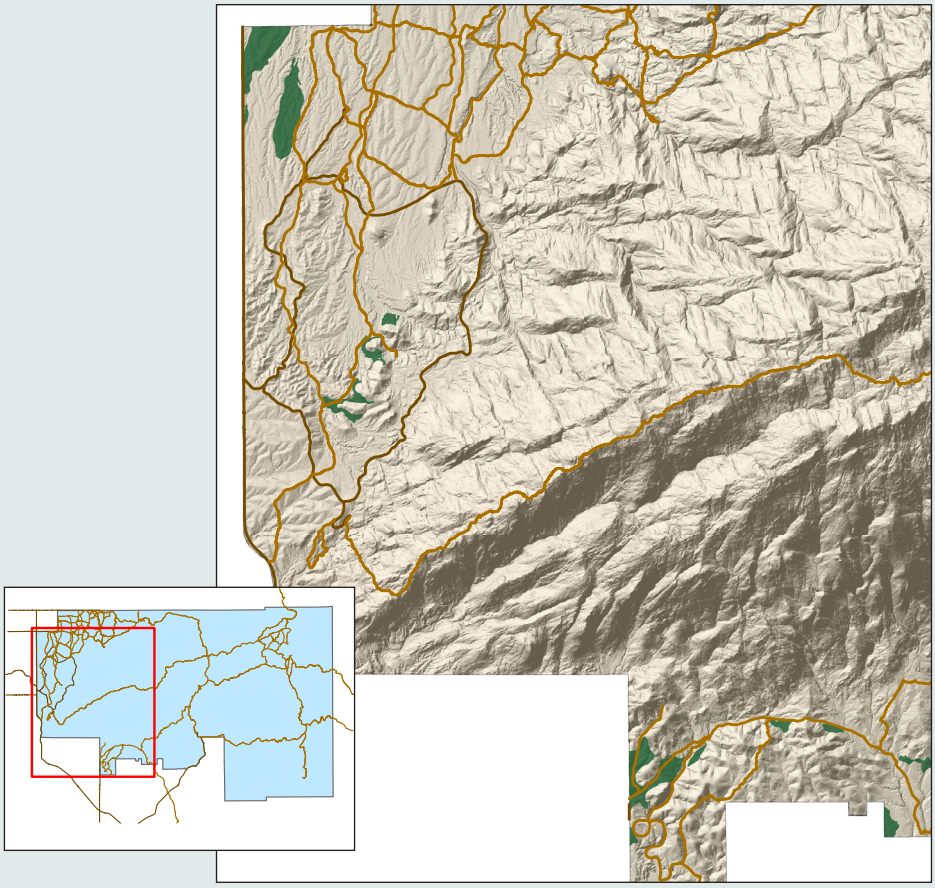
- *Parkinsonia microphylla*
- *Larrea tridentata*
- *Tiquilia canescens*
- *Zinnia acerosa*

This shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) dominated by yellow paloverde (*Parkinsonia microphylla*) and a moderately dense (15–30% cover) field layer (<0.5 m) dominated by woody crinklemat (*Tiquilia canescens*), with a diverse mix of associate shrubs. Yellow paloverde (*P. microphylla*) is typically present as small (3–5 m), tree-like individuals or low (<2 m) shrubs with consistent (1.0) cover of around 5%. Velvet mesquite (*Prosopis velutina*) is an uncommon (0.33) component of this community, generally with low (<3%) cover. The subcanopy (0.5–2 m) 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 of 3% cover across the community with occasional, dense (15–20% cover) areas of dominance. The field layer is characterized by the consistent (0.92) dominance of woody crinklemat (*T. canescens*) with one common associate, desert zinnia (*Zinnia acerosa*). Across the community, woody crinklemat (*T. canescens*) provides cover of 10–20%, with occasional areas of low (<5%) cover, often associated with the summits of small hills. Desert zinnia (*Z. acerosa*) is a less-consistent (0.81) species that, when present, provides around 5% cover.

This uncommon community covers 0.4% (109 ha/269 ac) of the Rincon Mountain District and 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. It is found on low-angle (1–10 [20]%) slopes of varying aspect at elevations around 950 meters (3,117 ft). The surface cover is defined by shallow, well-drained soils underlying a layer of coarse (5–10 cm) gravel and small rocks that are part of the Bisbee geologic group that includes sandstone, shale, and limestone. Within the park, this community is restricted to this geologic group.



Example of *Parkinsonia microphylla* / *Tiquilia canescens* (*Zinnia acerosa*) Shrubland.



Distribution of *Parkinsonia microphylla / Tiquilia canescens* (*Zinnia acerosa*) Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

33. *Prosopis velutina* / *Opuntia engelmannii* / *Encelia farinosa* (*Cottsia gracilis*) Wooded Shrubland Association (P)

Velvet mesquite / Cactus apple / Brittlebush (Slender janusia) Wooded Shrubland Association (P)

Common species

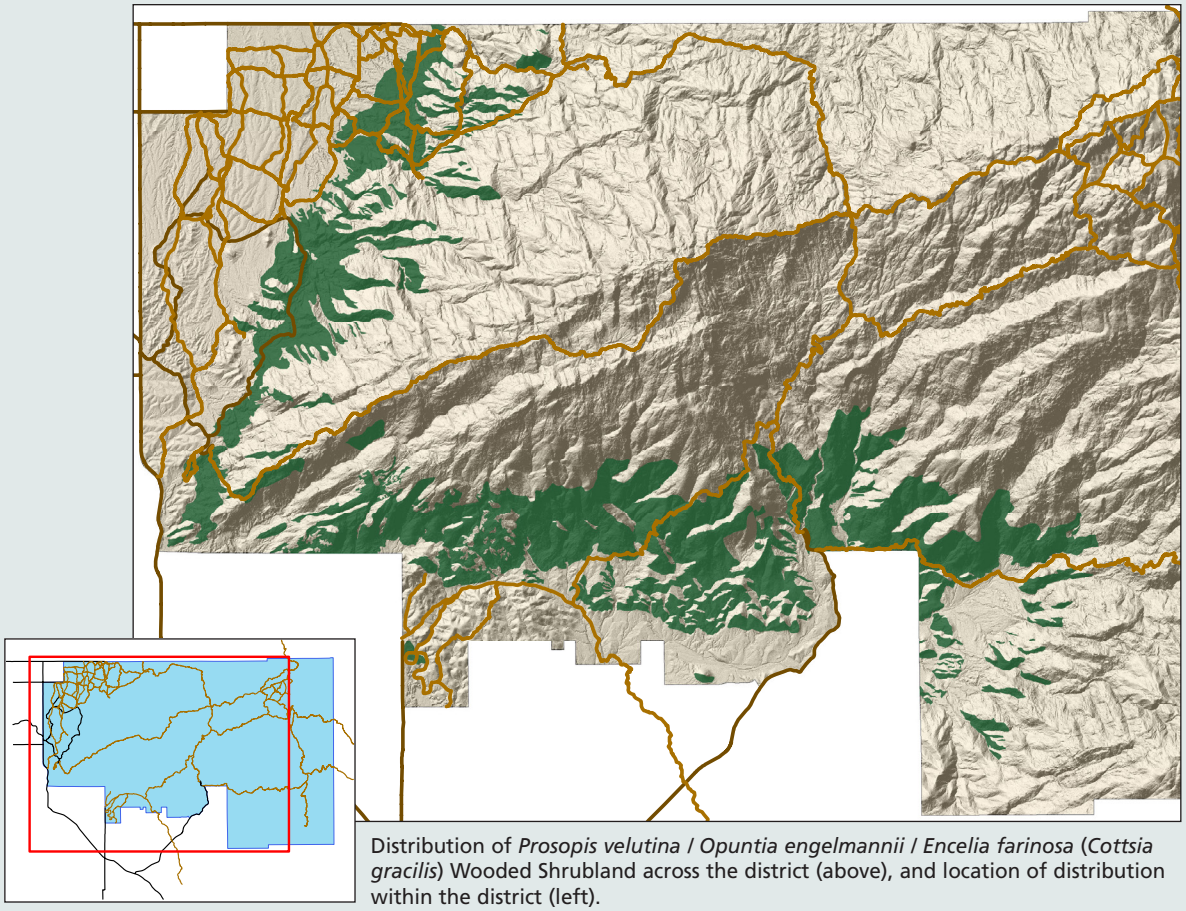
- *Prosopis velutina*
- *Opuntia engelmannii*
- *Encelia farinosa*
- *Cottsia gracilis*

This wooded shrubland is characterized by a sparse (<10% cover) canopy (>2 m) of velvet mesquite (*Prosopis velutina*), a variable (10–20% cover) subcanopy (0.5–2 m) of cactus apple (*Opuntia engelmannii*) with mixed associate shrubs, and a dense (20–40% cover) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*) with slender janusia (*Cottsia gracilis*). Velvet mesquite (*P. velutina*) provides consistent low cover of around 5%, sometimes over 10%. Yellow paloverde (*Parkinsonia microphylla*) provides a consistent 1% cover, with uncommon inclusions where it competes for dominance with velvet mesquite. Saguaro (*Carnegiea gigantea*) is present throughout the community, contributing <1% cover. The subcanopy is primarily composed of cactus apple (*O. engelmannii*), providing a consistent 5–10 [20]% cover, dropping to almost absent in areas of high grass cover. The remaining vegetation is a diverse mix of low-cover associate shrubs and succulents, including 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 can sometimes contribute up to 4% cover. Teddybear cholla (*C. bigelovii*) should only provide small, patchy inclusions and not become a consistent dominant in this community. The field is characterized by dominant brittlebush (*E. farinosa*), which is the most consistent and highest-cover (10–20%) species in the community. The remaining cover is split between a diverse mix of small shrubs, subshrubs, and grasses. Slender janusia (*C. gracilis*) is the most dominant of these species, providing consistent average cover of 4%. Fairyduster (*Calliandra eriophylla*) and sangre de cristo (*Jatropha cardiophylla*) are the next most-common, low-cover associates, providing 1–2% each, with occasional inclusions up to 8%. The grass component is diverse, with at least five noteworthy bunchgrasses, including bush muhly (*Muhlenbergia porteri*), tanglehead (*Heteropogon contortus*), sideoats grama (*Bouteloua curtipendula*), slender grama (*Bouteloua repens*), and Arizona cottontop (*Digitaria californica*). While not consistent across the community, Lehmann lovegrass (*Eragrostis lehmanniana*) can provide inclusions of dominance.

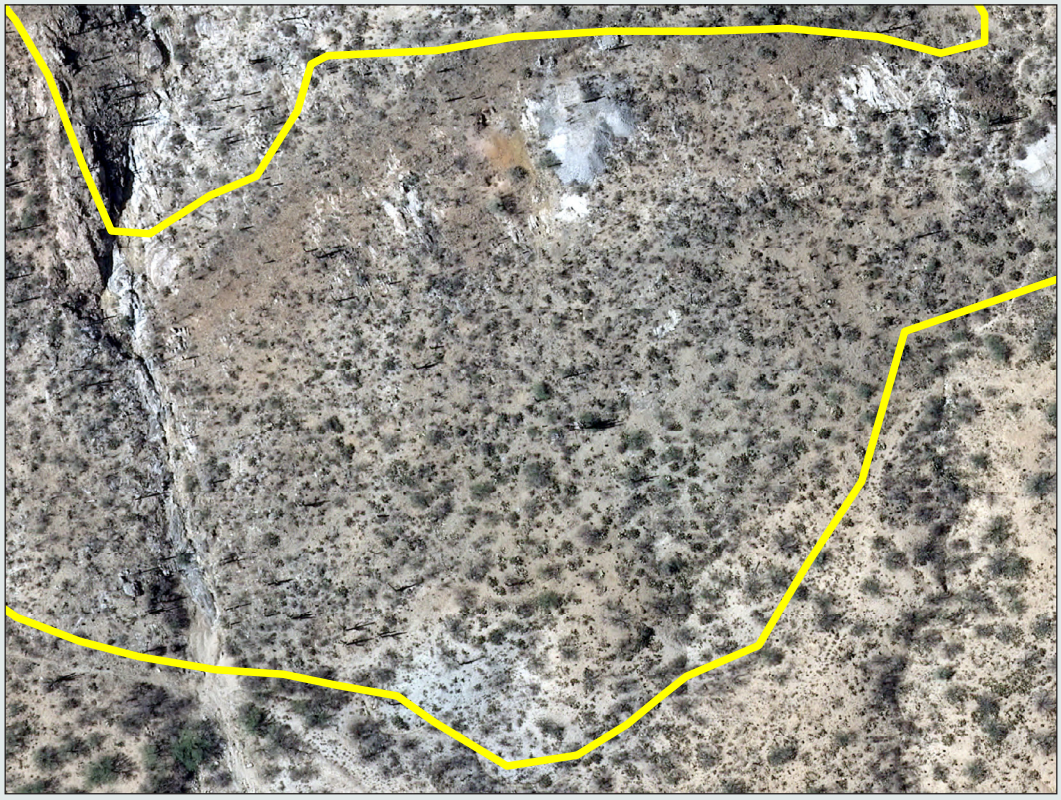
This community is contained within a two-association map class that covers 12% (3,225 ha/7,969 ac) of the Rincon Mountain District and is widespread throughout the low slopes of Tanque Verde Ridge and above the Madrona ranger station. It occupies low-angle slopes of varying aspects from 840 to 1,350 meters (2,755–4,429 ft). The ground surface is covered with very coarse gravel and rock with vast expanses of bedrock outcrops/shelves.



Example of *Prosopis velutina* / *Opuntia engelmannii* / *Encelia farinosa* (*Cottsia gracilis*) Wooded Shrubland.



Distribution of *Prosopis velutina / Opuntia engelmannii / Encelia farinosa* (*Cottsia gracilis*) Wooded Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

Jojoba (Mixed Cacti) Shrubland Association (P)

Common species

- *Fouquieria splendens*
- *Prosopis velutina*
- *Simmondsia chinensis*
- *Opuntia engelmannii*
- *Aloysia wrightii*

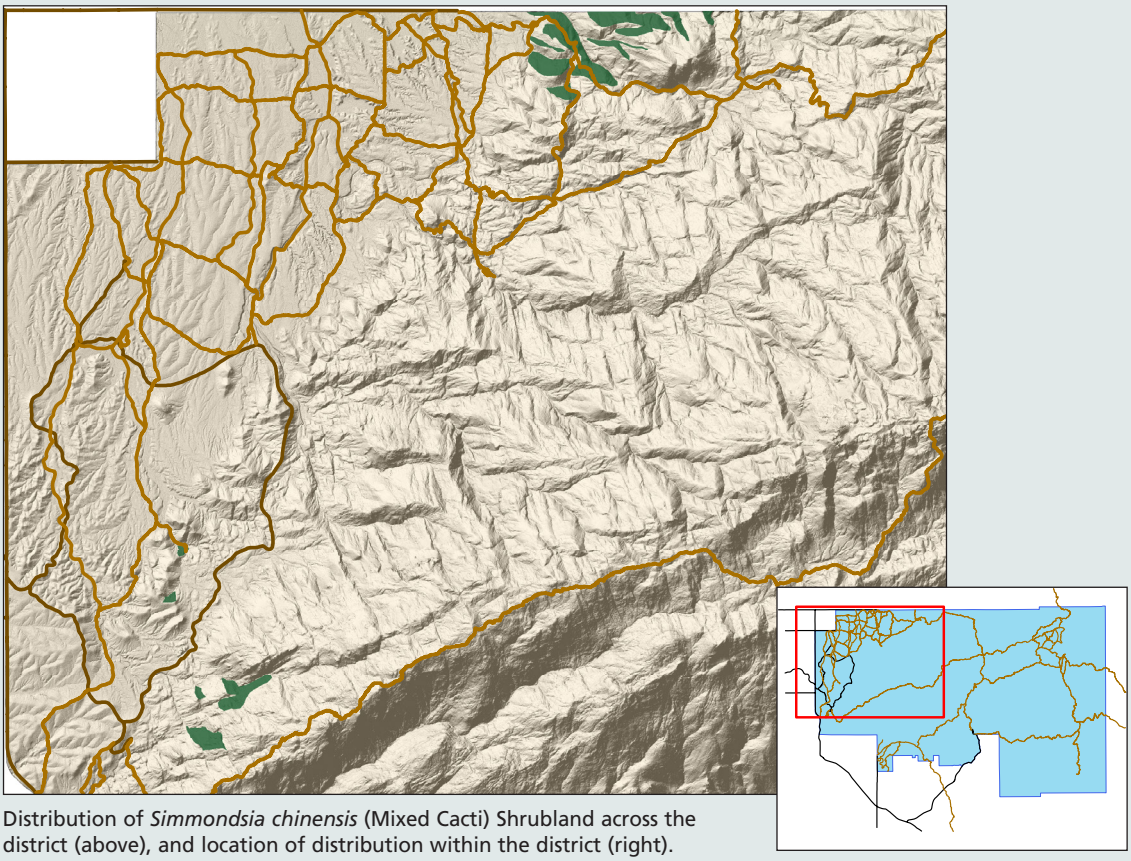
This shrubland association is characterized by an open (<5% cover) canopy (>2 m) with a subcanopy (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a variable mix of cacti that include buckhorn cholla (*Cylindropuntia acanthocarpa*), cactus apple (*Opuntia engelmannii*), and tulip pricklypear (*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. The moderately dense (15–30%) subcanopy is characterized by the consistent (1.0) dominance of jojoba (*S. chinensis*), with cover of 3–10 [20]%. This species is a diagnostic component of this community and commonly provides at least half of the total shrub cover in the stratum. The succulent cacti, buckhorn cholla (*C. acanthocarpa*), cactus apple (*O. engelmannii*), and tulip pricklypear (*O. phaeacantha*), are the second most-distinct and characteristic part of this community, providing about half of the shrub cover. The moderately sparse (10%) field layer is characterized by a diverse mix of small shrubs, subshrubs, perennial grasses, and spikemoss. Fairyduster (*Calliandra eriophylla*) and slender janusia (*Cottsia gracilis*) are the most consistent (>0.75) associates, each providing an average of 1–2% cover.

This community covers 0.26% (71 ha/175 ac) of the Rincon Mountain District (RMD). At the RMD, it is exclusively found along Douglas Spring trail between the Carrillo and Twin Tank Trail junctions. It is typically found on steep, north-facing backslopes from 890 to 970 meters (2,919–3,182 ft). In general, the surface cover is characterized by shallow, well-drained soils under a dominant layer of coarse gravel. Surface rock and exposed bedrock, primarily composed of gneissic granodiorite, are very common throughout this community.

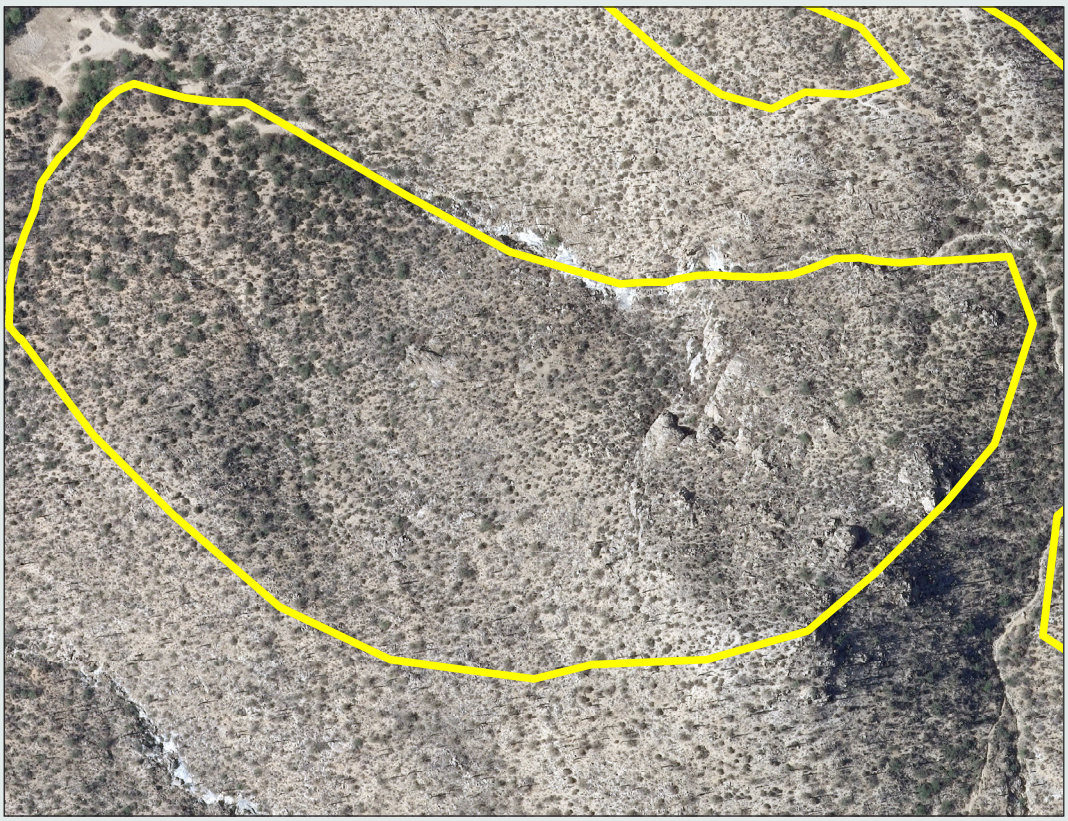
This association is one of five found in both the RMD and the Tucson Mountain District (see page 22).



Example of *Simmondsia chinensis* (Mixed Cacti) Shrubland.



Distribution of *Simmondsia chinensis* (Mixed Cacti) Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

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

Jojoba / Brittlebush Shrubland Association (P)

Common species

- *Simmondsia chinensis*
- *Opuntia engelmannii*
- *Encelia farinosa*

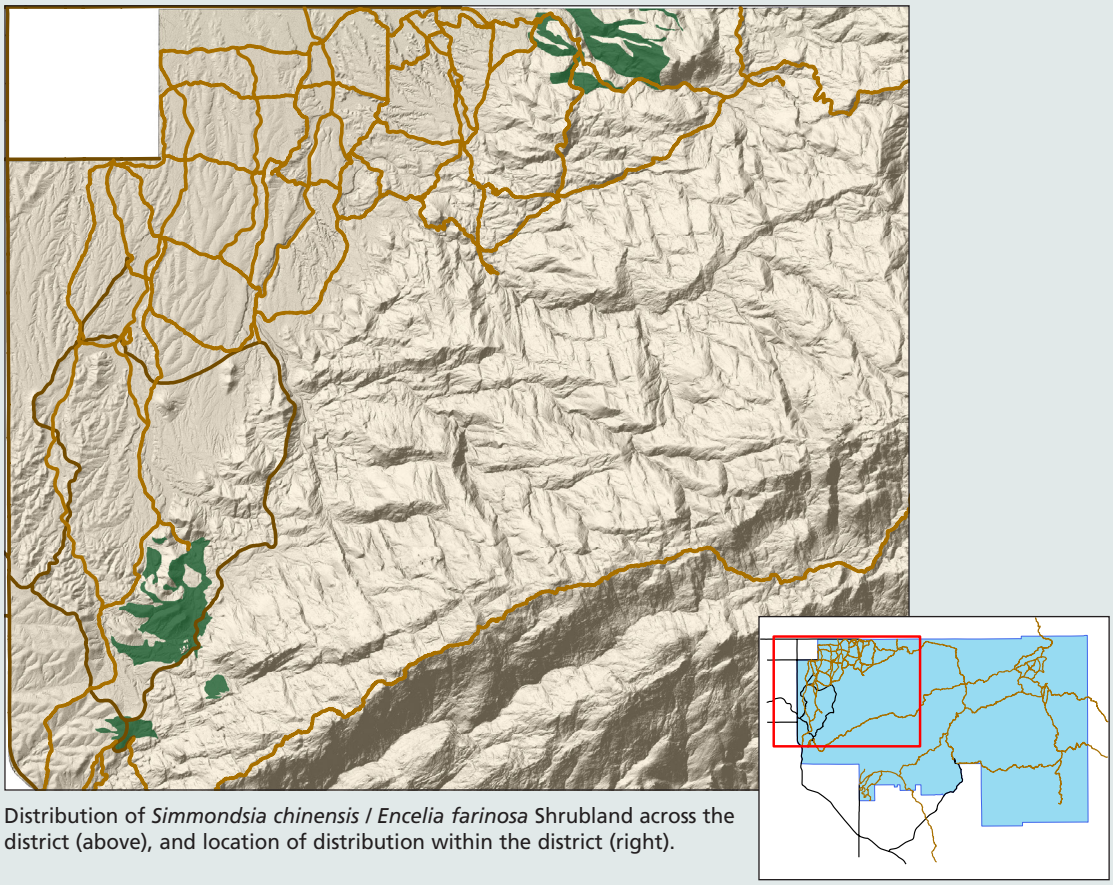
This shrubland association is characterized by a very open (<5% cover) canopy (>2 m), a variable (5–25% cover) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*), and a variable (5–30% cover) field layer (<0.5 m) dominated by brittlebush (*Encelia farinosa*). Ocotillo (*Fouquieria splendens*) is a very consistent (~0.9) associate, providing 1–2% cover. The cover and consistency of yellow paloverde (*Parkinsonia microphylla*) and velvet mesquite (*Prosopis velutina*) are dependent on the district. The subcanopy stratum is defined by the dominance of jojoba (*S. chinensis*). This species is a diagnostic component of this community, typically providing <10% cover. In the Rincon Mountain District (RMD), it averages 6%. Cactus apple (*Opuntia engelmannii*) is a consistent (0.90) succulent that, on the low-angle and less-rocky examples, may outcompete jojoba (*S. chinensis*), with cover above 10%. The field stratum is characterized by the dominance of brittlebush (*E. farinosa*), which is the most-consistent (1.0) and highest-cover species in this community. Other noteworthy species include slender janusia (*Cottsia gracilis*), fairyduster (*Calliandra eriophylla*), sangre de cristo (*Jatropha cardiophylla*), spidergrass (*Aristida ternipes*), and rough menodora (*Menodora scabra*).

This shrubland covers 0.5% (146 ha/360 ac) of the RMD, occurring near the southeast corner of the Cactus Forest Loop Road and along the Douglas Spring trail as it switchbacks upslope. This community is exclusively present on exposed, south-facing slopes of varying grade (5–40%) from 870 to 1,045 meters (2,854–3,428 ft).

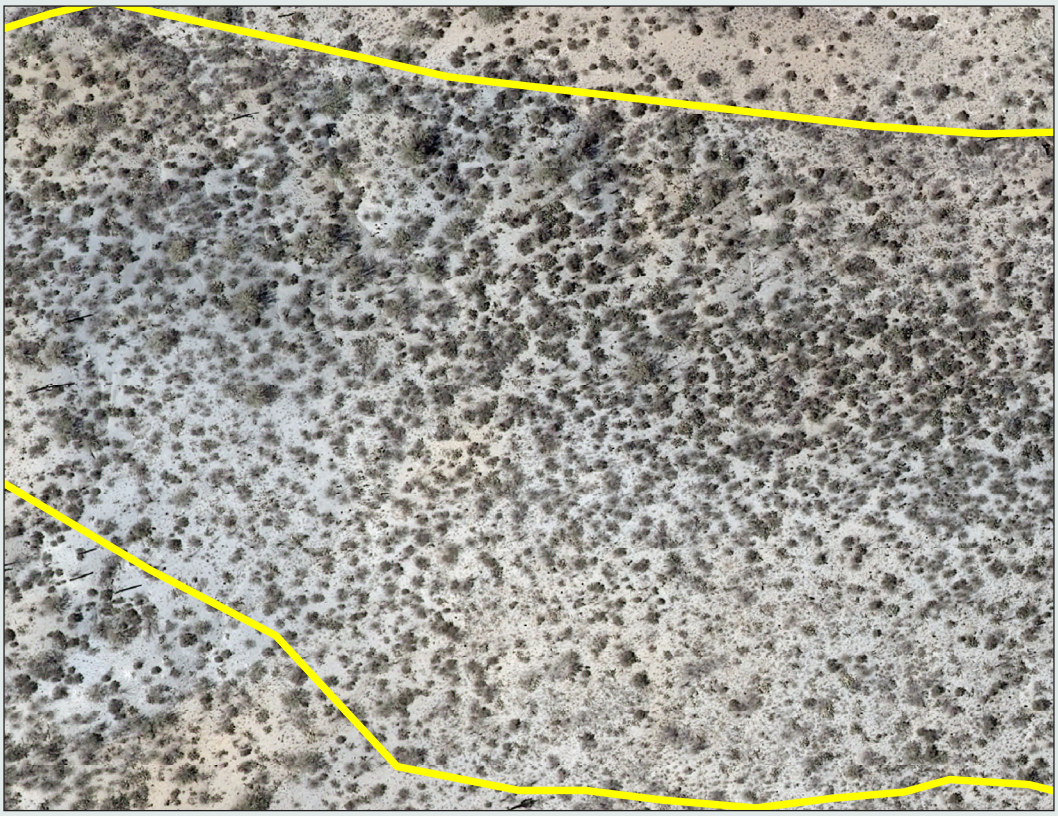
This association is one of five found in both the RMD and the Tucson Mountain District (see page 24).



Example of *Simmondsia chinensis / Encelia farinosa* Shrubland.



Distribution of *Simmondsia chinensis* / *Encelia farinosa* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

37. *Simmondsia chinensis* / *Hilaria belangeri* Shrub Savanna Association (P)

Jojoba / Curly mesquite Shrub Savanna Association (P)

Common species

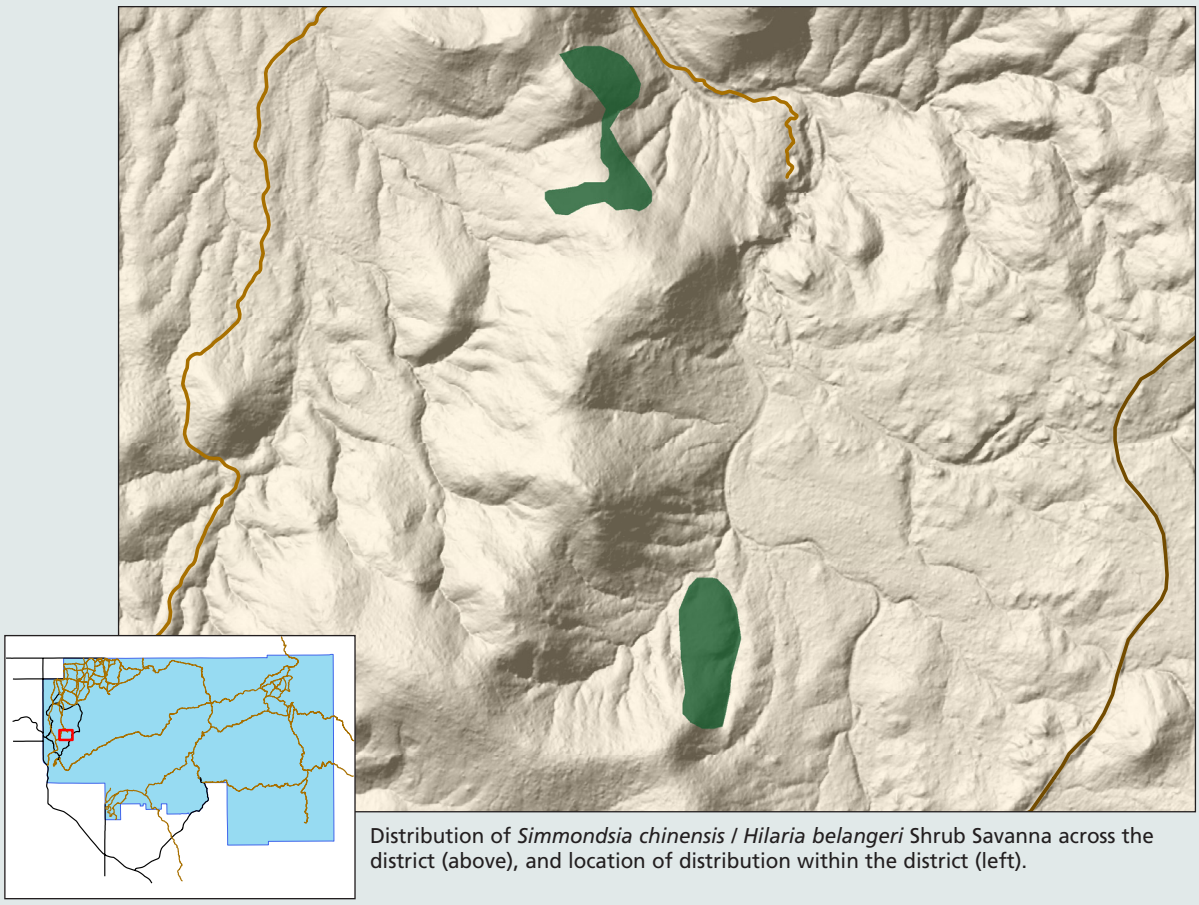
- *Simmondsia chinensis*
- *Hilaria belangeri*

This shrub savanna association is characterized by a moderately sparse (10–15% cover) subcanopy layer (0.5–2 m) dominated by jojoba (*Simmondsia chinensis*) and a moderately dense (20–30% cover) field layer (<0.5 m) dominated by curly mesquite (*Hilaria belangeri*). In the lower canopy (2–5 m), ocotillo (*Fouquieria splendens*), yellow paloverde (*Parkinsonia microphylla*), and velvet mesquite (*Prosopis velutina*) are low-cover (1–2% each) associates. The subcanopy stratum is defined by the consistent (1.0) dominance of jojoba (*S. chinensis*), with a suite of low-cover associates providing 1% cover. Jojoba typically provides 5–15% cover. 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 (*H. 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*).

This shrub savanna occupies only 0.005% (1.31 ha/3.23 ac) of the Rincon Mountain District and is limited to a few small patches spread across the low hills northwest of Javelina Rocks. 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.



Example of *Simmondsia chinensis* / *Hilaria belangeri* Shrub Savanna.



Distribution of *Simmondsia chinensis* / *Hilaria belangeri* Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

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

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

Common species

- *Prosopis velutina*
- *Vachellia constricta*
- *Larrea tridentata*
- *Senegalia greggii*

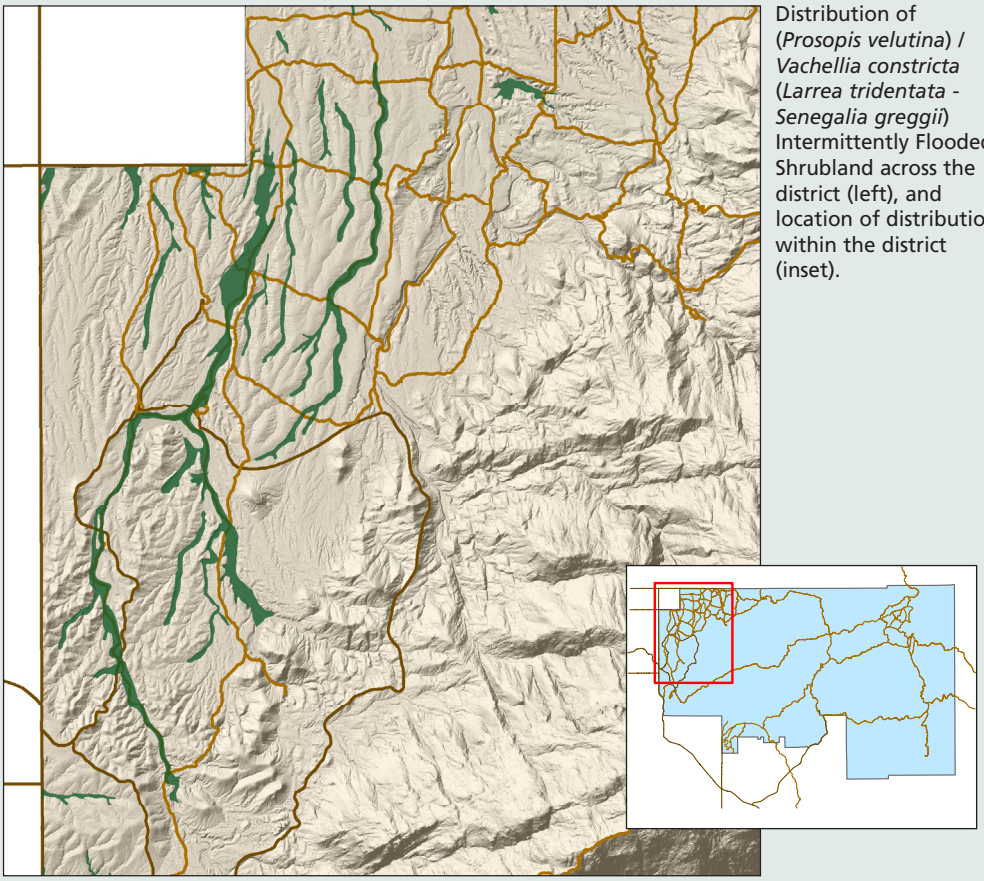
This xeroriparian shrubland community is characterized by a sparse (<10% cover) canopy (>2 m) of velvet mesquite (*Prosopis velutina*) and a dense (20–40 [60]% cover) shrub layer (0.5–2 m) dominated by whitethorn acacia (*Vachellia constricta*), with common associates creosote (*Larrea tridentata*) and catclaw acacia (*Senegalia greggii*). Velvet mesquite (*P. velutina*) is a consistent (1.0) component, typically present as large (4 m) trees along the margins of the watercourse with cover of around 6%. Yellow paloverde (*Parkinsonia microphylla*) and blue paloverde (*Parkinsonia florida*) are sparse (1–2% cover), inconsistent (0.5 and 0.4) associates that can co-occur or occasionally replace velvet mesquite (*P. velutina*) in the canopy. The shrub layer is consistently (1.0) dominated by large (up to 3 m) whitethorn acacia (*V. constricta*) that can form dense thickets along and within the watercourse. Overall, this species provides consistent cover throughout, with an average of around 20%. The remainder of the shrub layer is composed of a consistent (>0.75) mix of creosote (*L. tridentata*) and catclaw acacia (*S. greggii*), with an average cover of 6% for each species. The field layer (<0.5 m) is extremely sparse (<5% cover), without any consistent dominants or common associates.

This community covers 0.6% (152 ha/376 ac) of the Rincon Mountain District (RMD). At the RMD, it primarily occurs near the Douglas Spring trailhead and the Cactus Forest Loop Road. It is restricted to low-angle (<5%), typically north-flowing washes that bisect the broad alluvial fans and low hills from 820 to 935 meters (2,690–3,067 ft.). The surface cover is characterized by deep, well-drained soils that, within the watercourse, are dominated by fine gravel and sand while the adjacent slopes are more commonly bare soil.

This association is one of five found in both the RMD and the Tucson Mountain District (see page 28).



Example of (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata - Senegalia greggii*) Intermittently Flooded Shrubland.



Distribution of (*Prosopis velutina*) / *Vachellia constricta* (*Larrea tridentata* - *Senegalia greggii*) Intermittently Flooded Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

40. *Prosopis velutina - Chilopsis linearis* / *Ambrosia monogyra* Intermittently Flooded Woodland Association (P)

Velvet mesquite - Desert willow / Singlewhorl burrobush Intermittently Flooded Woodland Association (P)

Common species

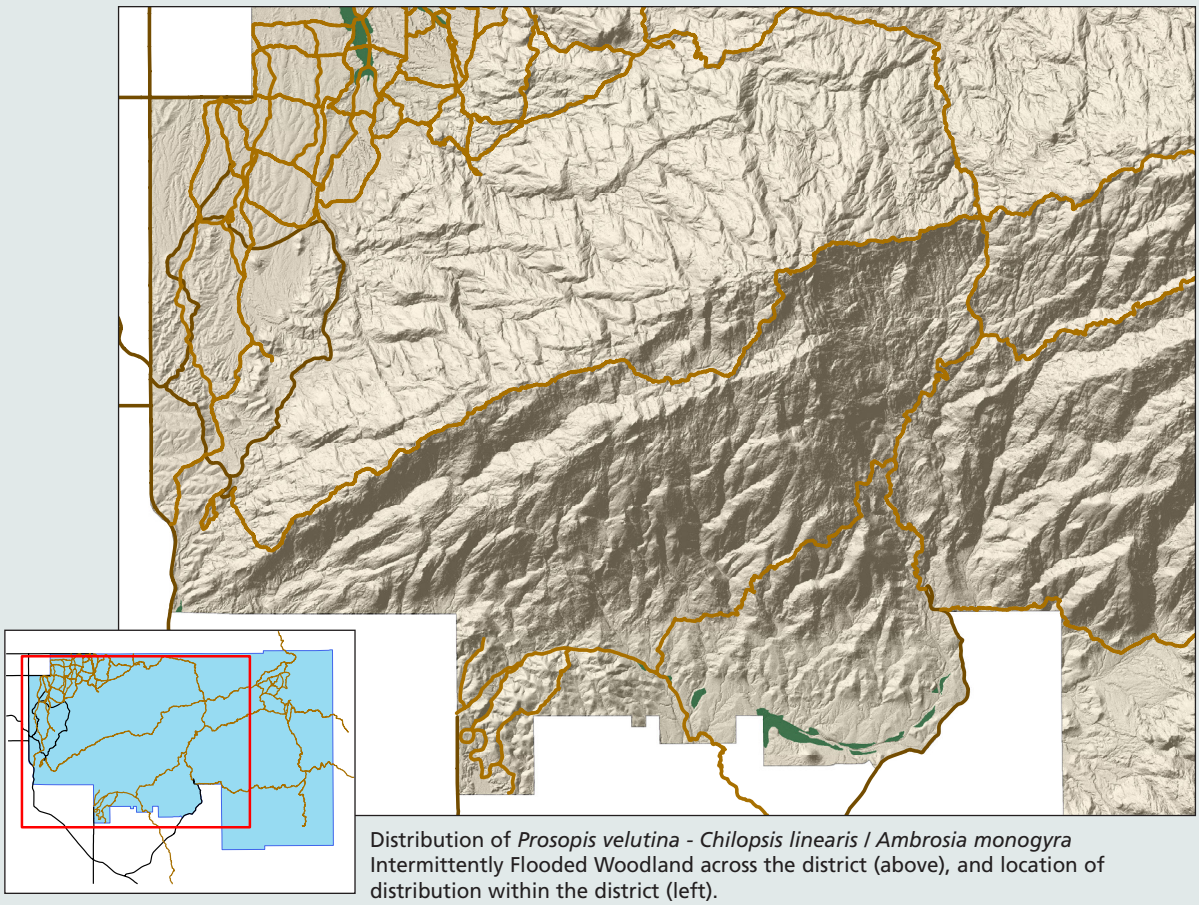
- *Prosopis velutina*
- *Chilopsis linearis*
- *Ambrosia monogyra*
- *Amaranthus palmeri*
- *Bouteloua barbata*

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% cover) 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 (*P. velutina*) and desert willow (*C. linearis*), but the subcanopy (0.5–2 m) is dominated by a patchy distribution of singlewhorl burrobush (*Ambrosia monogyra*). Other documented species include fourwing saltbush (*Atriplex canescens*), desert-thorn (*Lycium* sp.), lotebush (*Ziziphus obtusifolia*), desertbroom (*Baccharis sarothroides*), Warnock's snakewood (*Condalia warnockii*), sixweeks grama (*Bouteloua barbata*), carelessweed (*Amaranthus palmeri*), spiderling (*Boerhavia* sp.), and morning-glory (*Ipomoea* sp.).

The community is contained within a two-association map class that covers 0.3% (87 ha/215 ac) and 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. It 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.



Example of *Prosopis velutina - Chilopsis linearis* / *Ambrosia monogyra* Intermittently Flooded Woodland.



Distribution of *Prosopis velutina - Chilopsis linearis / Ambrosia monogyra* Intermittently Flooded Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

41. *Alnus oblongifolia* / *Acer negundo* / *Rosa woodsii* Intermittently Flooded Woodland Association (P)

Arizona alder / Boxelder / Woods' rose Intermittently Flooded Woodland Association (P)

Common species

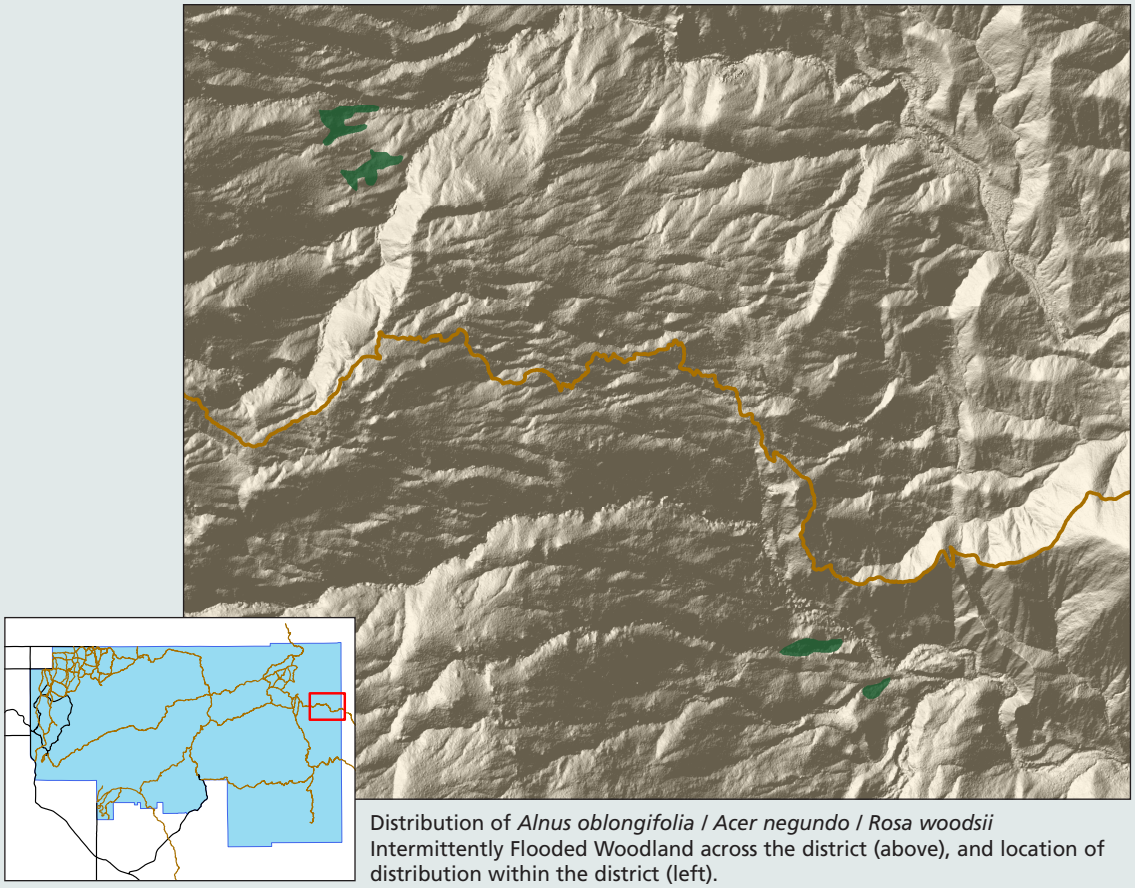
- *Alnus oblongifolia*
- *Acer negundo*
- *Rosa woodsii*

This intermittently flooded woodland community is characterized by a moderately dense (30–50% cover) 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 (*A. oblongifolia*) is present as tall (10–20 m), wide-canopied trees with cover ranging from 10% to 40%. Boxelder (*A. negundo*) is a shorter (5–10 m) tree that is typically co-dominant with or subdominant to Arizona alder (*A. oblongifolia*), with cover ranging 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*) species. Woods' rose (*R. woodsii*) ranges from absent to dense inclusions with cover surpassing 20%.

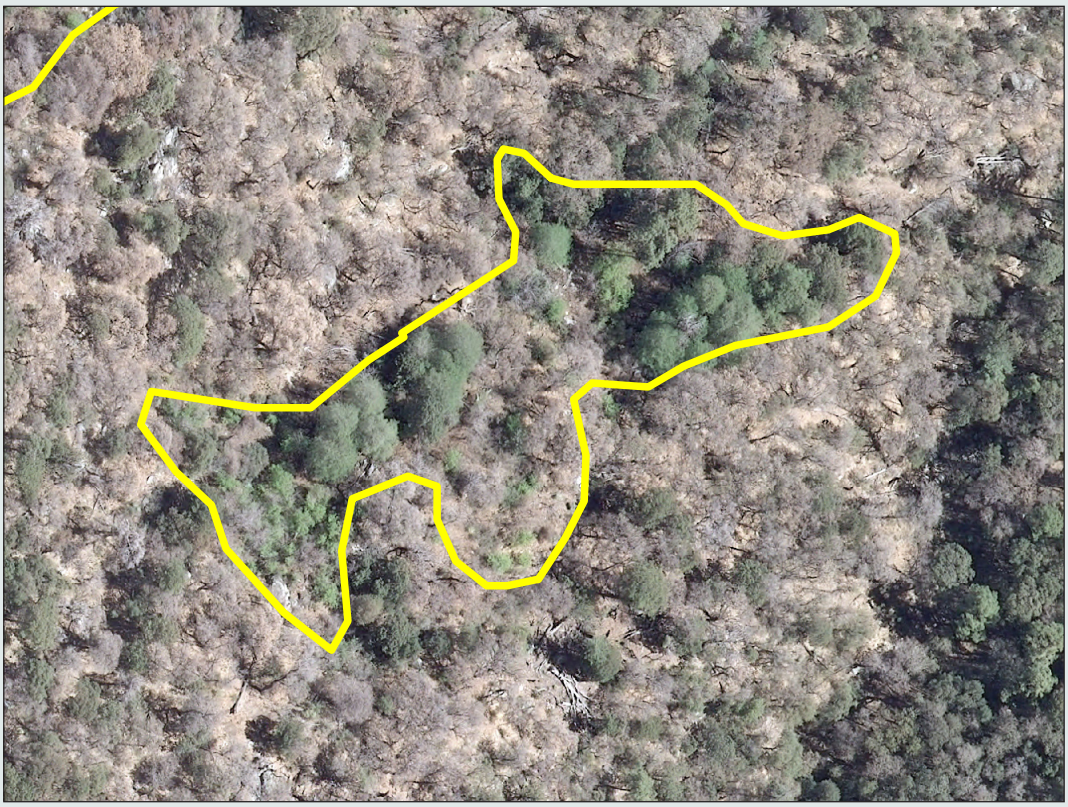
This community covers 0.009% (2.4 ha/6 ac) of the Rincon Mountain District and is restricted to two locations, in Turkey Creek near the eastern boundary and in an unnamed drainage east of Spud Rock Campground. It is typically found in low-angle drainages with intermittent water flow. The surface cover is characterized by deep, well-drained soils, often covered with a dense layer of leaf litter.



Example of *Alnus oblongifolia* / *Acer negundo* / *Rosa woodsii* Intermittently Flooded Woodland.



Distribution of *Alnus oblongifolia / Acer negundo / Rosa woodsii* Intermittently Flooded Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

42. *Platanus wrightii - Fraxinus velutina* Intermittently Flooded Woodland Association (P)

Arizona sycamore - Velvet ash Intermittently Flooded Woodland Association (P)

Common species

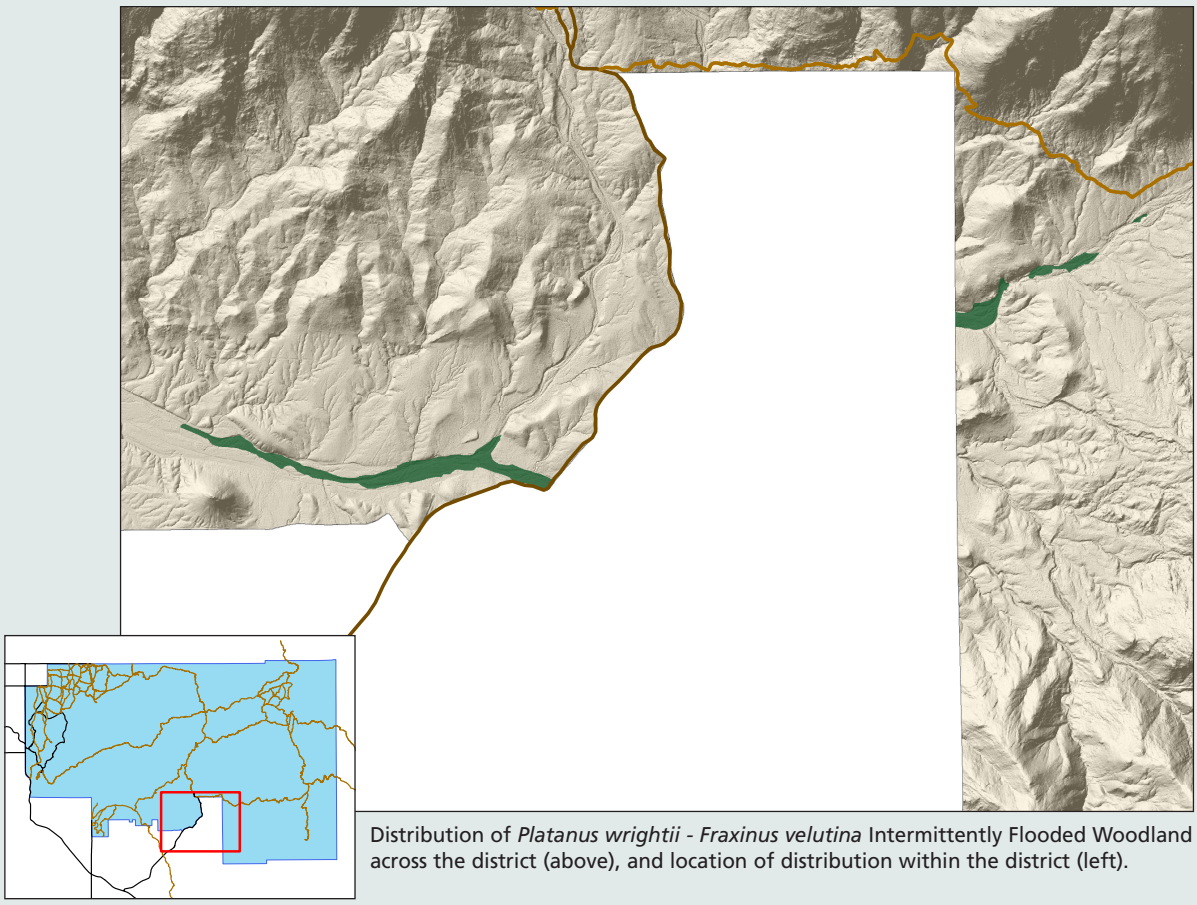
- *Platanus wrightii*
- *Fraxinus velutina*
- *Salix gooddingii*
- *Muhlenbergia rigens*

This community is characterized by a moderately dense (20–30% cover) 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 (*P. wrightii*) is a consistent (1.0) dominant with cover of 5–15%. 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. Velvet ash (*F. velutina*) is a less-consistent (0.80) dominant that, when present, provides highly variable cover of 5–30%. Other documented species include Goodding's willow (*Salix gooddingii*), Fremont cottonwood (*Populus fremontii*), common buttonbush (*Cephalanthus occidentalis*), Thurber's cotton (*Gossypium thurberi*), mule-fat (*Baccharis salicifolia*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), catclaw mimosa (*Mimosa aculeaticarpa*), deergrass (*Muhlenbergia rigens*), and crimson fountaingrass (*Cenchrus setaceus*).

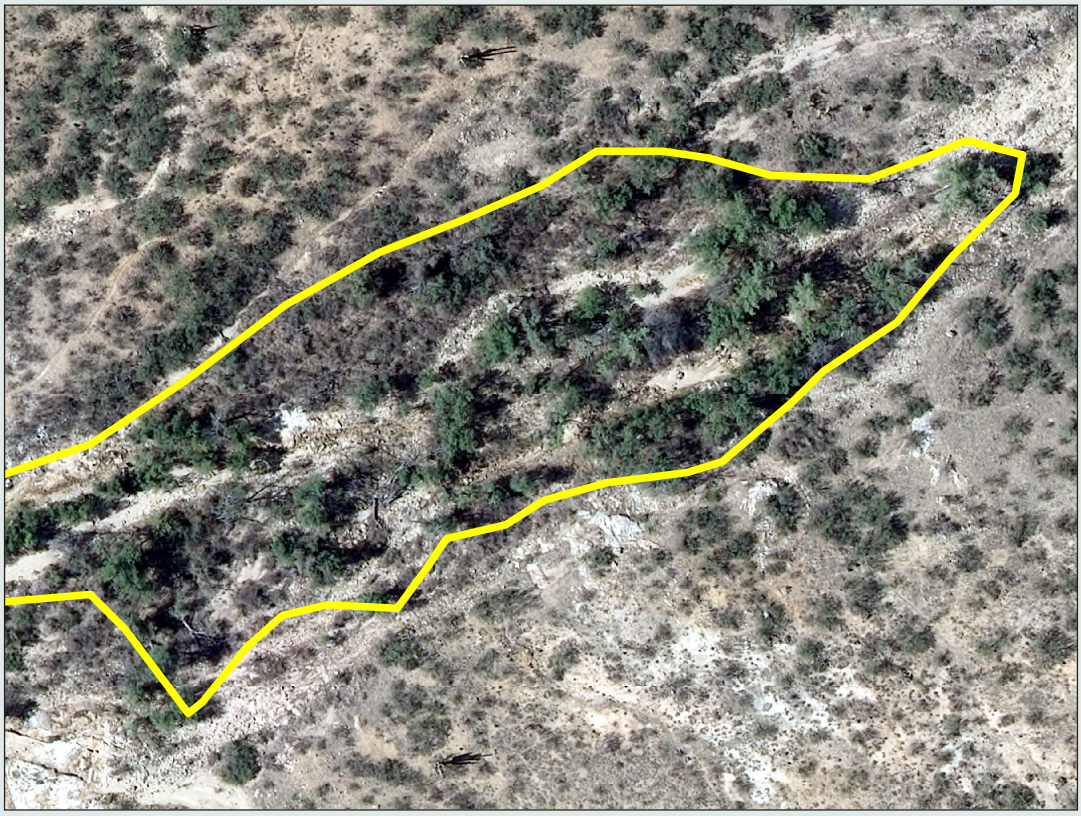
This community covers 0.08% (23 ha/47 ac) of the Rincon Mountain District and is restricted to the major ephemeral drainages throughout the park, specifically, the lower reaches of Rincon and Deer creeks. It is typically found in low-angle drainages with intermittent water flow where geologic and hydrologic 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 with underlying pockets of variable, deep sand and gravel that shift with each flood event.



Example of *Platanus wrightii - Fraxinus velutina* Intermittently Flooded Woodland.



Distribution of *Platanus wrightii - Fraxinus velutina* Intermittently Flooded Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

43. *Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland Association

Arizona sycamore / Mexican blue oak Riparian Woodland Association

Common species

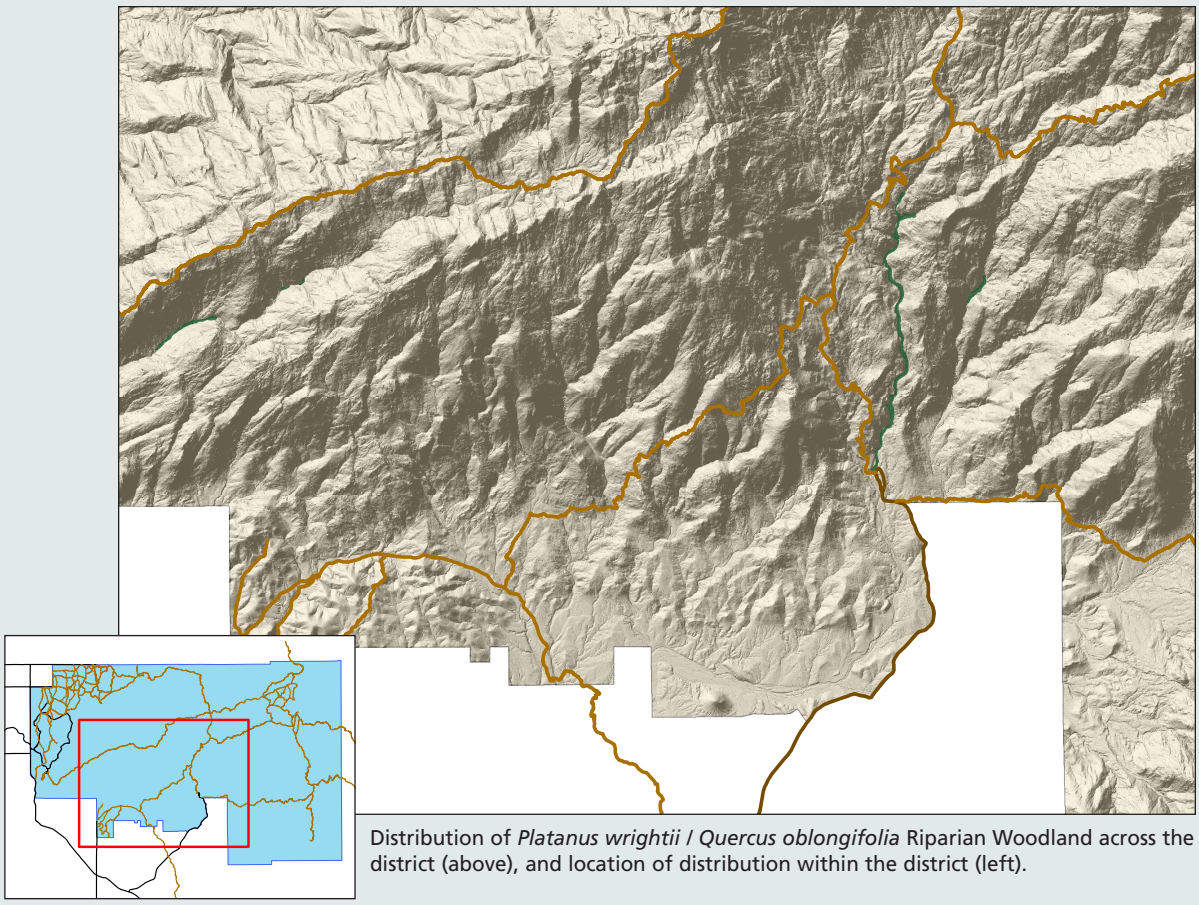
- *Quercus oblongifolia*
- *Platanus wrightii*
- *Fraxinus velutina*

This riparian woodland community is characterized by a variable (30–40% cover) 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 (*Q. oblongifolia*) is a consistent (1.0) dominant that provides average cover of around 15%, ranging from 10% to 25%. This species is present as wide, canopied trees with heights of 4–8 meters, typically lining the margins of the watercourse. Arizona sycamore (*P. wrightii*) and velvet ash (*F. velutina*) are patchy (0.57) common associates that, when present, provide cover of 5–20%. Other documented species include Goodding's willow (*Salix gooddingii*), alligator juniper (*Juniperus deppeana*), Arizona walnut (*Juglans major*), Arizona white oak (*Quercus arizonica*), velvet mesquite (*Prosopis velutina*), Thurber's cotton (*Gossypium thurberi*), catclaw mimosa (*Mimosa aculeaticarpa*), catclaw acacia (*Senegalia greggii*), and deergrass (*Muhlenbergia rigens*).

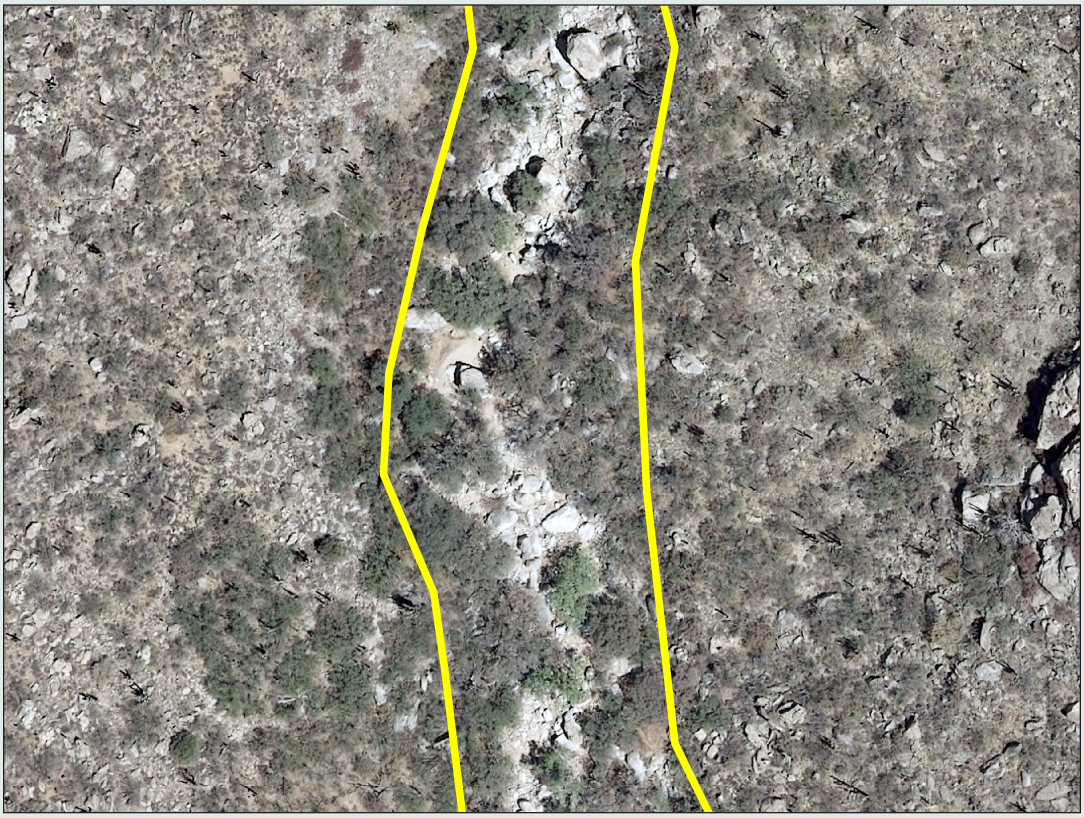
This community covers 0.08% (21 ha/52 ac) of the Rincon Mountain District and is restricted to the major ephemeral drainages throughout the park, specifically, lower Chiminea Canyon, lower Madrona Canyon, and numerous tributaries of Rincon Creek. It is found on low-angle, typically south to west-flowing drainages with intermittent 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.



Example of *Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland.



Distribution of *Platanus wrightii* / *Quercus oblongifolia* Riparian Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

44. *Populus fremontii* / *Muhlenbergia rigens* Riparian Woodland Association

Fremont cottonwood / Deergrass Riparian Woodland Association

Common species

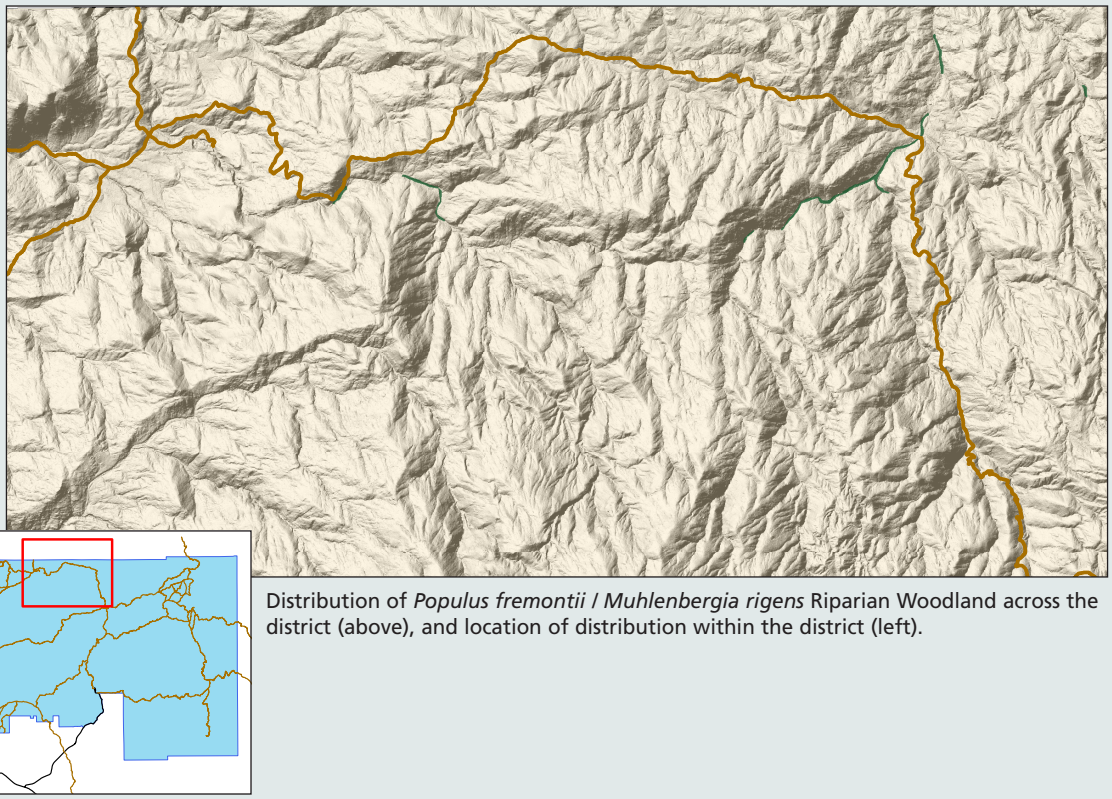
- *Populus fremontii*
- *Salix gooddingii*
- *Muhlenbergia rigens*

This community is characterized by a moderately sparse (10–20% cover) 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. Fremont cottonwood (*P. fremontii*) provides variable cover, ranging from a few scattered individuals providing less than 5% cover to areas of more consistent dominance, with cover up to 20%. Deergrass (*M. rigens*) is a consistent (1.0) component of the community but provides highly variable dominance (0.5), with cover ranging from less than 1% to dense areas of up to 30%. Areas of low cover are typically associated with stretches of dominant, exposed bedrock. Other documented species include Mexican blue oak (*Quercus oblongifolia*), Emory oak (*Quercus emoryi*), Arizona white oak (*Quercus arizonica*), Lehmann lovegrass (*Eragrostis lehmanniana*), bullgrass (*Muhlenbergia emersleyi*), rough bentgrass (*Agrostis scabra*), Texas bluestem (*Schizachyrium cirratum*), and pinyon ricegrass (*Piptochaetium fimbriatum*).

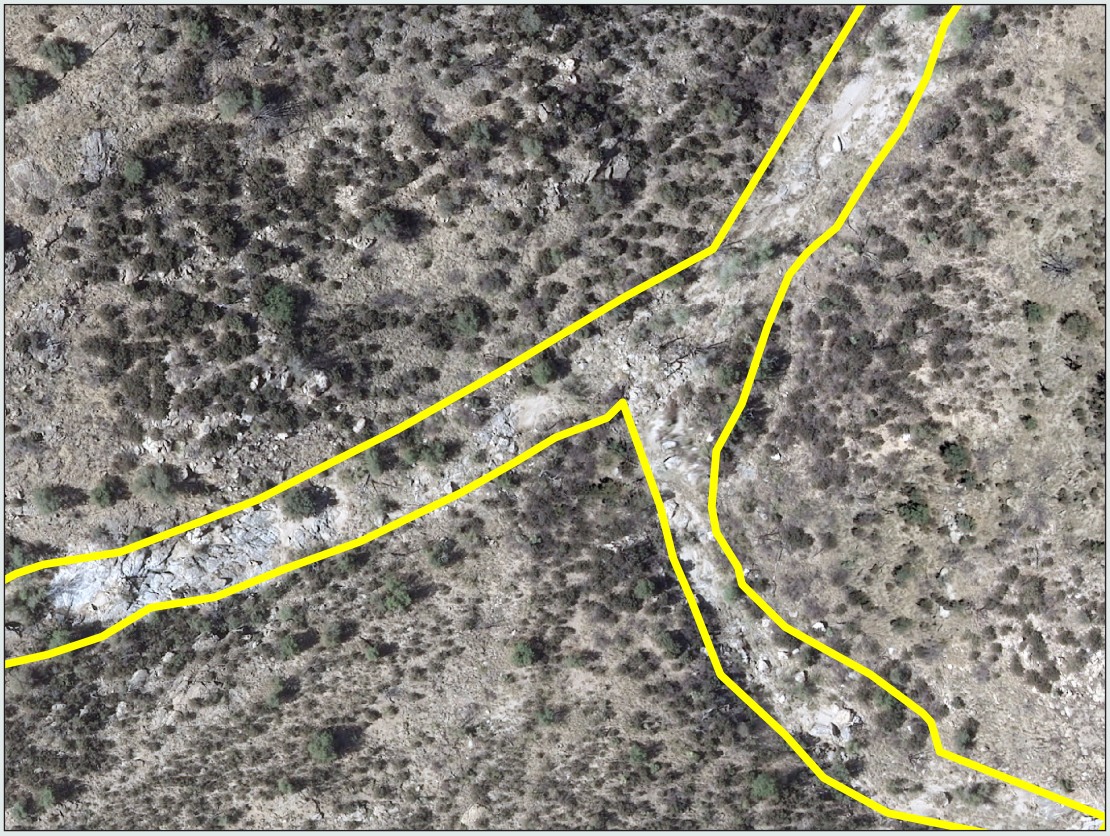
This community covers 0.01% (3.3 ha/8.2 ac) of the Rincon Mountain District and is primarily found within the mid-slope drainages flowing off the north side of Tanque Verde Ridge. The most notable occurrences are above Bridal Wreath Falls and around the Douglas Spring campground. It is restricted to low-angle drainages with intermittent 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, with underlying pockets of variable, deep sand and gravel that shift with each flood event.



Example of *Populus fremontii* / *Muhlenbergia rigens* Riparian Woodland.



Distribution of *Populus fremontii / Muhlenbergia rigens* Riparian Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

45. *Prosopis velutina - Senegalia greggii* Intermittently Flooded Shrubland (P)

Velvet mesquite - Catclaw acacia Intermittently Flooded Shrubland (P)

Common species

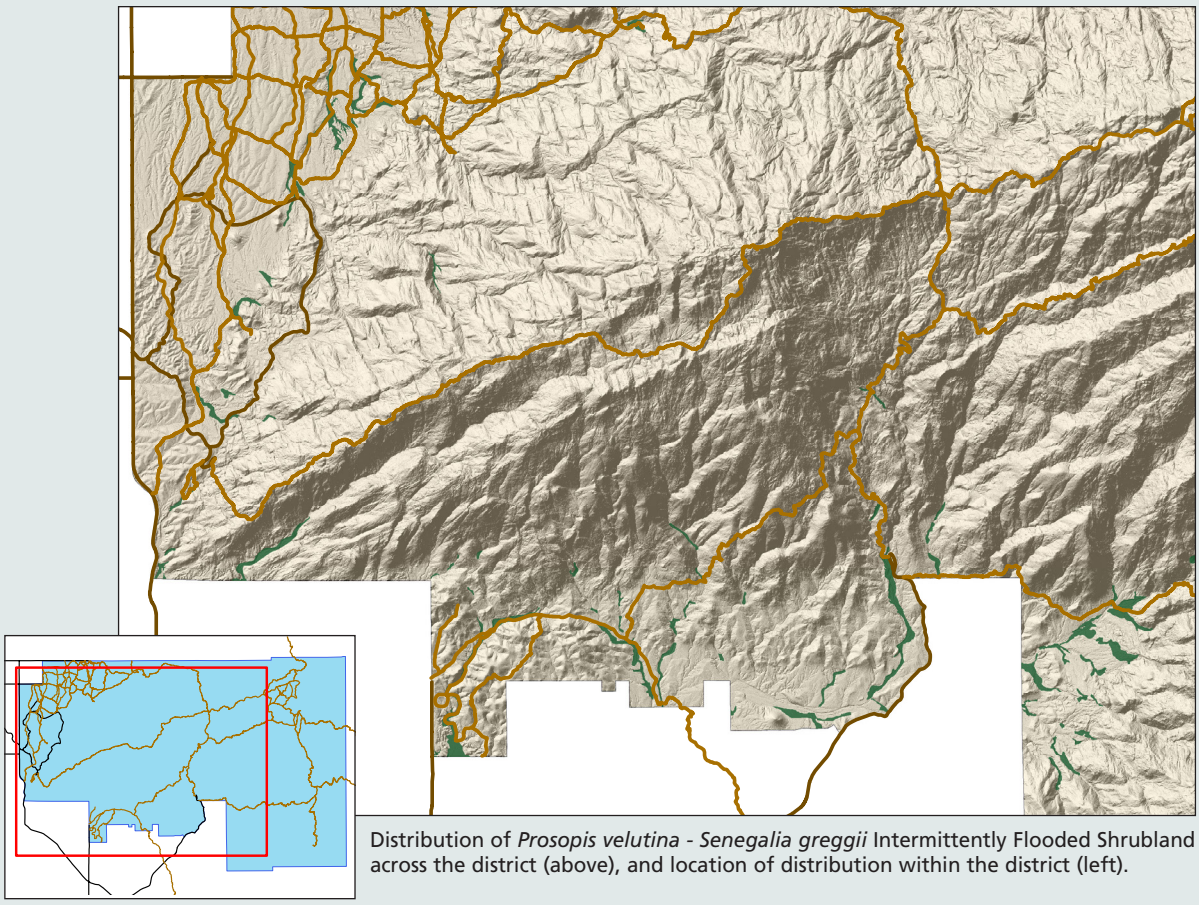
- *Prosopis velutina*
- *Senegalia greggii*
- *Celtis ehrenbergiana*

This community is characterized by a variably dense (15–40% cover) 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 (*P. velutina*) is by far the most consistent (1.0) and dominant species in this community, with average cover of around 21% and some examples up to 30%. Catclaw acacia (*S. greggii*) provides cover in both the canopy stratum as a large (4 m), single-stemmed tree and in the subcanopy (0.5–2 m) stratum as a small (<2 m) shrub. Across all strata, this species provides around 8% cover, with some areas up to 15%. Other documented species include netleaf hackberry (*Celtis reticulata*), western soapberry (*Sapindus saponaria* var. *drummondii*), lotebush (*Ziziphus obtusifolia*), common buttonbush (*Cephalanthus occidentalis*), singlewhorl burrobush (*Ambrosia monogyra*), mule-fat (*Baccharis salicifolia*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), whitethorn acacia (*Vachellia constricta*), and Arizona desert-thorn (*Lycium exsertum*).

This community covers 1% (253 ha/625 ac) of the Rincon Mountain District and was documented throughout the lower elevational range of the park. It 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.



Example of *Prosopis velutina - Senegalia greggii* Intermittently Flooded Shrubland.



Distribution of *Prosopis velutina - Senegalia greggii* Intermittently Flooded Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

46. *Prosopis velutina - Senegalia greggii* Intermittently Flooded Woodland (P)

Velvet mesquite - Catclaw acacia Intermittently Flooded Woodland (P)

Common species

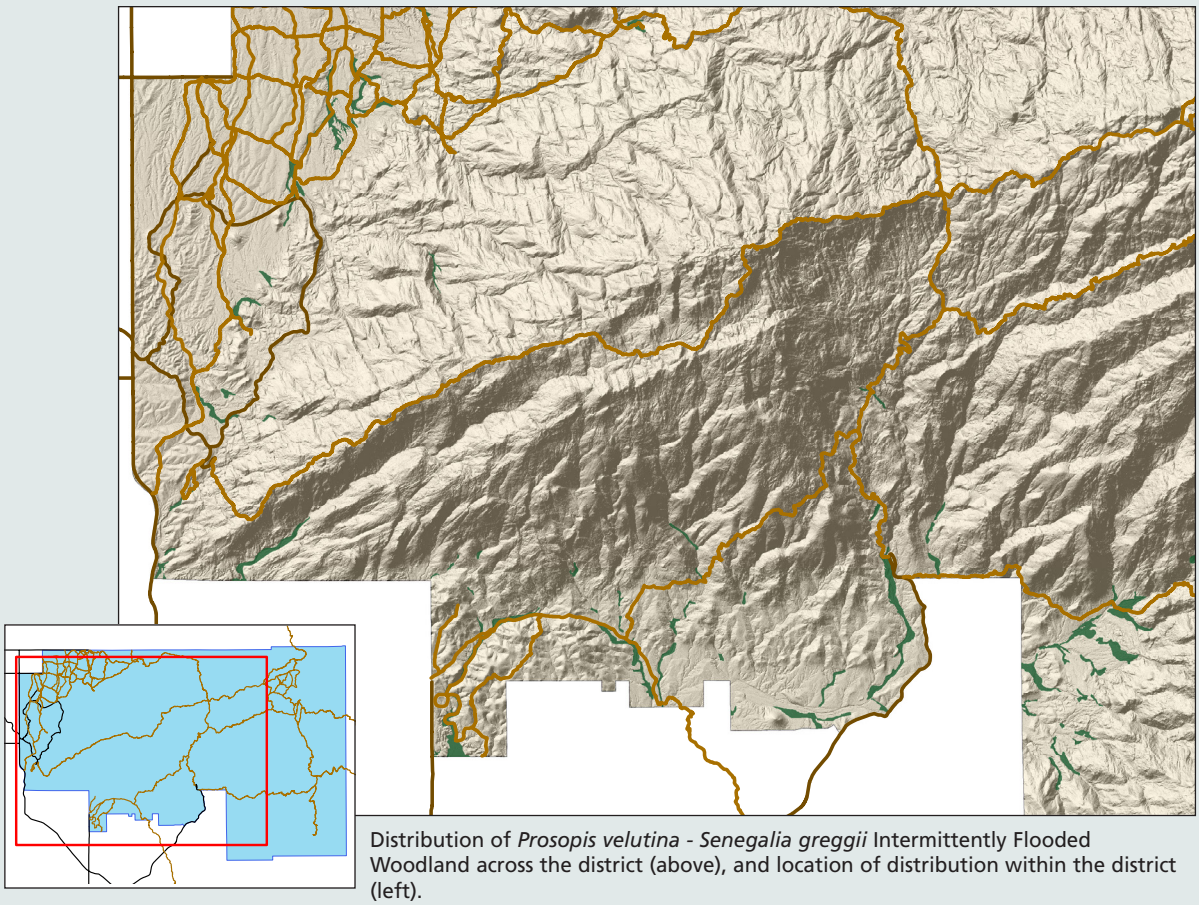
- *Prosopis velutina*
- *Senegalia greggii*

This community is characterized by a variable (15–40% cover) lower 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 (*P. velutina*) is by far the most consistent (1.0) and dominant species in this community, with average cover of 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 (*S. greggii*) is exclusively present in the subcanopy stratum as a small (<2 m) shrub with cover ranging from absent to 10%, with an average of 3%. Other documented species include Wright's beebrush (*Aloysia wrightii*), netleaf hackberry (*Celtis ehrenbergiana*), staghorn cholla (*Cylindropuntia versicolor*), whitethorn acacia (*Vachellia constricta*), Thurber's desert honeysuckle (*Anisacanthus thurberi*), Warnock's snakewood (*Condalia warnockii*), Berlandier's wolfberry (*Lycium berlandieri*), ambrosia leaf bur ragweed (*Ambrosia ambrosioides*), sideoats grama (*Bouteloua curtipendula*), and bush muhly (*Muhlenbergia porteri*).

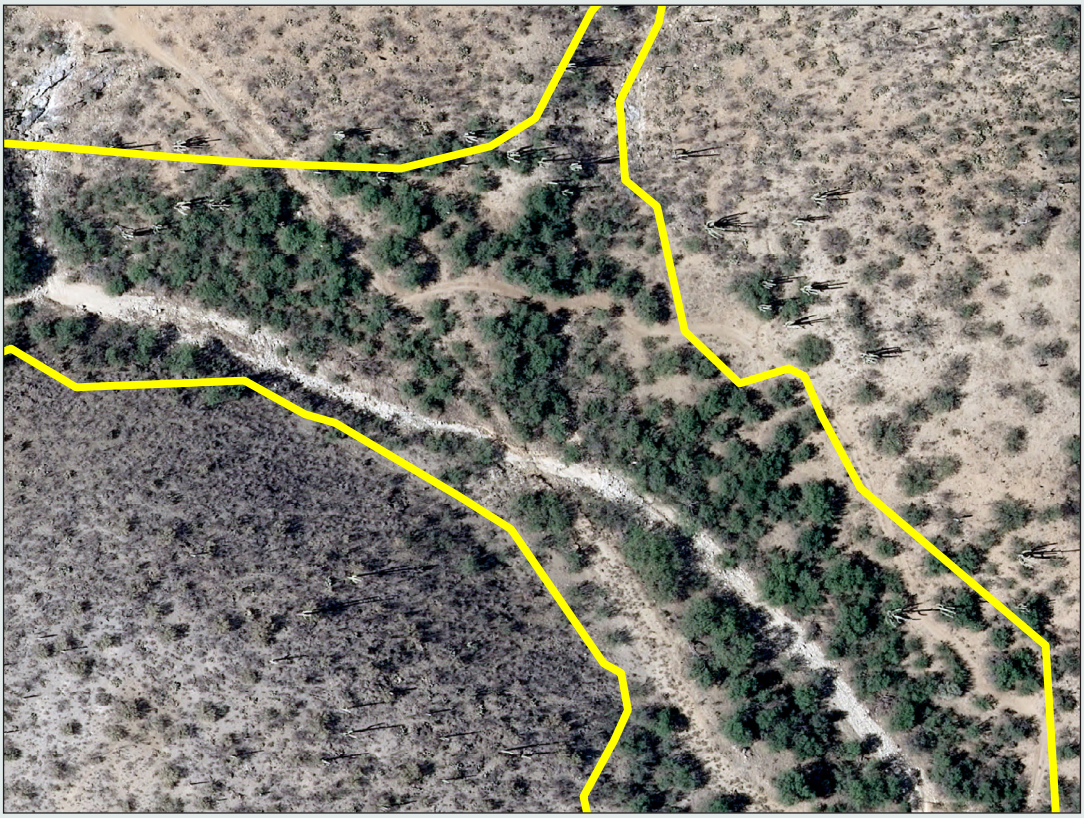
This community covers 0.9% (253 ha/625 ac) of the Rincon Mountain District and was documented throughout the lower elevational range of the park. This intermittently flooded woodland is restricted to mixed gradient (3–50+%) drainages/arroyos and adjacent slopes from 920 to 1,240 meters (3,018–4,068 m). 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.



Example of *Prosopis velutina - Senegalia greggii* Intermittently Flooded Woodland.



Distribution of *Prosopis velutina - Senegalia greggii* Intermittently Flooded Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

47. *Prosopis velutina* / Annual Forb Woodland Association (P)

Velvet mesquite / Annual Forb Woodland Association (P)

Common species

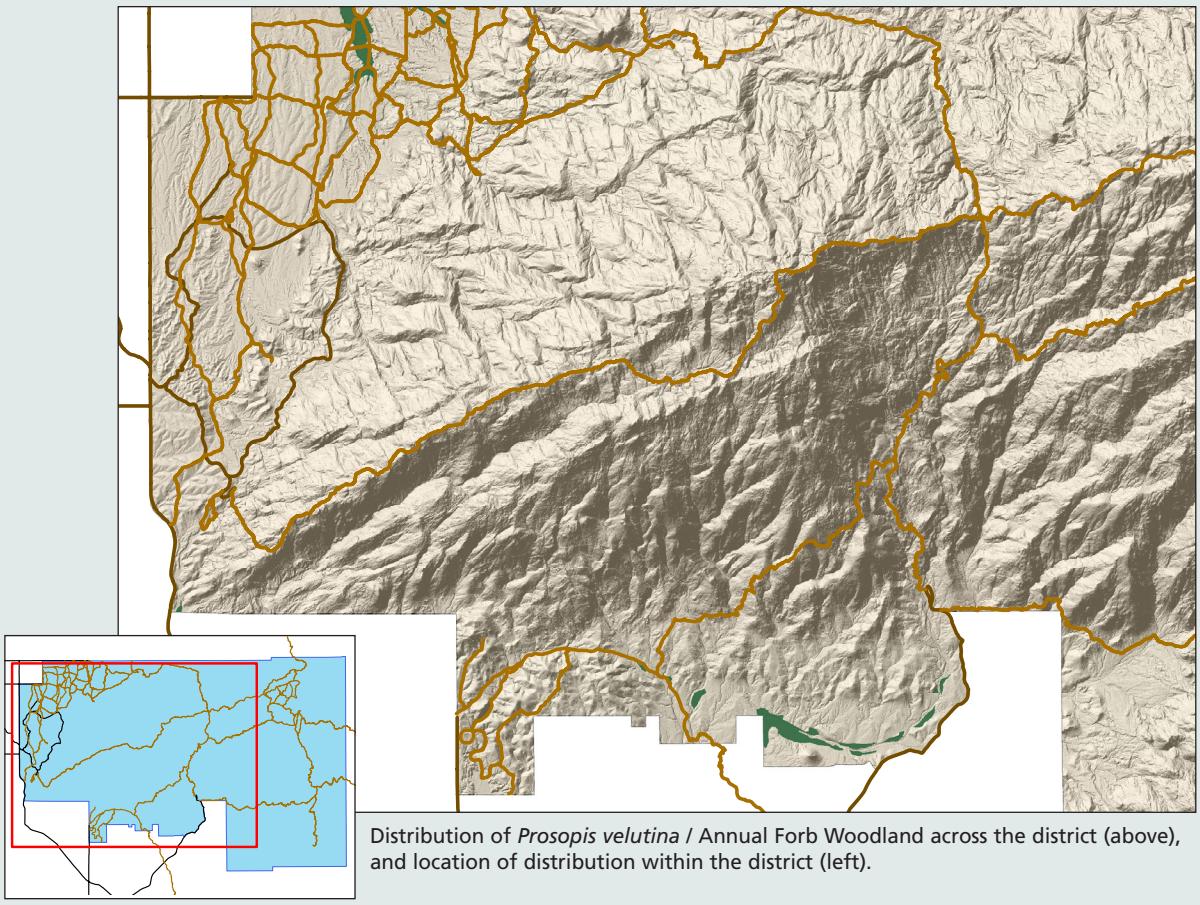
- *Prosopis velutina*
- *Senegalia greggii*
- Annual Forbs

This community is characterized by a variably dense (10–40% cover) canopy (2–5 m) solely dominated by velvet mesquite (*Prosopis velutina*) with an understory of mixed annual forbs and grasses. Velvet mesquite (*P. 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*) provides up to 5% cover in the canopy stratum, with tree-like individuals ranging in height up to 4 meters. The sub-canopy 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 whitethorn acacia (*Vachellia constricta*). The field stratum (<0.5 m) 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.).

This community is contained within a two-association map class that covers 0.3% (87 ha/215 ac) of the Rincon Mountain District and was documented in and adjacent to the major washes and adjacent floodplains in the northern portion of the Cactus Forest. It 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, 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.



Example of *Prosopis velutina* / Annual Forb Woodland.



Distribution of *Prosopis velutina* / Annual Forb Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

48. *Prosopis velutina / Ziziphus obtusifolia - Condalia warnockii* Woodland Association (P)

Velvet mesquite / Lotebush - Warnock's snakewood Woodland Association (P)

Common species

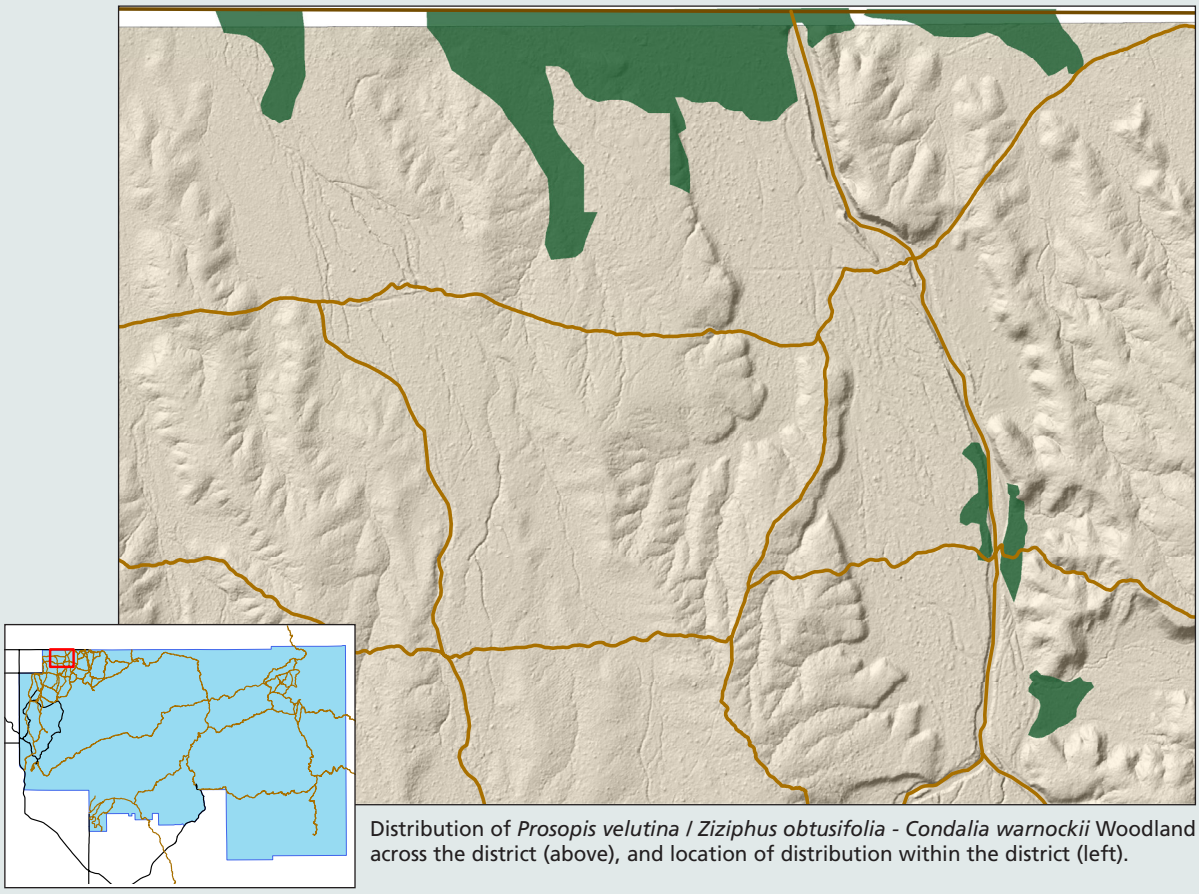
- *Prosopis velutina*
- *Ziziphus obtusifolia*
- *Condalia warnockii*

This community is characterized by a dense (40–50+% cover) canopy stratum (>2 m) solely dominated by velvet mesquite (*Prosopis velutina*), with a variable (5–20% cover) understory of lotebush (*Ziziphus obtusifolia*) and Warnock's snakewood (*Condalia warnockii*). Velvet mesquite (*P. velutina*) is consistently (1.0) present as large (5+ m), single-stemmed trees, often with broad canopies (10 m), that provide all documented cover in the canopy stratum. The subcanopy (0.5–2 m) is characterized by the consistent (1.0) co-dominance of lotebush (*Z. obtusifolia*) and Warnock's snakewood (*C. 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 whitethorn acacia (*Vachellia constricta*). These species all provide sparse cover (<1%) that rarely competes with the subcanopy dominants. The field stratum is quite sparse (<8% cover), with only a suite of annuals, most notably carelessweed (*Amaranthus palmeri*), providing noteworthy cover.

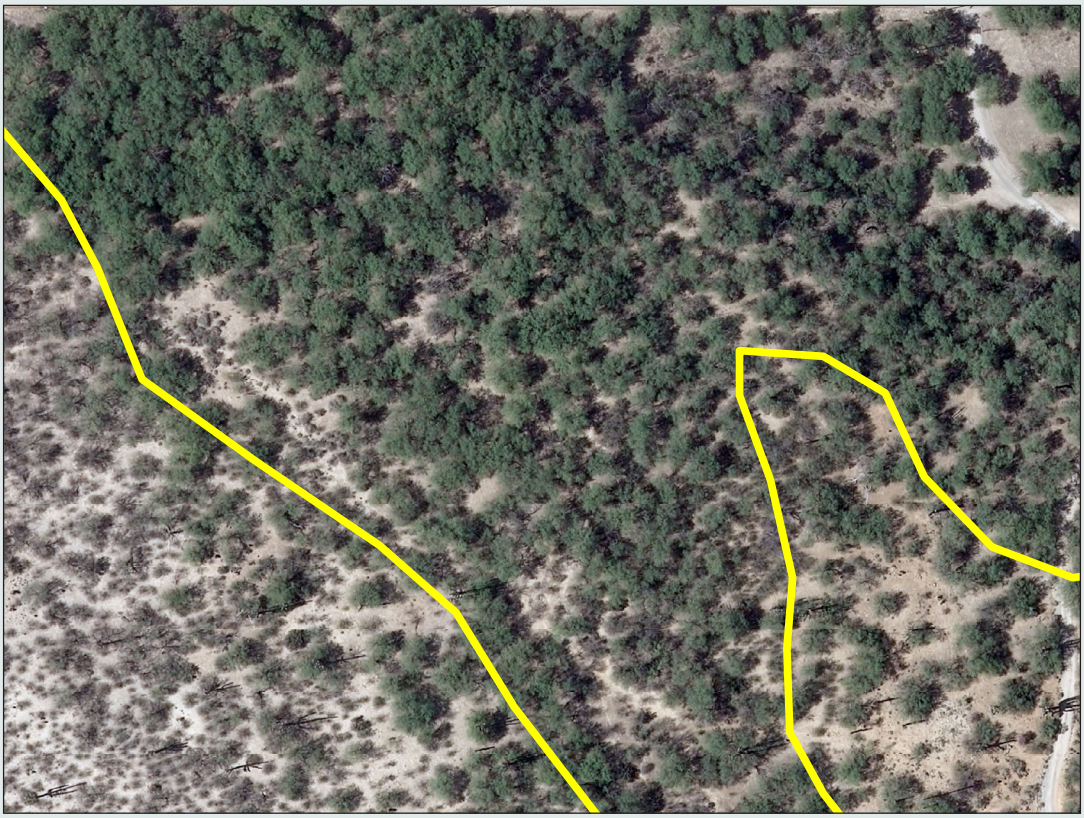
The community covers 0.05% (13 ha/32 ac) of the Rincon Mountain District and was documented within the floodplains adjacent to Monument Wash in the northern portions of the Cactus Forest. This woodland is restricted to very low-angle (<5%) floodplains around 800 meters (2,624 ft). The surface cover is characterized by deep, well-drained, fine to coarse loamy soil and silt underlying a dominant layer of litter.



Example of *Prosopis velutina / Ziziphus obtusifolia - Condalia warnockii* Woodland.



Distribution of *Prosopis velutina / Ziziphus obtusifolia - Condalia warnockii* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

49. *Quercus rugosa - Ceanothus integerrimus* Woodland Association (P)

Netleaf oak - Deerbrush Woodland Association (P)

Common species

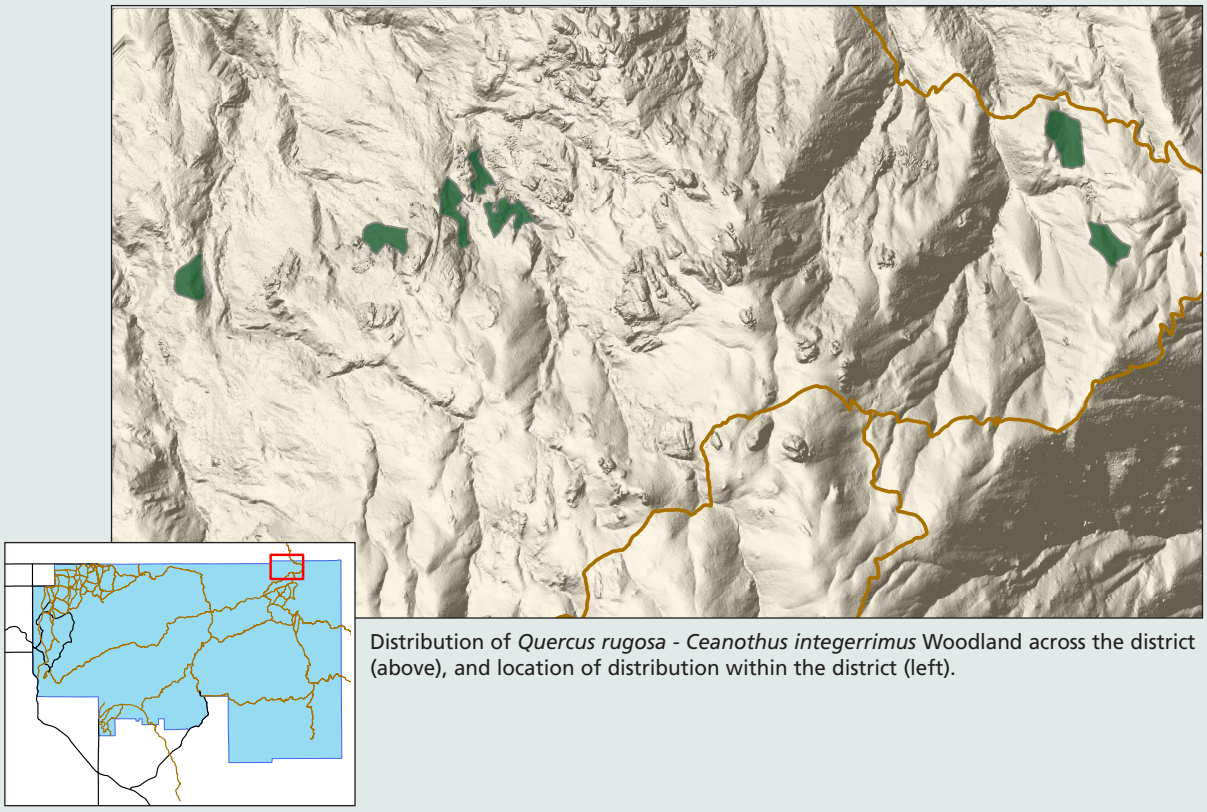
- *Quercus rugosa*
- *Ceanothus integerrimus*

This woodland community is present in two distinct variations: unburned woodland and burned shrubland. The unburned version is characterized by a dense (50–75+% cover) 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% cover) subcanopy (0.5–2 m) dominated by deerbrush (*C. integerrimus*) with variable netleaf oak (*Q. rugosa*). Other documented species include silverleaf oak (*Quercus hypoleucoides*), New Mexico locust (*Robinia neomexicana*), pineland figwort (*Scrophularia parviflora*), Gambel oak (*Quercus gambelii*), New Mexico raspberry (*Rubus neomexicana*), Pringle's manzanita (*Arctostaphylos pringlei*), muttongrass (*Poa fendleri*), and meadow rue (*Thalictrum fendleri*).

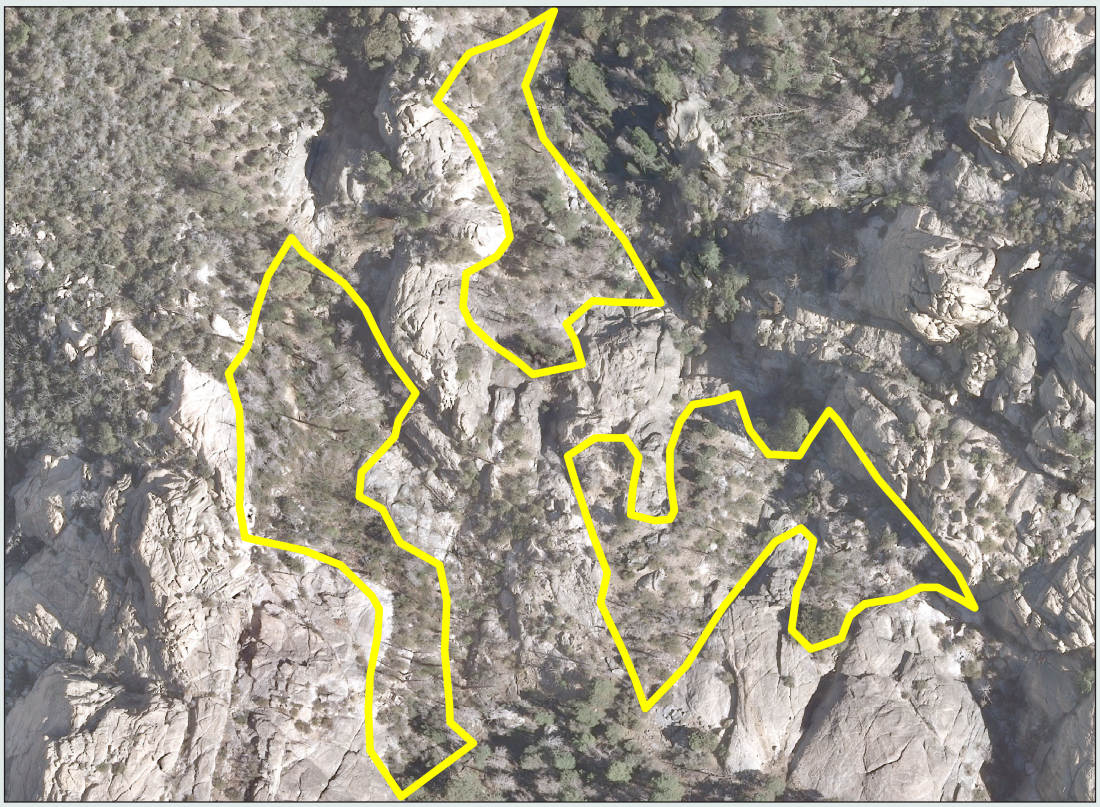
This community covers 0.01% (3 ha/7 ac) of the Rincon Mountain District and was documented on the north slopes of Mica Mountain. It is primarily present on mountain backslopes from 2,050 to 2,300 meters (6,725–7,545 ft). All examples of this community are north-trending and most are sheltered by large bedrock outcrops. The dominant surface cover varies based on fire history. Unburned examples are dominated by deep litter. Burned versions are dominated by a mix of gravel, bare soil and shallow litter.



Example of *Quercus rugosa - Ceanothus integerrimus* Woodland.



Distribution of *Quercus rugosa - Ceanothus integerrimus* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

50. (*Quercus arizonica - Quercus emoryi*) / *Arctostaphylos pungens* Shrubland Association (P)

(Arizona white oak - Emory oak) / Pointleaf manzanita Shrubland Association (P)

Common species

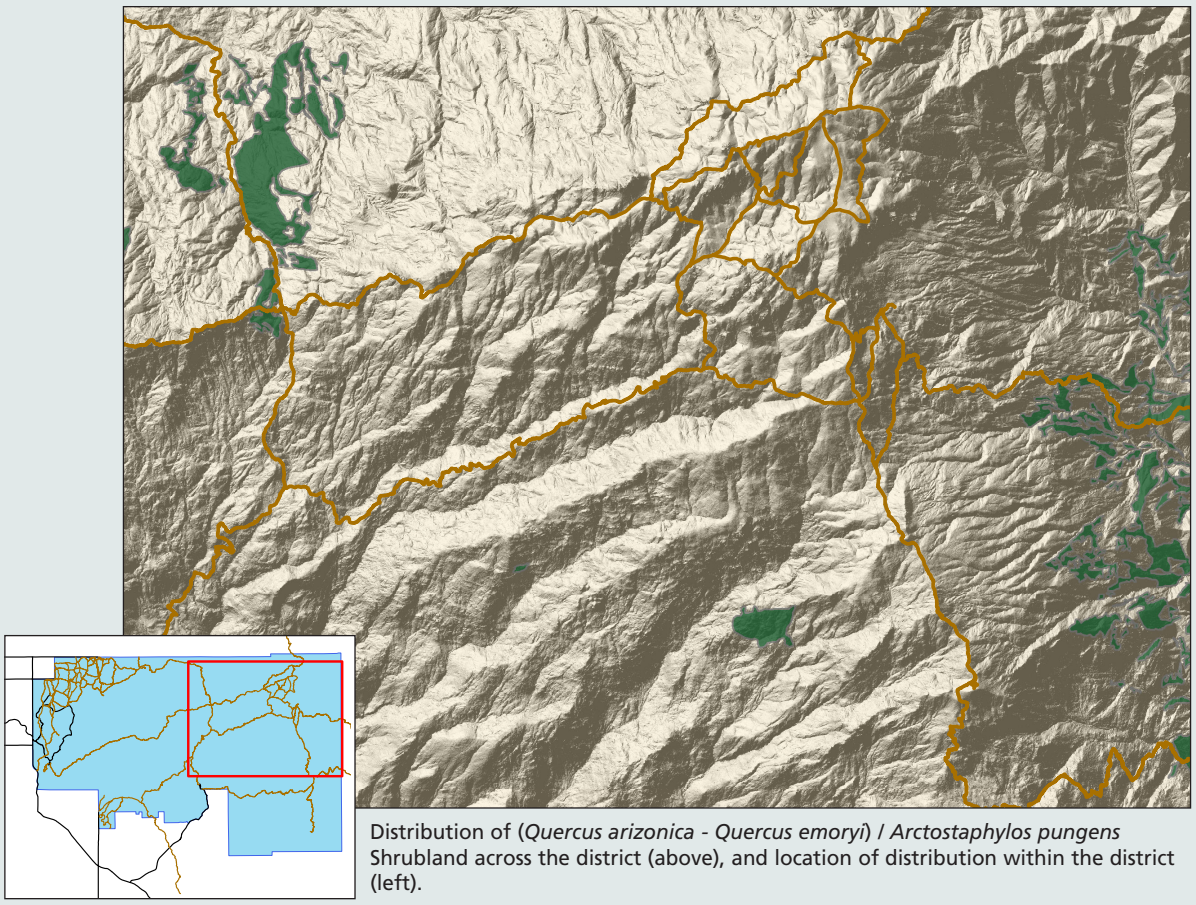
- *Quercus arizonica*
- *Quercus emoryi*
- *Arctostaphylos pungens*

This shrubland is characterized by a sparse (<10 [20]% cover) canopy stratum (2–5 m) of Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*), with a dense (20–50% cover) subcanopy (0.5–2 m) dominated by pointleaf manzanita (*Arctostaphylos pungens*). The composition of oak species forms a distinct gradient based on elevation and/or aspect. Both oak species are typically present as small (3–4 m) trees with cover ranging from 1% to 10% each. Pointleaf manzanita (*A. pungens*) 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 (*A. pungens*). Other documented species include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), catclaw mimosa (*Mimosa aculeaticarpa*), common sotol (*Dasylirion wheeleri*), and bullgrass (*Muhlenbergia emersleyi*).

This community is contained within a two-association map class that covers 1.3% (362 ha/894 ac) of the Rincon Mountain District and is widespread throughout the mid-slopes of Tanque Verde Ridge and the eastern slopes of the range, often in areas with evidence of historic fire disturbance, likely from the Chiva (1989) and Rincon (1994) fires. It 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.



Example of (*Quercus arizonica - Quercus emoryi*) / *Arctostaphylos pungens* Shrubland.



Distribution of (*Quercus arizonica - Quercus emoryi*) / *Arctostaphylos pungens* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

51. (*Quercus hypoleucoides - Quercus arizonica*) / *Arctostaphylos* (*pringlei - pungens*) Shrubland Association (P)

(Silverleaf oak - Arizona white oak) / Manzanita (Pringle's - pointleaf) Shrubland Association (P)

Common species

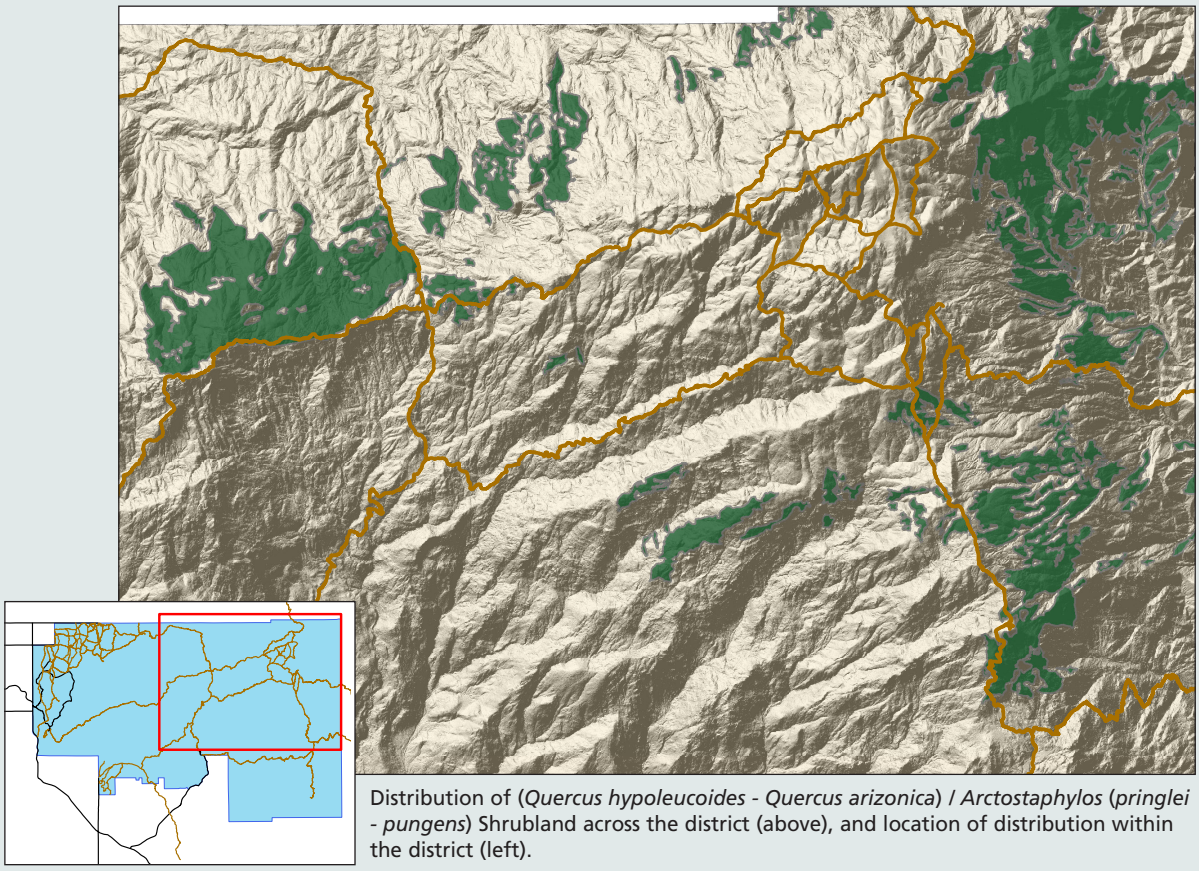
- *Quercus hypoleucoides*
- *Quercus arizonica*
- *Arctostaphylos pungens*
- *Arctostaphylos pringlei*

This shrubland is characterized by a sparse (<10% cover) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), with a dense (25–50% cover) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*) and pointleaf manzanita (*Arctostaphylos pungens*). Within the canopy strata, silverleaf oak (*Q. hypoleucoides*) is the more prolific of the two oaks, providing consistent (1.0) presence with highly variable cover of around 2 [15]%. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) are sparse (1%) associates. Snags of both species, which are poorly adapted to fire and very slow to recolonize, were documented across the community. Other documented species include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), common sotol (*Dasylirion wheeleri*), bullgrass (*Muhlenbergia emersleyi*), bristly wolfstail (*Muhlenbergia alopecuroides*), Palmer's century plant (*Agave palmeri*), and single threeawn (*Aristida schiedeana*).

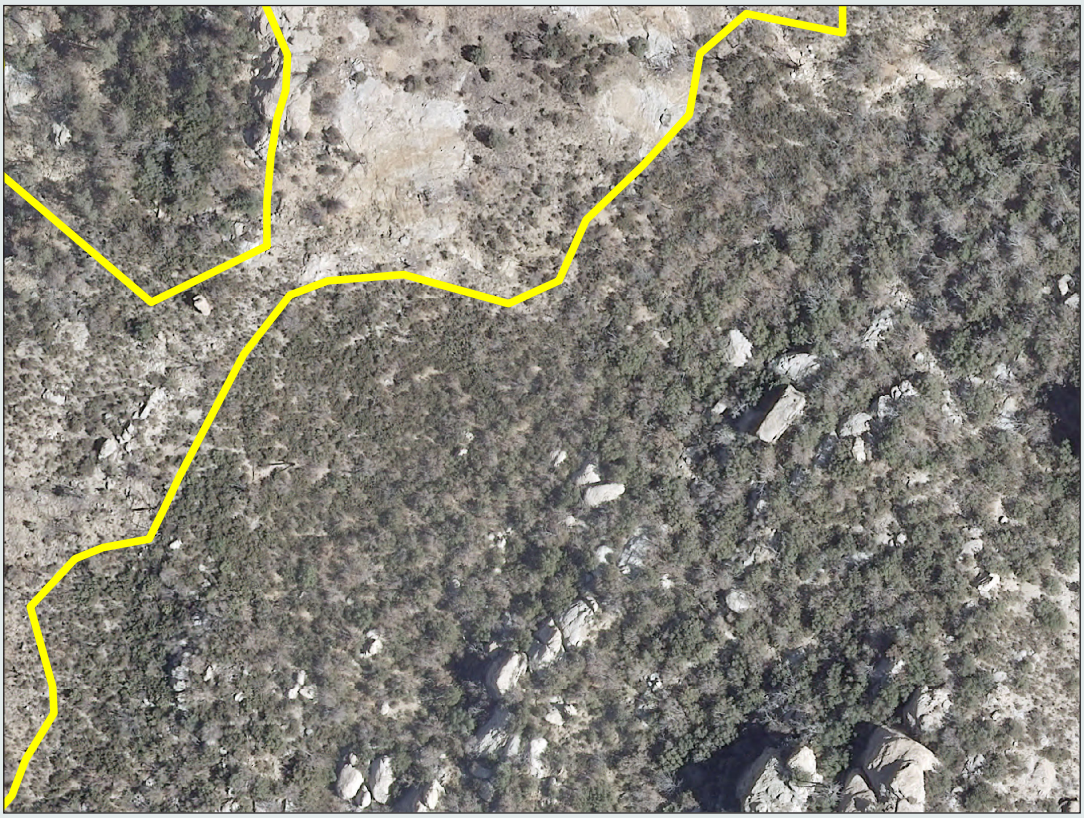
This community is contained within a four-association map class that covers 5% (1,474 ha/3,642 ac) of the Rincon Mountain District and is widespread throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire. It 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.



Example of (*Quercus hypoleucoides - Quercus arizonica*) / *Arctostaphylos* (*pringlei - pungens*) Shrubland.



Distribution of (*Quercus hypoleucoides - Quercus arizonica*) / *Arctostaphylos* (*pringlei - pungens*) Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

52. (*Quercus hypoleucoides - Quercus arizonica*) / *Ceanothus fendleri* Wooded Shrubland Association (P)

(Silverleaf oak - Arizona white oak) / Fendler's ceanothus Wooded Shrubland Association (P)

Common species

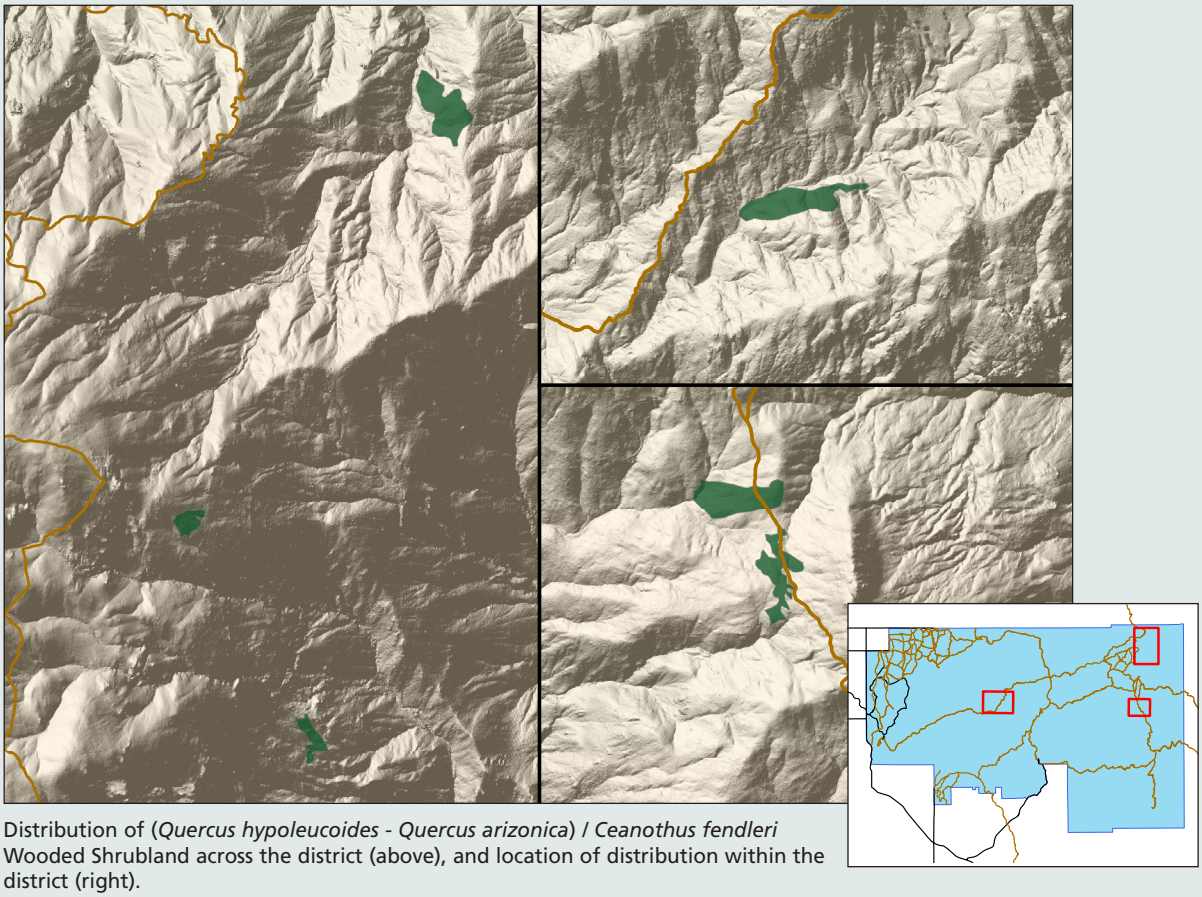
- *Quercus arizonica*
- *Quercus hypoleucoides*
- *Ceanothus fendleri*

This wooded shrubland is characterized by a moderately sparse (10–20% cover) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), with a moderately dense (20–40% cover) subcanopy (0.5–2 m) dominated by Fendler's ceanothus (*Ceanothus fendleri*). The oaks provide consistent (1.0) presence, with each contributing variable cover of 1–2 [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*) are sparse (1%) associates. Fendler's ceanothus (*C. fendleri*) provides cover of 10–50+% throughout the community. Other documented species include Pringle's manzanita (*Arctostaphylos pringlei*), pointleaf manzanita (*Arctostaphylos pungens*), Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), catclaw mimosa (*Mimosa aculeaticarpa*), common sotol (*Dasylirion wheeleri*), bullgrass (*Muhlenbergia emersleyi*), and long-tongue muhly (*Muhlenbergia longiligula*).

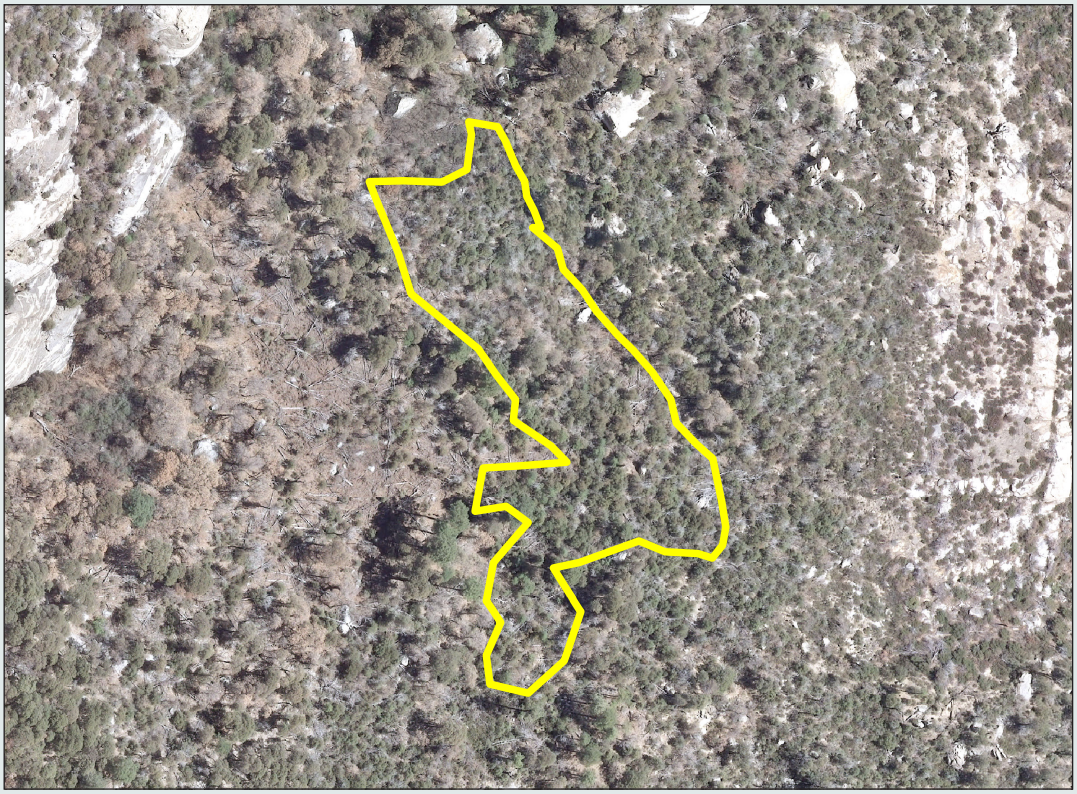
This community covers 0.04% (10 ha/25 ac) of the Rincon Mountain District and is found on the high slopes of Tanque Verde Ridge and around Juniper Basin, often within the boundaries of historic fire events, specifically the Chiva (1989) and Box Canyon (1999) fires. It is primarily present on mountain 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.



Example of (*Quercus hypoleucoides - Quercus arizonica*) / *Ceanothus fendleri* Wooded Shrubland.



Distribution of (*Quercus hypoleucoides - Quercus arizonica*) / *Ceanothus fendleri* Wooded Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

53. (*Quercus hypoleucoides - Quercus rugosa*) / *Arctostaphylos pringlei* Shrubland Association (P)

(Silverleaf oak - Netleaf oak) / Pringle's manzanita Shrubland Association (P)

Common species

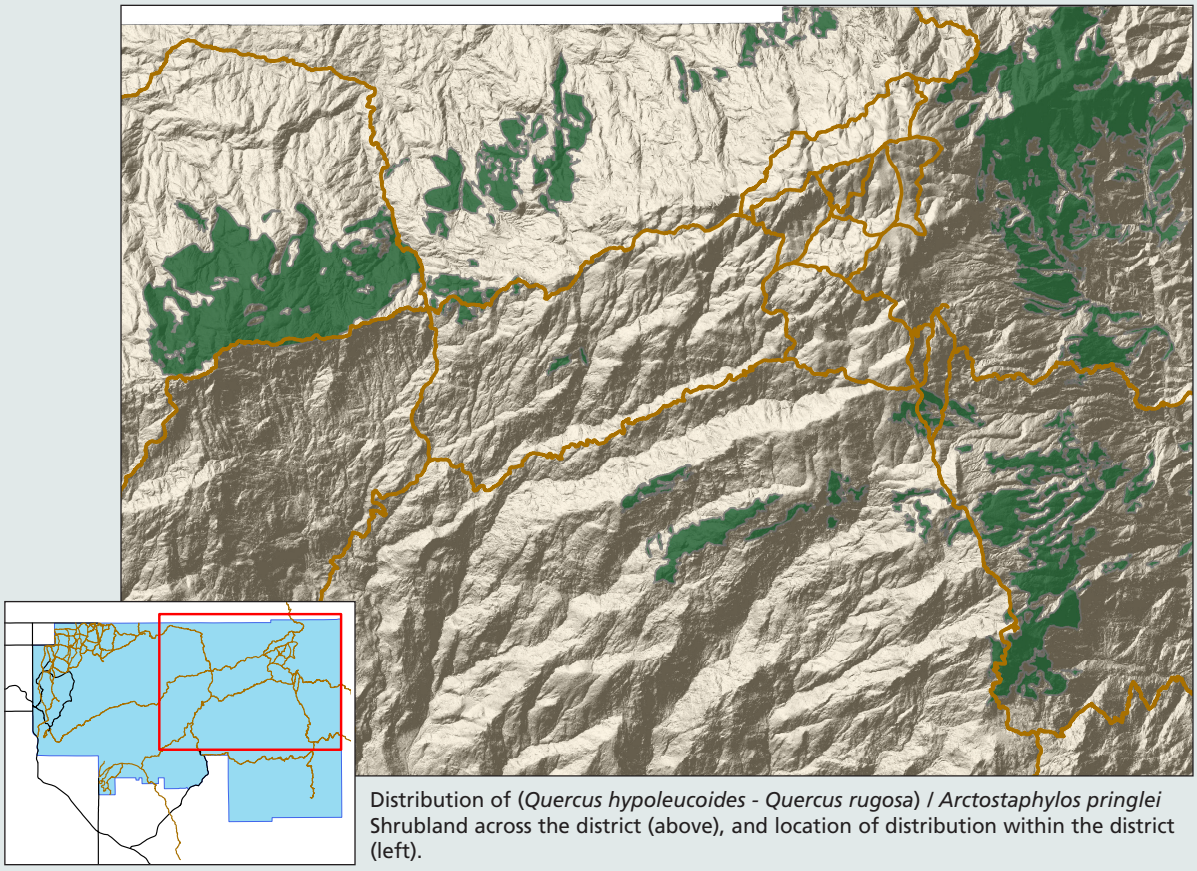
- *Quercus hypoleucoides*
- *Quercus rugosa*
- *Arctostaphylos pringlei*
- *Arctostaphylos pungens*

This shrubland is characterized by a sparse (<10% cover) canopy stratum (2–5 m) of silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*), with a dense (25–50% cover) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*). The oaks are both consistent (1.0) components that on average provide 4–5 [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*) are sparse (1%) associates. Pringle's manzanita (*A. pringlei*) provides around 20% cover 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%. Other noteworthy subcanopy species include Fendler's ceanothus (*Ceanothus fendleri*), Wright's silktassel (*Garrya wrightii*), beargrass (*Nolina microcarpa*), New Mexico locust (*Robinia neomexicana*), longtongue muhly (*Muhlenbergia longiligula*), fragrant snakeroot (*Ageratina herbacea*), muttongrass (*Poa fendleriana*), and Fendler's lipfern (*Cheilanthes fendleri*).

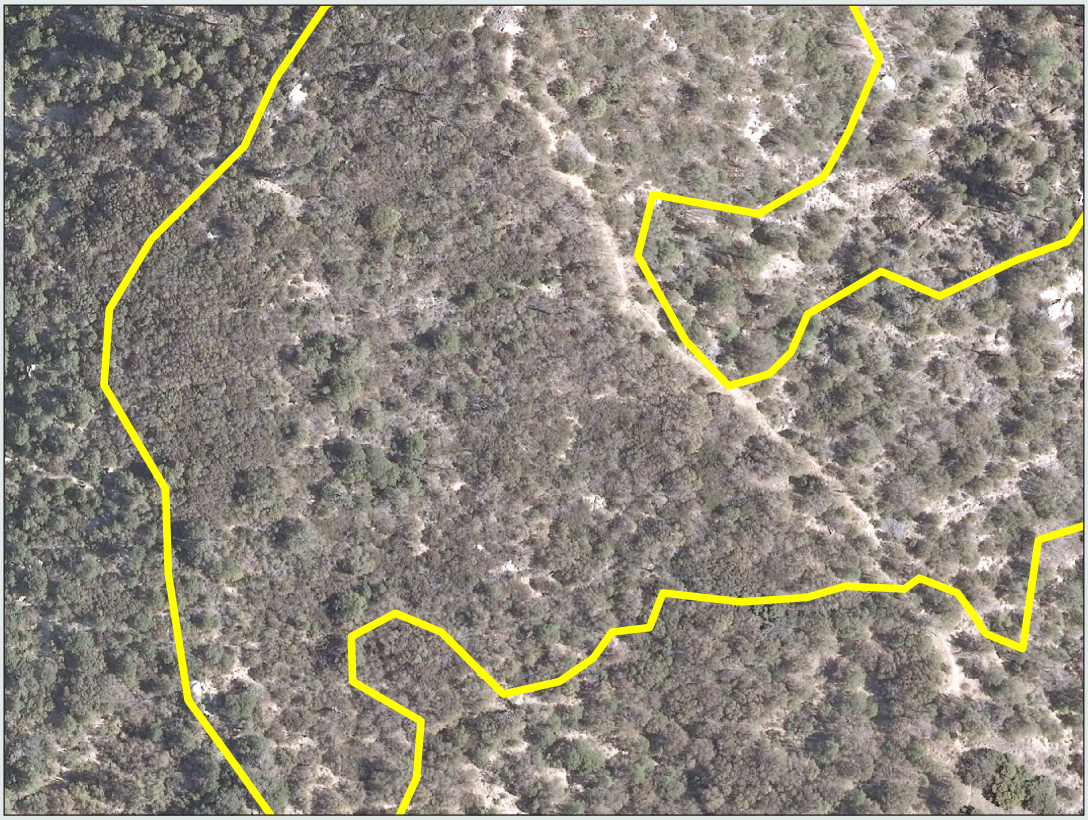
This community is contained within a four-association map class that covers 5% (1,474 ha/3,642 ac) of the Rincon Mountain District and is present throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire. It 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.



Example of (*Quercus hypoleucoides - Quercus rugosa*) / *Arctostaphylos pringlei* Shrubland.



Distribution of (*Quercus hypoleucoides - Quercus rugosa*) / *Arctostaphylos pringlei* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

54. [*Quercus arizonica - Quercus emoryi*] / *Arctostaphylos pungens* Woodland Association (P)

[Arizona white oak - Emory oak] / Pointleaf manzanita Woodland Association (P)

Common species

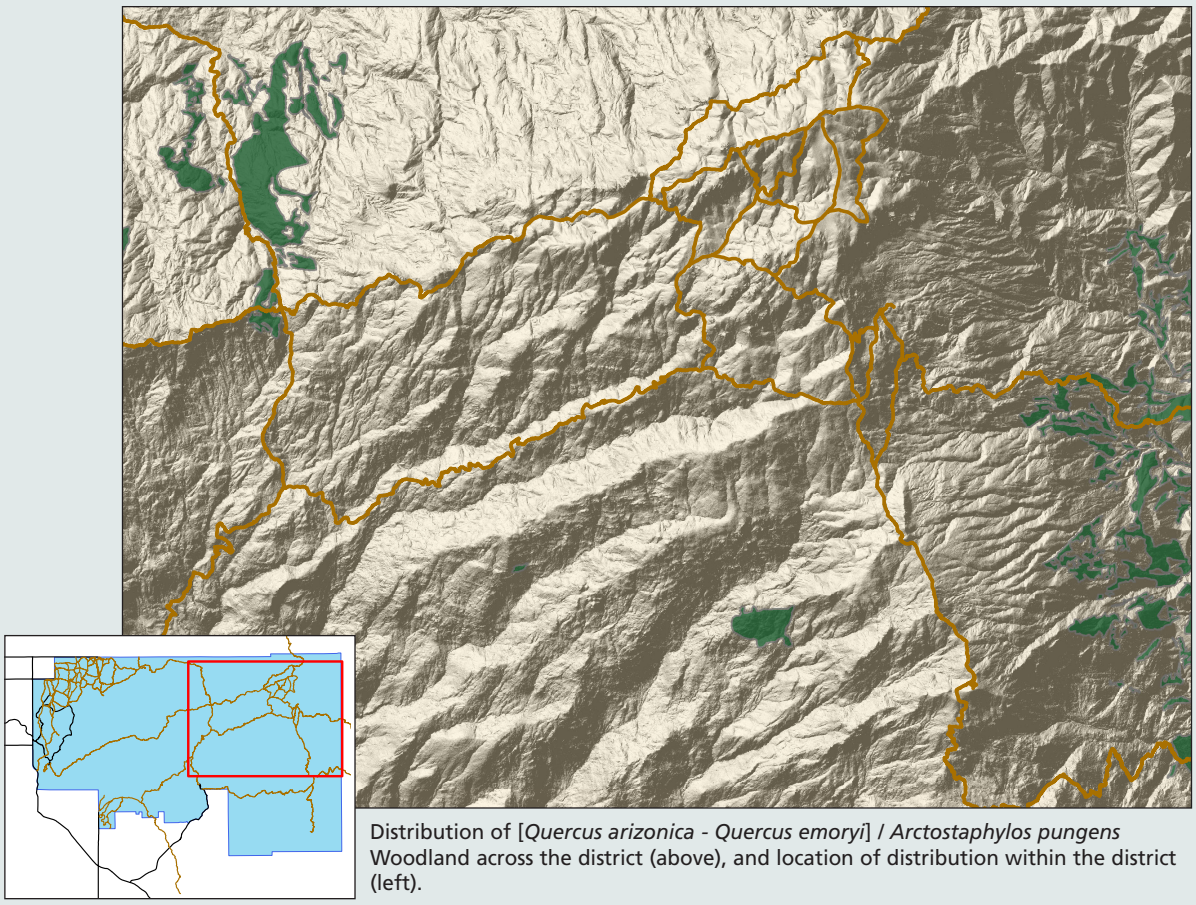
- *Quercus arizonica*
- *Quercus emoryi*
- *Arctostaphylos pungens*

This woodland is characterized by a variably dense (20–40% cover) canopy stratum (2–5 m) dominated by Arizona white oak (*Quercus arizonica*) and Emory oak (*Quercus emoryi*) with a similarly dense (20–40% cover) subcanopy (0.5–2 m) dominated by manzanita (*Arctostaphylos* sp.), mainly pointleaf manzanita (*Arctostaphylos pungens*). The oak species provide similar 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. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) are sparse (1%) associates. Pointleaf manzanita (*A. pungens*) provides around 20+% cover throughout the community, with some areas reaching up to 40%. Other documented species include Pringle's manzanita (*Arctostaphylos pringlei*), Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), Fendler's ceanothus (*Ceanothus fendleri*), and bullgrass (*Muhlenbergia emersleyi*).

This community is contained within a two-association map class that covers 1.3% (362 ha/894 ac) of the Rincon Mountain District and occurs throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire. It 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 primarily composed of gneissic quartz monzonite.



Example of [*Quercus arizonica - Quercus emoryi*] / *Arctostaphylos pungens* Woodland.



Distribution of [*Quercus arizonica - Quercus emoryi*] / *Arctostaphylos pungens* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

55. [*Quercus chrysolepis - Quercus rugosa - Holodiscus dumosa*] Shrubland Association (P)

[Canyon live oak - Netleaf oak - Rockspirea] Shrubland Association (P)

Common species

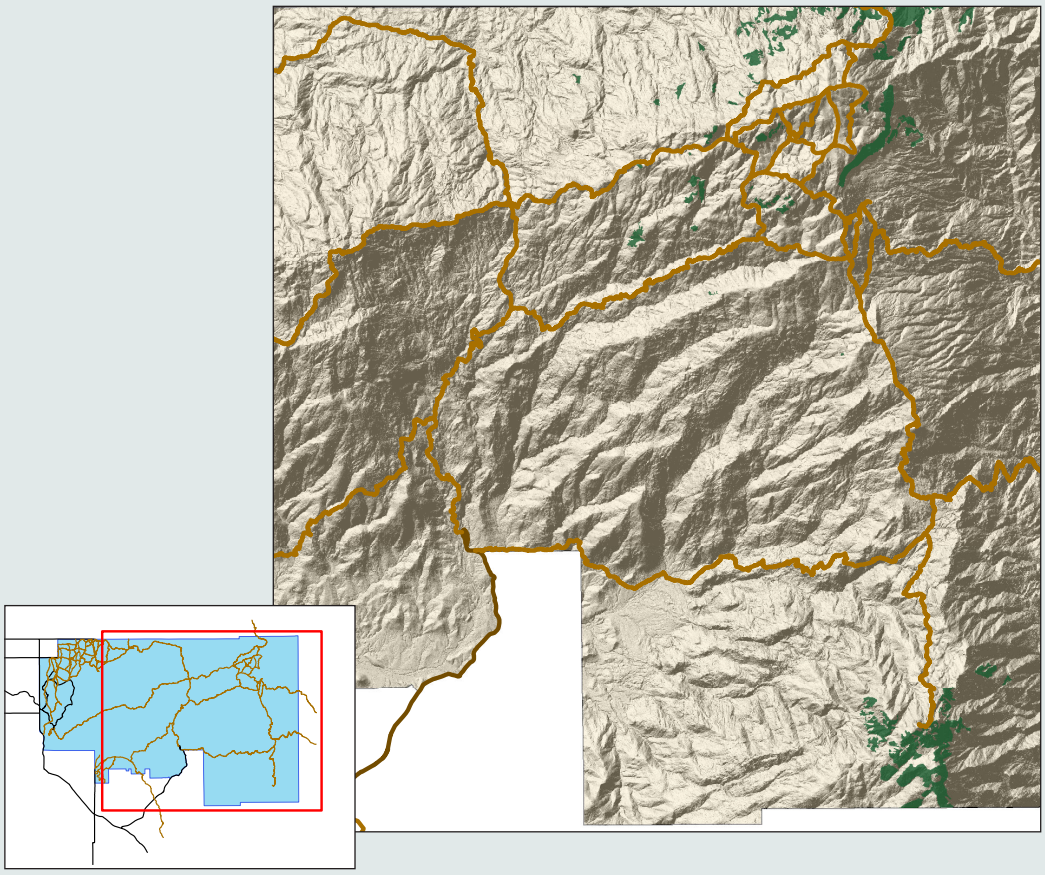
- *Quercus chrysolepis*
- *Quercus rugosa*
- *Holodiscus dumosa*

This shrubland community is characterized by a variably dense (20–40% cover) 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 (*Q. chrysolepis*) typically contributing the highest cover. In general, these species are present as shrubs or stunted trees 1–2 meters tall, 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*).

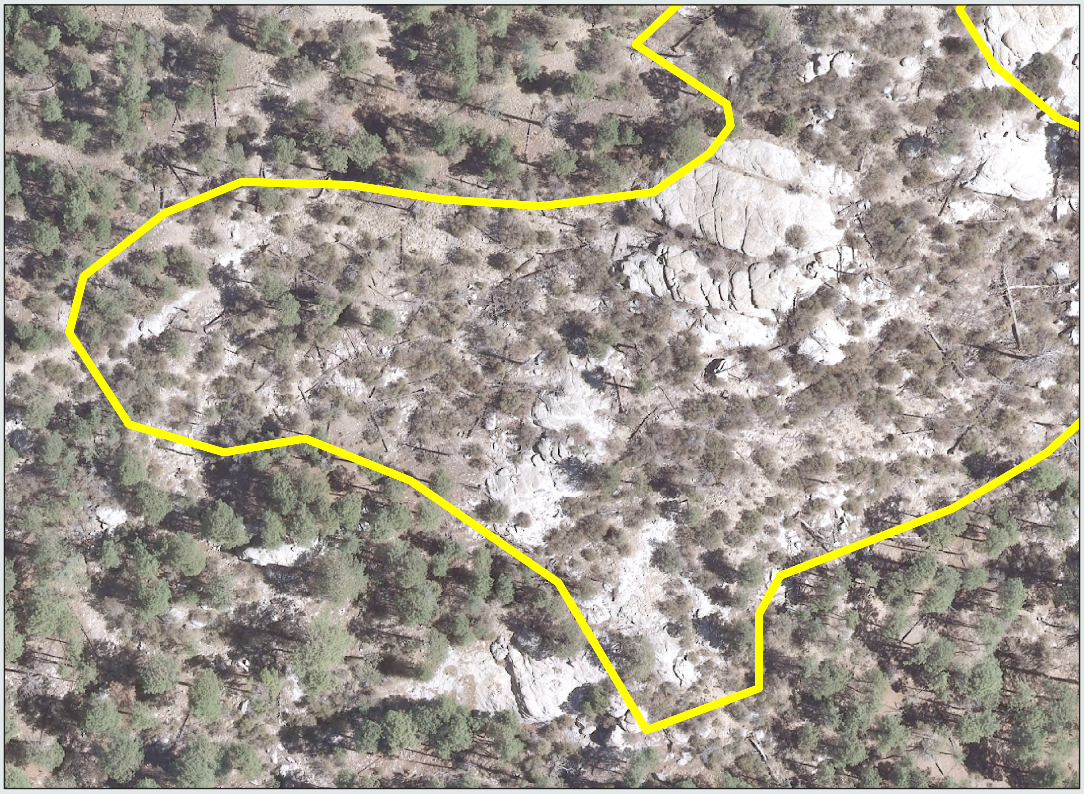
This community is contained within a two-association map class that covers 1.18% (322 ha/795 ac) of the Rincon Mountain District. This shrubland is typically found on mountain backslopes and shoulders of variable grade (10–50+%) above 2,600 meters (8,200 ft). The surface cover is characterized by the 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.



Example of [*Quercus chrysolepis - Quercus rugosa - Holodiscus dumosa*] Shrubland.



Distribution of [*Quercus chrysolepis - Quercus rugosa - Holodiscus dumosa*] Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

56. [*Quercus hypoleucoides - Quercus arizonica*] / *Arctostaphylos* (*pringlei - pungens*) Woodland Association (P)

[Silverleaf oak - Arizona white oak] / Manzanita (Pringle's - pointleaf) Woodland Association (P)

Common species

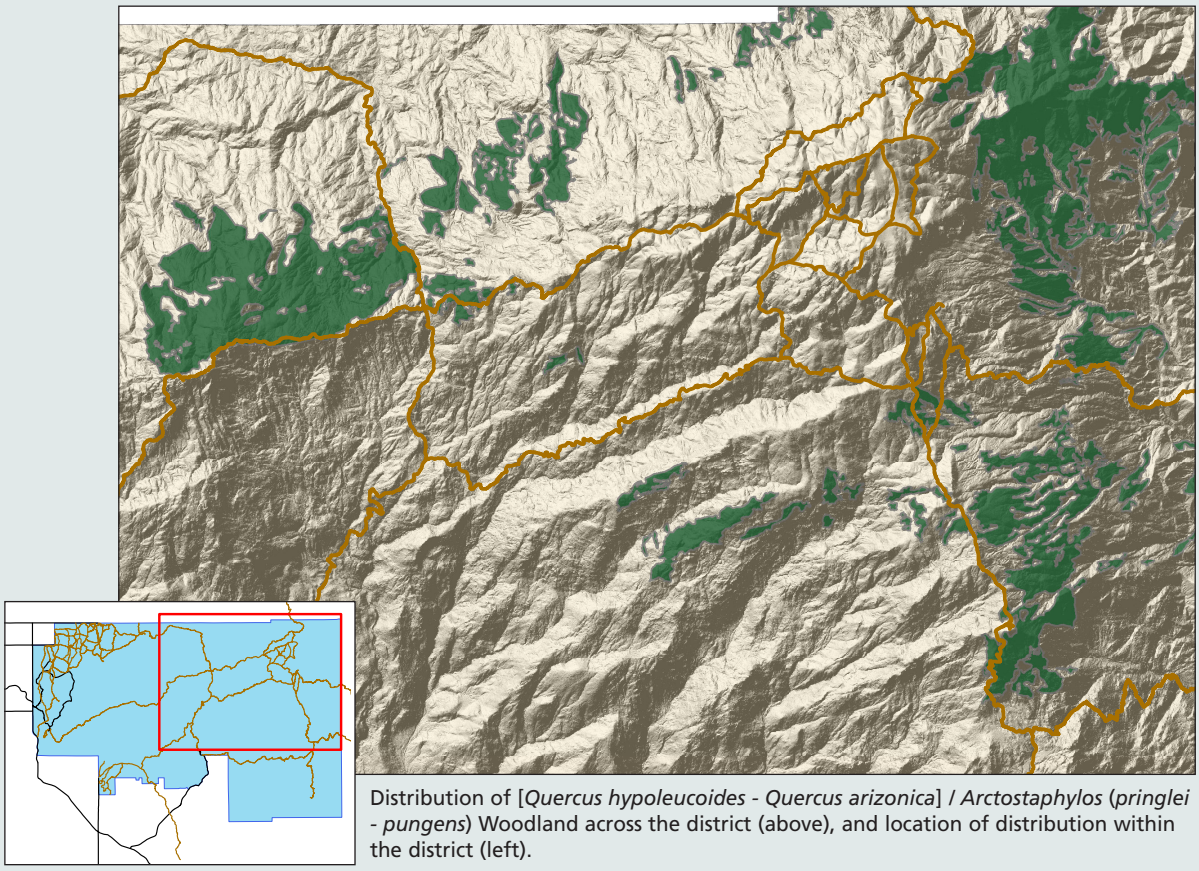
- *Quercus hypoleucoides*
- *Quercus arizonica*
- *Arctostaphylos pungens*
- *Arctostaphylos pringlei*

This woodland is characterized by a variably dense (20–40% cover) canopy stratum (2–5 m) dominated by silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), with a similarly dense (20–40% cover) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*) and/or pointleaf manzanita (*Arctostaphylos pungens*). Within the canopy strata, silverleaf oak (*Q. hypoleucoides*) and Arizona white oak (*Q. 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. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) are sparse (1%) associates. Pringle's manzanita (*A. pringlei*) and pointleaf manzanita (*A. pungens*) provide around 20% cover throughout the community, with some areas reaching up to 40%. Composition and dominance of these species aligns with a distinct elevational gradient. Other documented species include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), Fendler's ceanothus (*Ceanothus fendleri*), longtongue muhly (*Muhlenbergia longiligula*), and bullgrass (*Muhlenbergia emersleyi*).

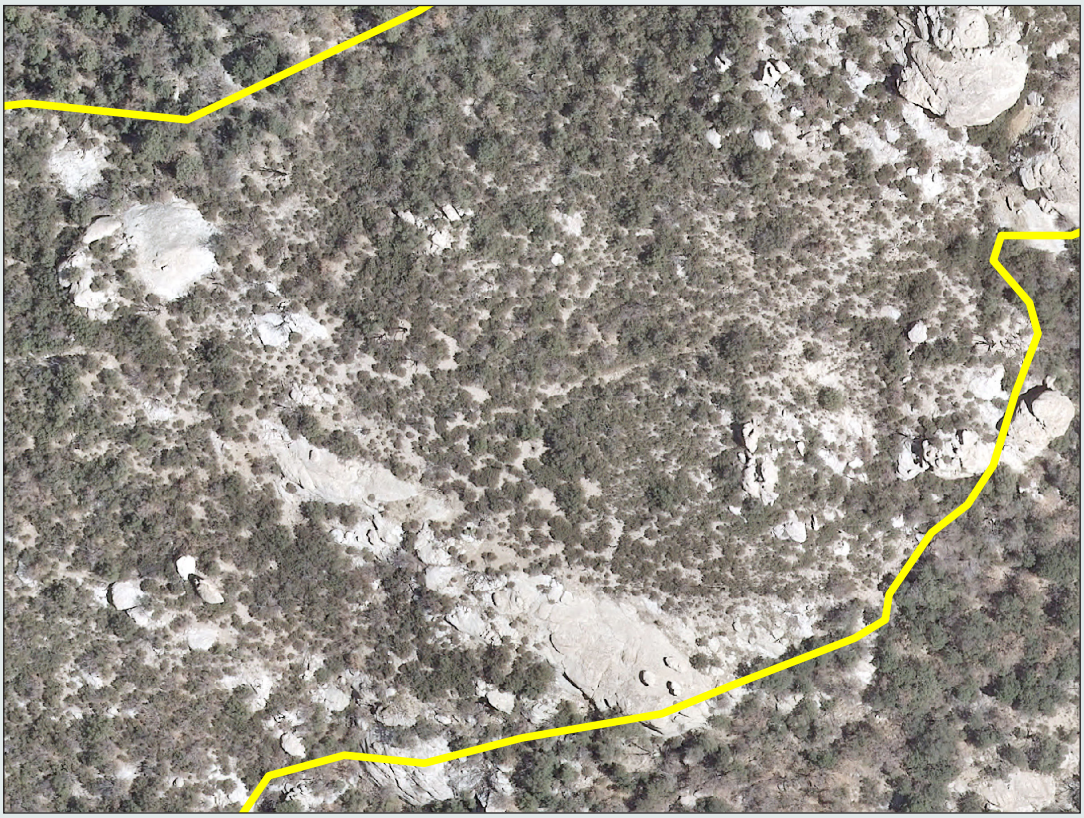
This community is contained within a four-association map class that covers 5% (1,474 ha/3,642 ac) of the Rincon Mountain District and is widespread throughout the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire. It 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.



Example of [*Quercus hypoleucoides - Quercus arizonica*] / *Arctostaphylos* (*pringlei - pungens*) Woodland.



Distribution of [*Quercus hypoleucoides - Quercus arizonica*] / *Arctostaphylos* (*pringlei - pungens*) Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

57. [*Quercus hypoleucoides - Quercus arizonica*] Shrubland Association (P)

[Silverleaf oak - Arizona white oak] Shrubland Association (P)

Common species

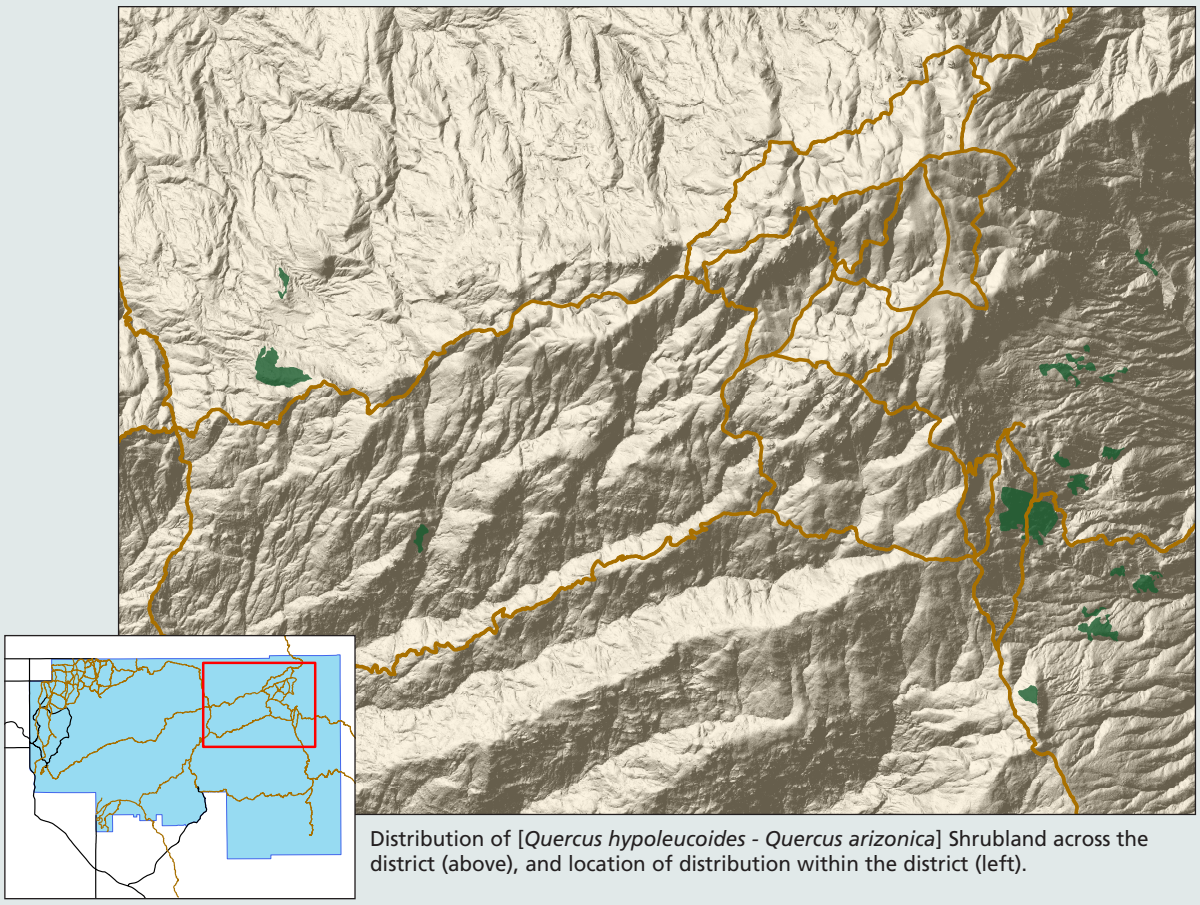
- *Quercus hypoleucoides*
- *Quercus arizonica*

This shrubland community is characterized by a variably dense (25–50% cover) 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 (<5%) 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* spp.) and/or junipers (*Juniperus* spp.). Numerous large snags were documented throughout. The understory contains a mix of Arizona madrone (*Arbutus arizonica*), Pringle's manzanita (*Arctostaphylos pringlei*), Fendler's ceanothus (*Ceanothus fendleri*), pointleaf manzanita (*Arctostaphylos pungens*), Wright's silktassel (*Garrya wrightii*), and longtongue muhly (*Muhlenbergia longiligula*).

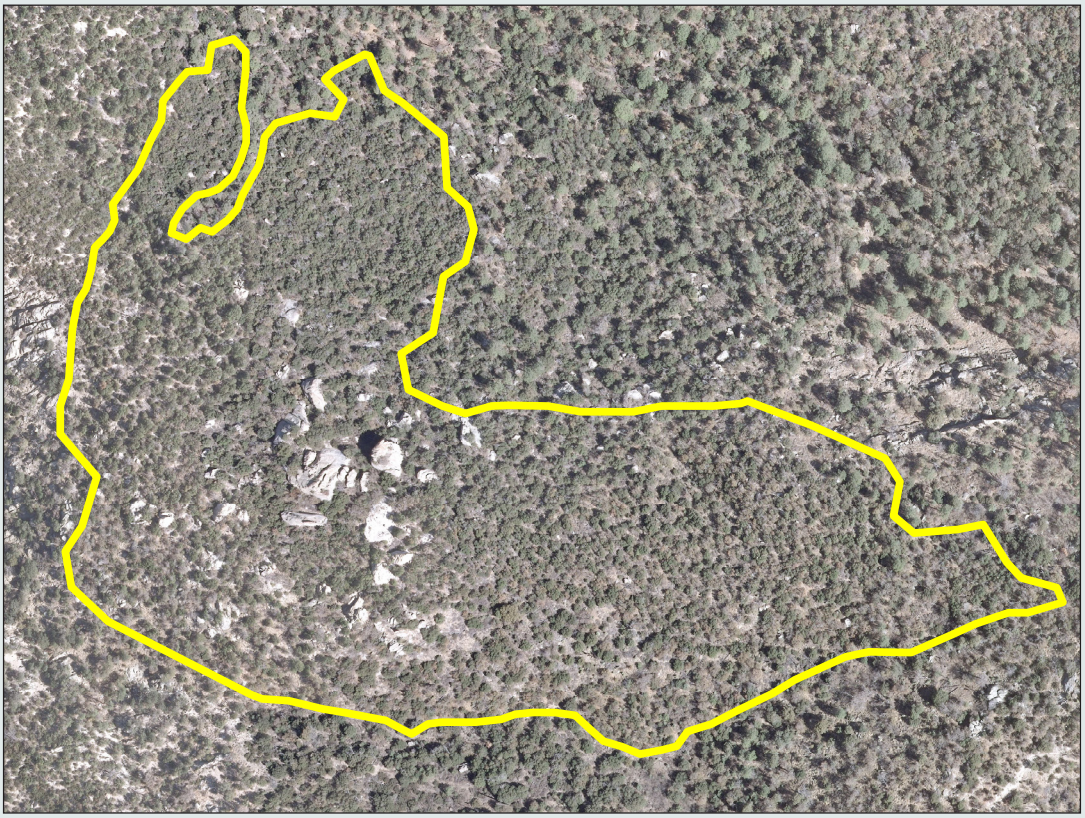
This community covers 0.14% (37 ha/91 ac) of the Rincon Mountain District, often in areas of historic fire disturbance. This shrubland community is typically found on mountain backslopes of variable grade (10–50+%), with an east-trending aspect from 1,860 to 2,160 meters (6,102–7,086 ft). The surface 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.



Example of [*Quercus hypoleucoides - Quercus arizonica*] Shrubland.



Distribution of [*Quercus hypoleucoides - Quercus arizonica*] Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

58. [*Quercus hypoleucoides - Quercus rugosa*] / *Arctostaphylos pringlei* Woodland Association (P)

[Silverleaf oak - Netleaf oak] / Pringle's manzanita Woodland Association (P)

Common species

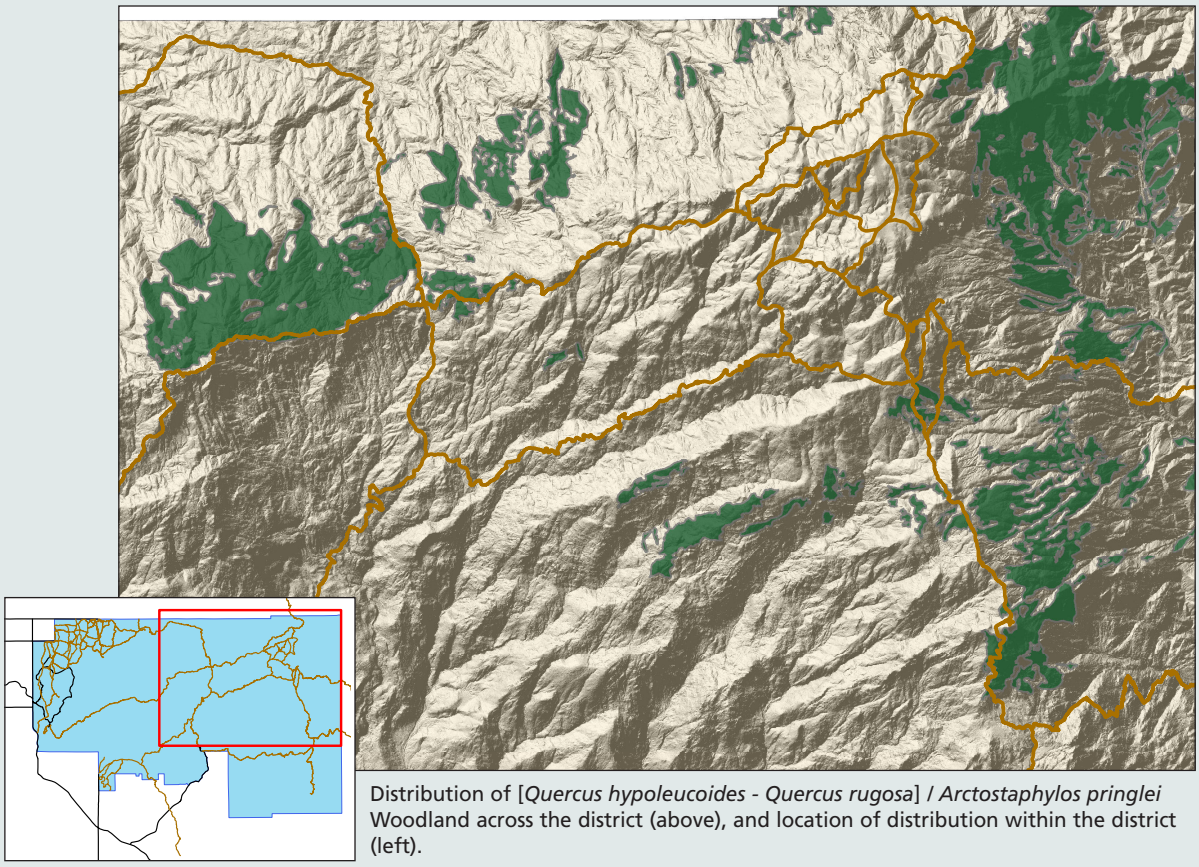
- *Quercus hypoleucoides*
- *Quercus rugosa*
- *Arctostaphylos pringlei*
- *Arctostaphylos pungens*

This woodland is characterized by a variably dense (20–40% cover) canopy stratum (2–5 m) dominated by silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*) with a similarly dense (20–40% cover) subcanopy (0.5–2 m) dominated by Pringle's manzanita (*Arctostaphylos pringlei*). The oaks 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. Alligator juniper (*Juniperus deppeana*) and border pinyon (*Pinus discolor*) are sparse (1% cover) associates. Pringle's manzanita (*A. pringlei*) provides around 20% cover throughout the community, with some areas reaching up to 40%. Other documented species include Wright's silktassel (*Garrya wrightii*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), Fendler's ceanothus (*Ceanothus fendleri*), 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*).

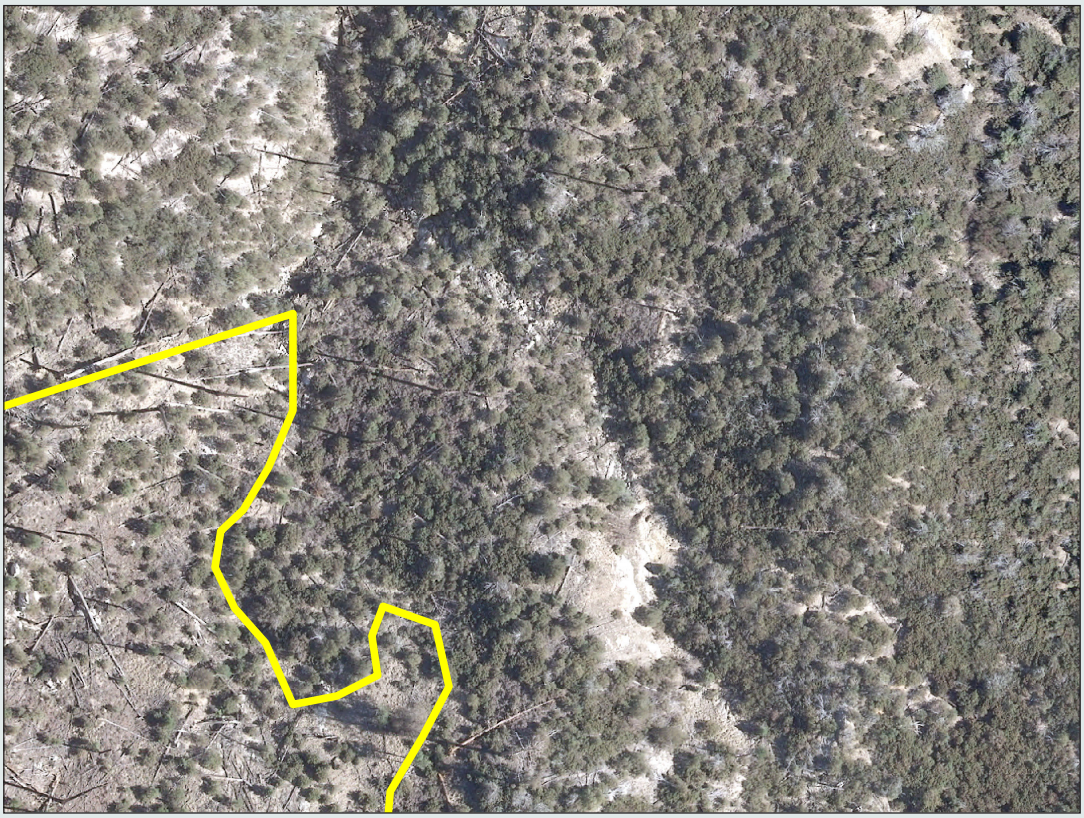
This community is contained within a four-association map class that covers 5% (1,474 ha/3,642 ac) of the Rincon Mountain District and is restricted to the high slopes of Tanque Verde and Heartbreak ridges, often within the boundaries of historic fire events, specifically the 1989 Chiva Fire. It is primarily 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.



Example of [*Quercus hypoleucoides - Quercus rugosa*] / *Arctostaphylos pringlei* Woodland.



Distribution of [*Quercus hypoleucoides - Quercus rugosa*] / *Arctostaphylos pringlei* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

59. [*Quercus hypoleucoides - Quercus rugosa*] Shrubland Association (P)

[Silverleaf oak - Netleaf oak] Shrubland Association (P)

Common species

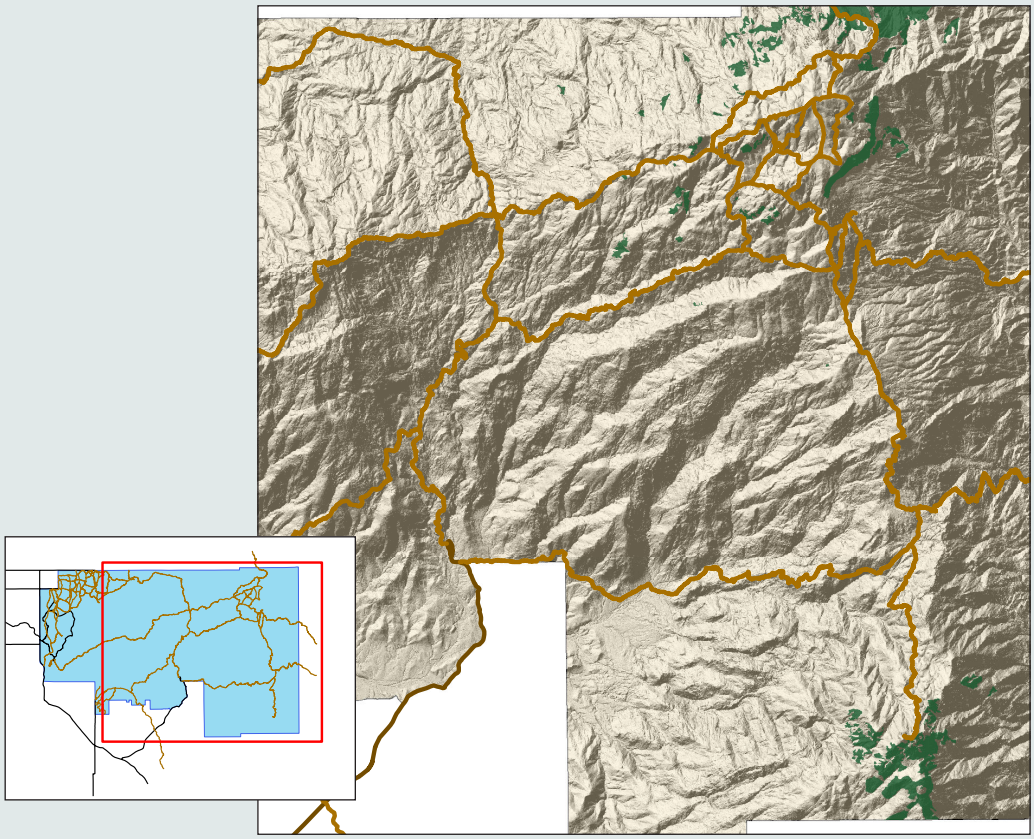
- *Quercus hypoleucoides*
- *Quercus rugosa*

This shrubland community is characterized by a variably dense (25–50% cover) 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 (<5% cover) 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* spp.) and/or junipers (*Juniperus* spp.). Numerous large snags, and occasional mature conifers, were documented throughout. The understory contains Arizona madrone (*Arbutus arizonica*), Pringle's manzanita (*Arctostaphylos pringlei*), Fendler's ceanothus (*Ceanothus fendleri*), Wrights silktassel (*Garrya wrightii*), and longtongue muhly (*Muhlenbergia longiligula*).

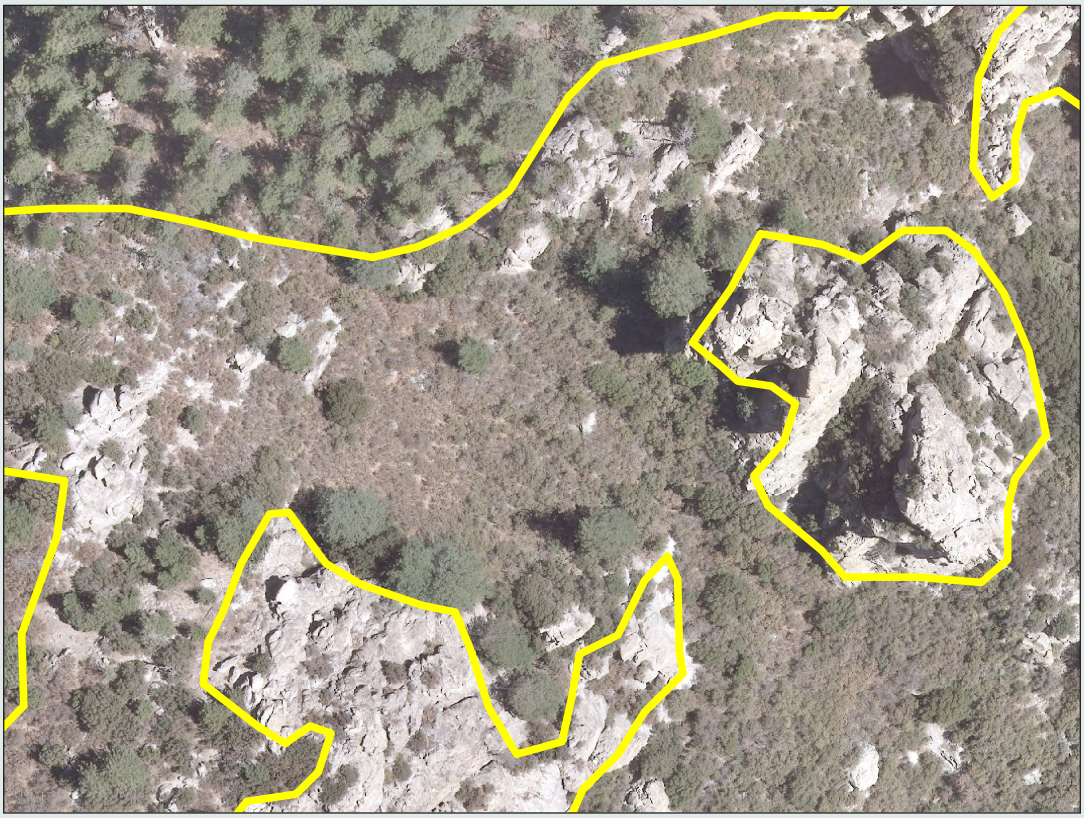
This community is contained within a two-association map class that covers 1.2% (322 ha/795 ac) of the Rincon Mountain District, typically in areas of historic fire disturbance. In these areas, this shrubland spans mountain backslopes of variable grade (10–50+%), often with an east-trending aspect above 1,645 meters (5,400 ft). 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. The largest examples of this community are found on the southern slopes of Rincon Peak and on the north slope of Mica Mountain.



Example of [*Quercus hypoleucoides - Quercus rugosa*] Shrubland.



Distribution of [*Quercus hypoleucoides - Quercus rugosa*] Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

60. *Mimosa aculeaticarpa* Shrubland Association (P)

Catclaw mimosa Shrubland Association (P)

Common species

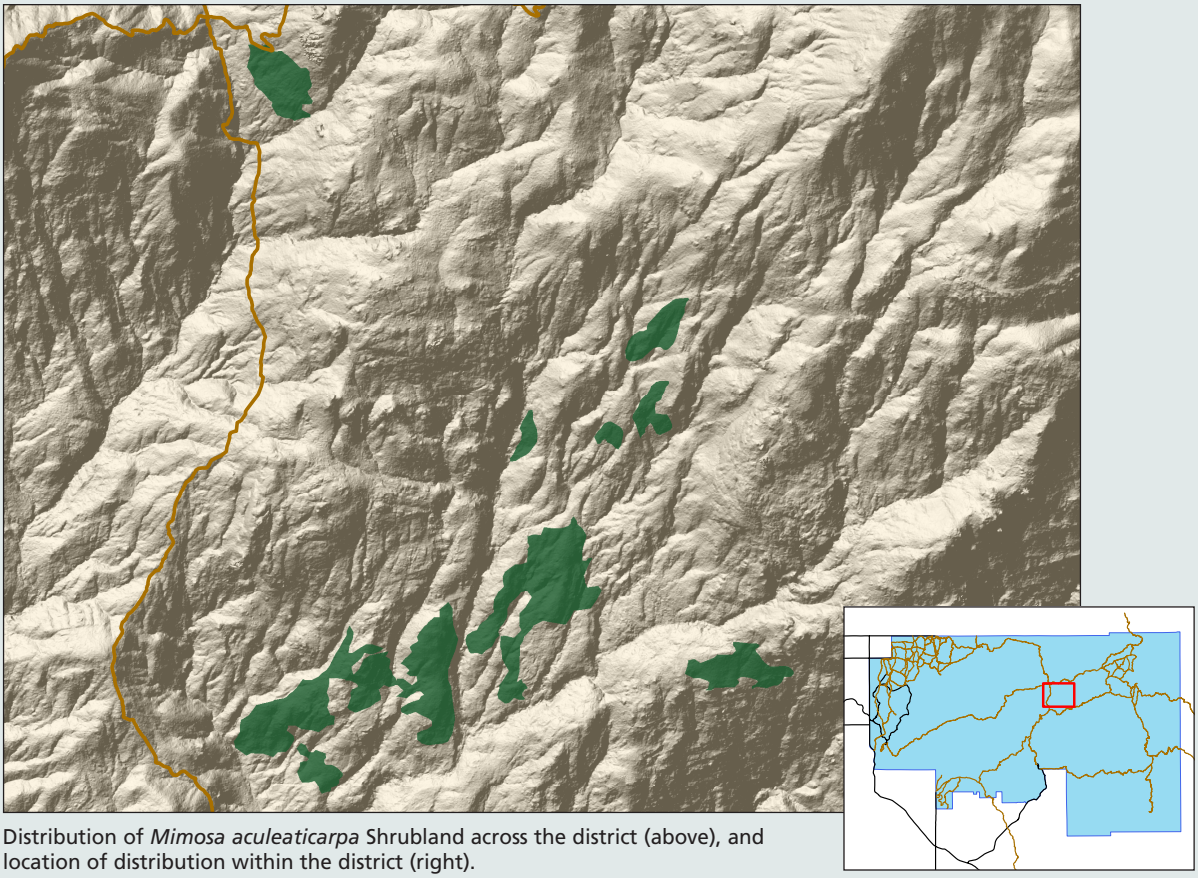
- *Mimosa aculeaticarpa*

This shrubland community is characterized by a dense subcanopy stratum (0.5–2 m) solely dominated by a thicket of catclaw mimosa (*Mimosa aculeaticarpa*). This species provides the vast majority of cover, up to 40%. Individual catclaw mimosa shrubs range in size from 1 to 3 meters tall. Other documented subcanopy species include pointleaf manzanita (*Arctostaphylos pungens*), yucca (*Yucca madrensis*), cactus apple (*Opuntia engelmannii*), and beargrass (*Nolina microcarpa*). Historic fire disturbance was noted in all examples of this community, with numerous snags present as a result. Based on these snags, the pre-fire community was likely dominated by border pinyon (*Pinus discolor*), Arizona white oak (*Quercus arizonica*), and alligator juniper (*Juniperus deppeana*). The canopy stratum is extremely sparse, with remnant trees providing a few percent cover (<5%). The field stratum is also sparse and typically composed of a low-cover (<10%) mix of perennial forbs, grasses, and succulents. Documented species in this layer include tarragon (*Artemisia dracunculus*), single threeawn (*Aristida schiedeana*), Schott's century plant (*Agave schottii*), and Lehmann lovegrass (*Eragrostis lehmanniana*).

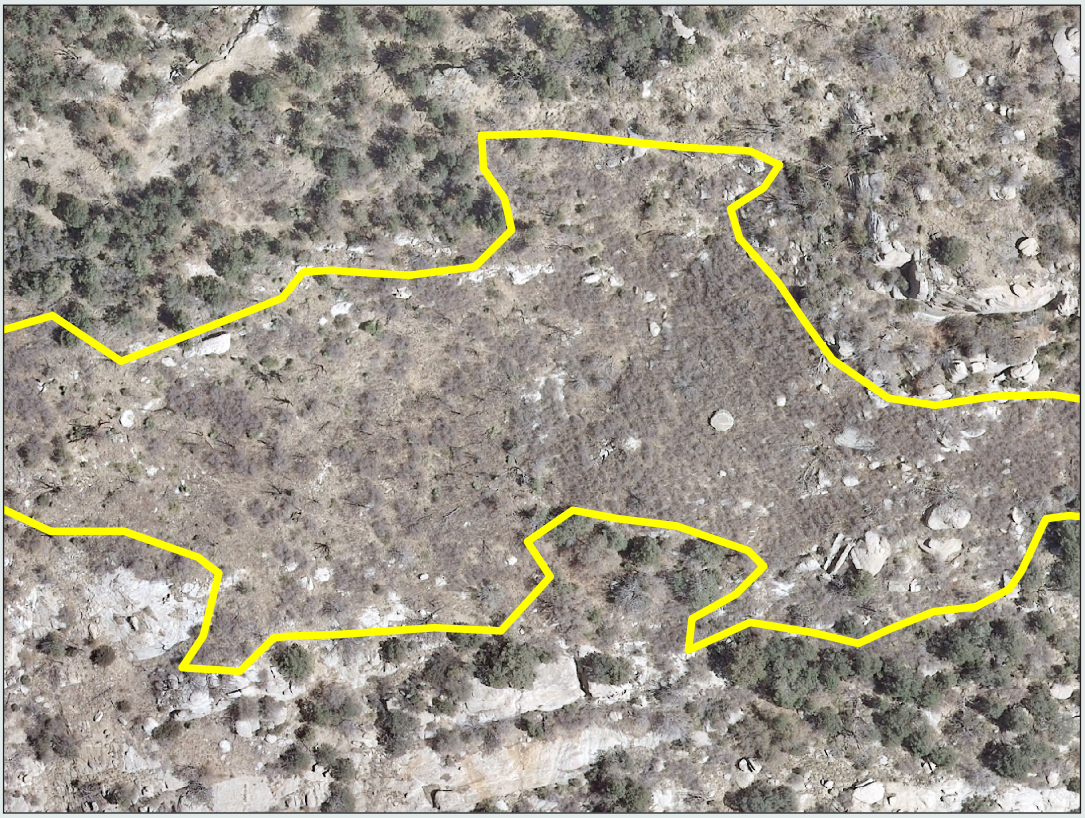
This community covers 0.05% (14 ha/35 ac) of the Rincon Mountain District and was documented as small inclusions within greater oak savannas and pinyon-juniper woodlands, as well as in larger patches on the slopes above Grass Shack Campground. It typically occurs on south-trending and low-grade (<30%) mountain backslopes, shoulders, and summits 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 littler with patches of exposed bedrock slabs. The bedrock and rock are typically composed of gneissic quartz monzonite.



Example of *Mimosa aculeaticarpa* Shrubland.



Distribution of *Mimosa aculeaticarpa* Shrubland across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

61. [*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna Association (P)

[Mexican blue oak - Velvet mesquite - California rosewood] / Mixed Perennial Grass - Schott's century plant Wooded Shrub Savanna Association (P)

Common species

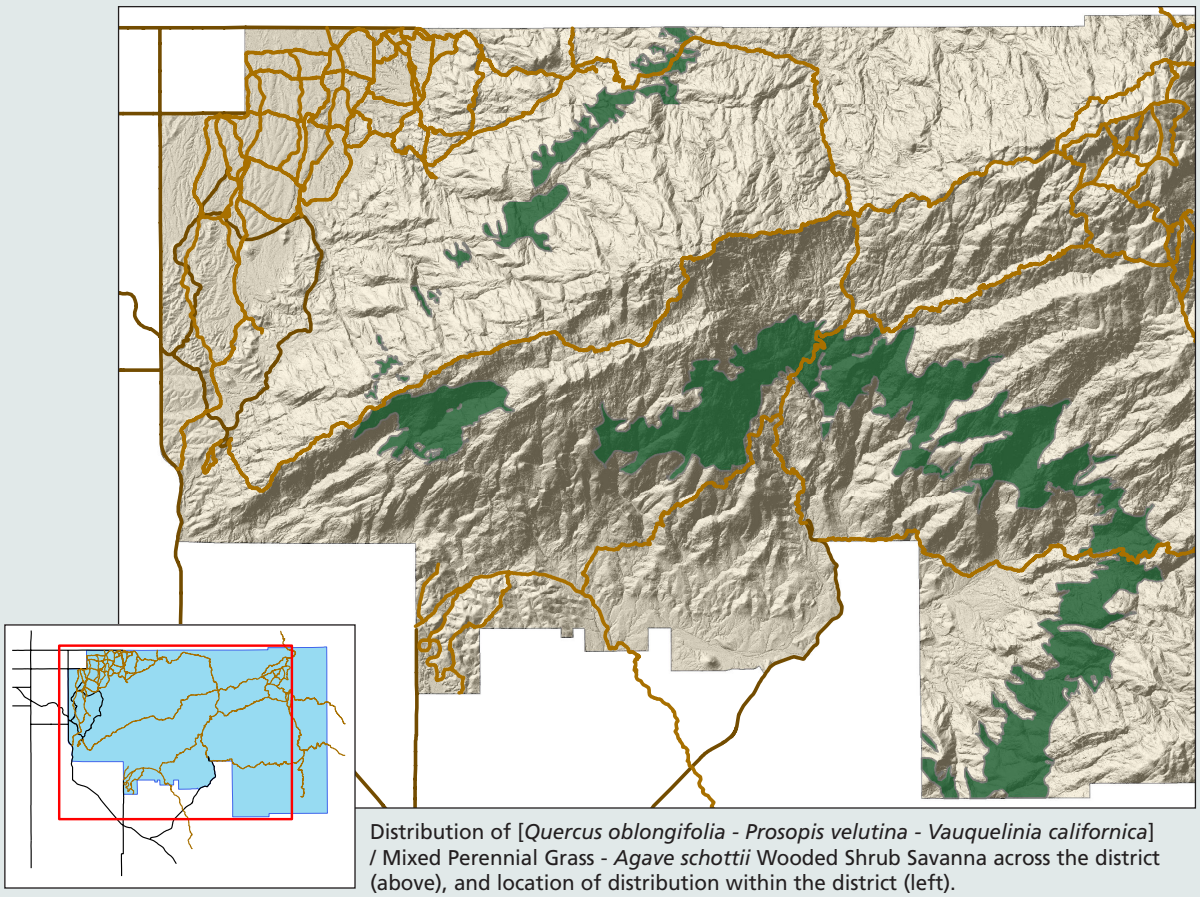
- *Quercus oblongifolia*
- *Prosopis velutina*
- *Vauquelinia californica*
- *Agave schottii*
- *Bouteloua curtipendula*

This community is characterized by a sparse (5–10 [15]% cover) lower-canopy stratum (2–5 m) dominated by California rosewood (*Vauquelinia californica*), Mexican blue oak (*Quercus oblongifolia*), and velvet mesquite (*Prosopis velutina*), a subcanopy (0.5–2 m) of mixed shrubs and succulents (5–20% cover), and a variable (5–40% cover) field stratum (<0.5 m) dominated by perennial grasses and Schott's century plant (*Agave schottii*). Mexican blue oak (*Q. oblongifolia*), velvet mesquite (*P. velutina*), and California rosewood (*V. californica*) are consistently present (0.70, 0.85, 0.75) as co-dominants or with any of them becoming the sole dominant. Sideoats grama (*Bouteloua curtipendula*) and bullgrass (*Muhlenbergia emersleyi*) are by far the most consistent (1.0) native grasses, with variable of cover less than 5% each. Other documented species include beargrass (*Nolina microcarpa*), turpentine bush (*Ericameria laricifolia*), cactus apple (*Opuntia engelmannii*), Staghorn cholla (*Cylindropuntia versicolor*), common sotol (*Dasylirion wheeleri*), Thurber's cotton (*Gossypium thurberi*), and pointleaf manzanita (*Arctostaphylos pungens*).

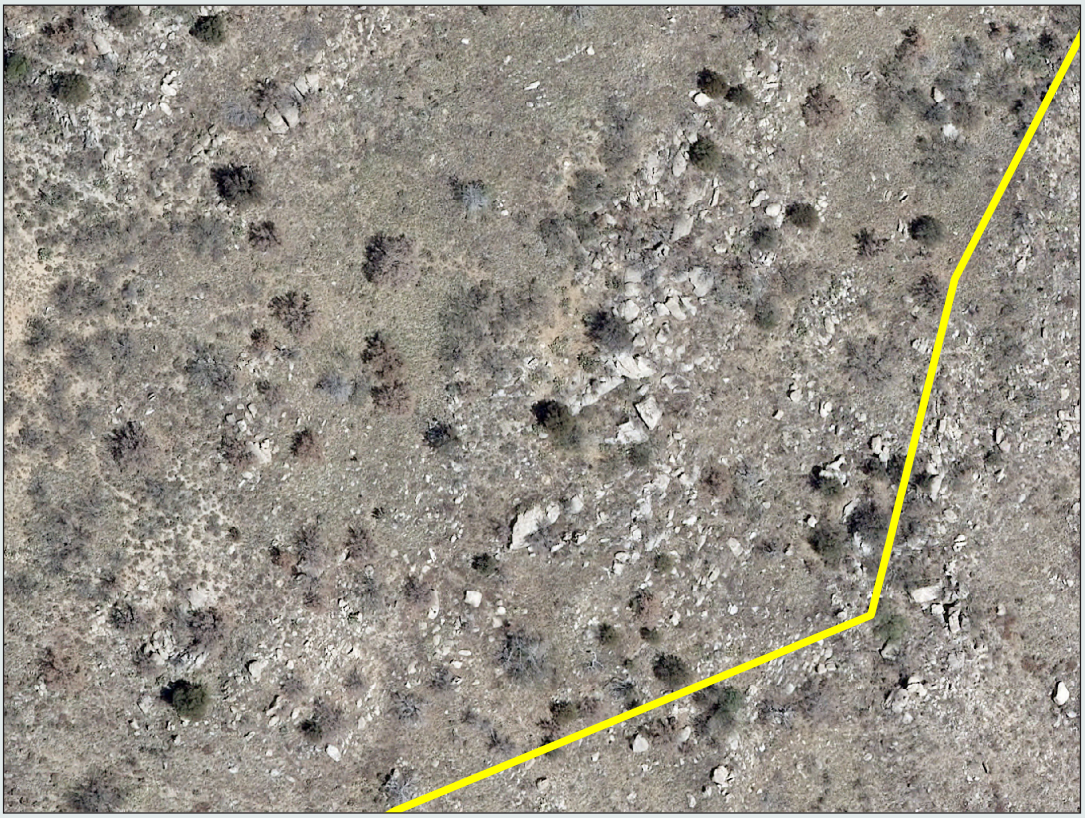
This community is contained within a two-association map class that covers 8.7% (2,361 ha/5,834 ac) of the Rincon Mountain District and is widespread throughout mid-elevation regions of the park, mainly on the southern side of the range. It is typically found on backslopes of varying grade (15–60%) from 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.



Example of [*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna.



Distribution of [*Quercus oblongifolia - Prosopis velutina - Vauquelinia californica*] / Mixed Perennial Grass - *Agave schottii* Wooded Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

62. *Quercus emoryi* / *Arctostaphylos pungens* / *Muhlenbergia emersleyi* Wooded Shrub Savanna Association (P)

Emory oak / Pointleaf manzanita / Bullgrass Semi-Desert Wooded Shrub Savanna Association (P)

Common species

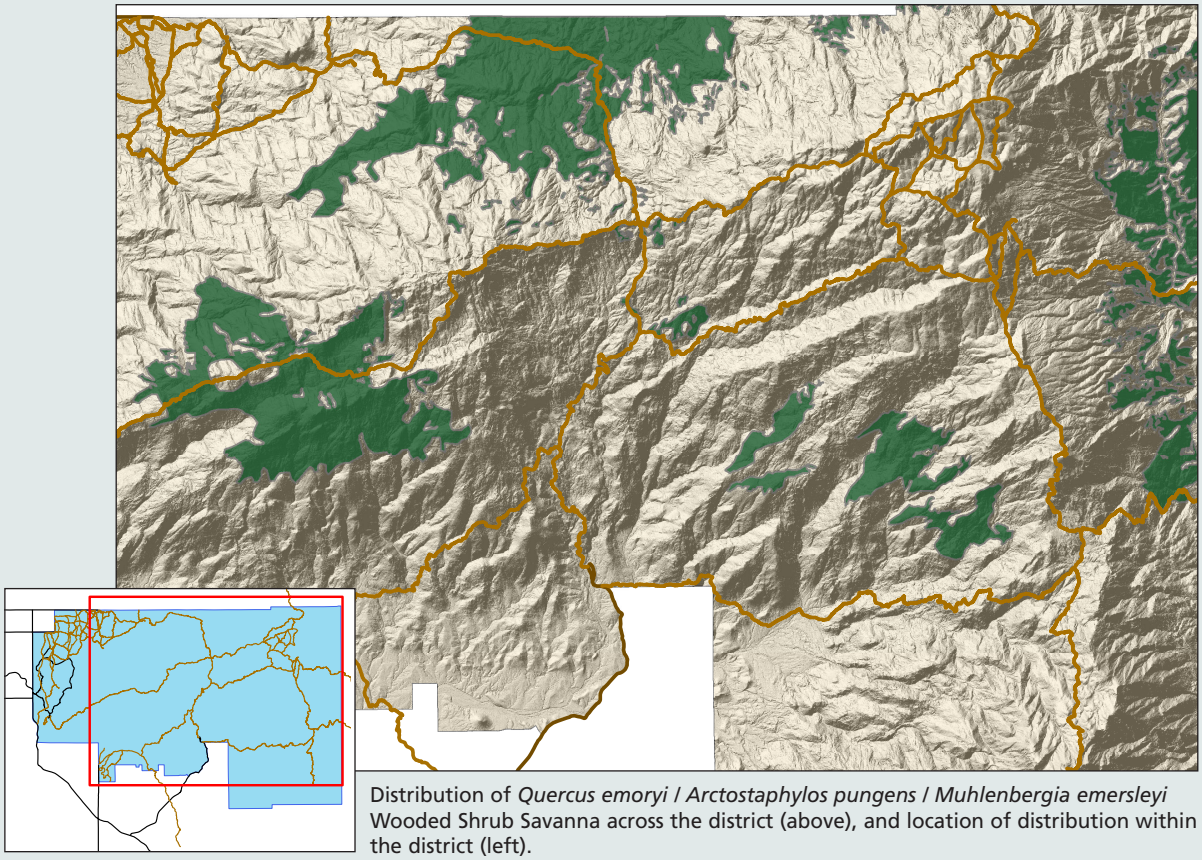
- *Quercus emoryi*
- *Arctostaphylos pungens*
- *Muhlenbergia emersleyi*
- *Nolina microcarpa*
- *Agave schottii*

This community is characterized by a sparse (<10% cover) canopy stratum (2–5 m) dominated by Emory oak (*Quercus emoryi*), a variable (5–20% cover) subcanopy stratum (0.5–2 m) dominated by pointleaf manzanita (*Arctostaphylos pungens*), and a highly variable (5–30% cover) 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 (*Q. emoryi*) is present as short (3 m), shrub-like trees to tall (5 m), single-stem trees with consistent (1.0) cover of typically less than 10%. The subcanopy is characterized by the consistent presence (1.0) and typical dominance of pointleaf manzanita (*A. pungens*) with a number of occasionally dominant and/or co-dominant associate shrubs and succulents, including beargrass (*Nolina microcarpa*), catclaw mimosa (*Mimosa aculeaticarpa*), and common sotol (*Dasylirion wheeleri*). The field stratum is characterized by a diverse mix of native perennial grasses, most commonly dominated by bullgrass (*M. emersleyi*) with the low succulent Schott's century plant (*Agave schottii*).

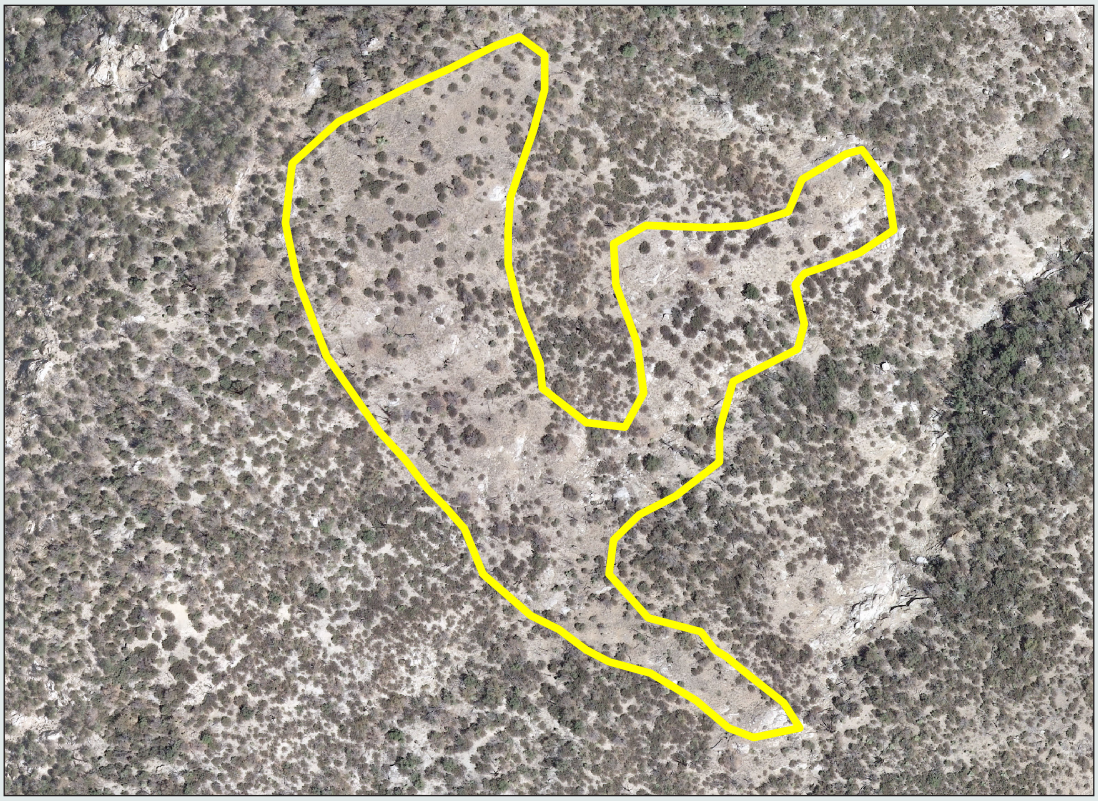
This community is contained within a two-association map class that covers 11% (2,962 ha/7,319 ac) of the Rincon Mountain District, with main examples occurring along the northern slopes of Tanque Verde Ridge and along the eastern boundary of the park. This wooded shrub savanna is primarily present on 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 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.



Example of *Quercus emoryi* / *Arctostaphylos pungens* / *Muhlenbergia emersleyi* Wooded Shrub Savanna.



Distribution of *Quercus emoryi* / *Arctostaphylos pungens* / *Muhlenbergia emersleyi* Wooded Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

63. *Quercus emoryi* / *Nolina microcarpa* / *Muhlenbergia emersleyi* Wooded Shrub Savanna Association (P)

Emory oak / Beargrass / Bullgrass Wooded Shrub Savanna Association (P)

Common species

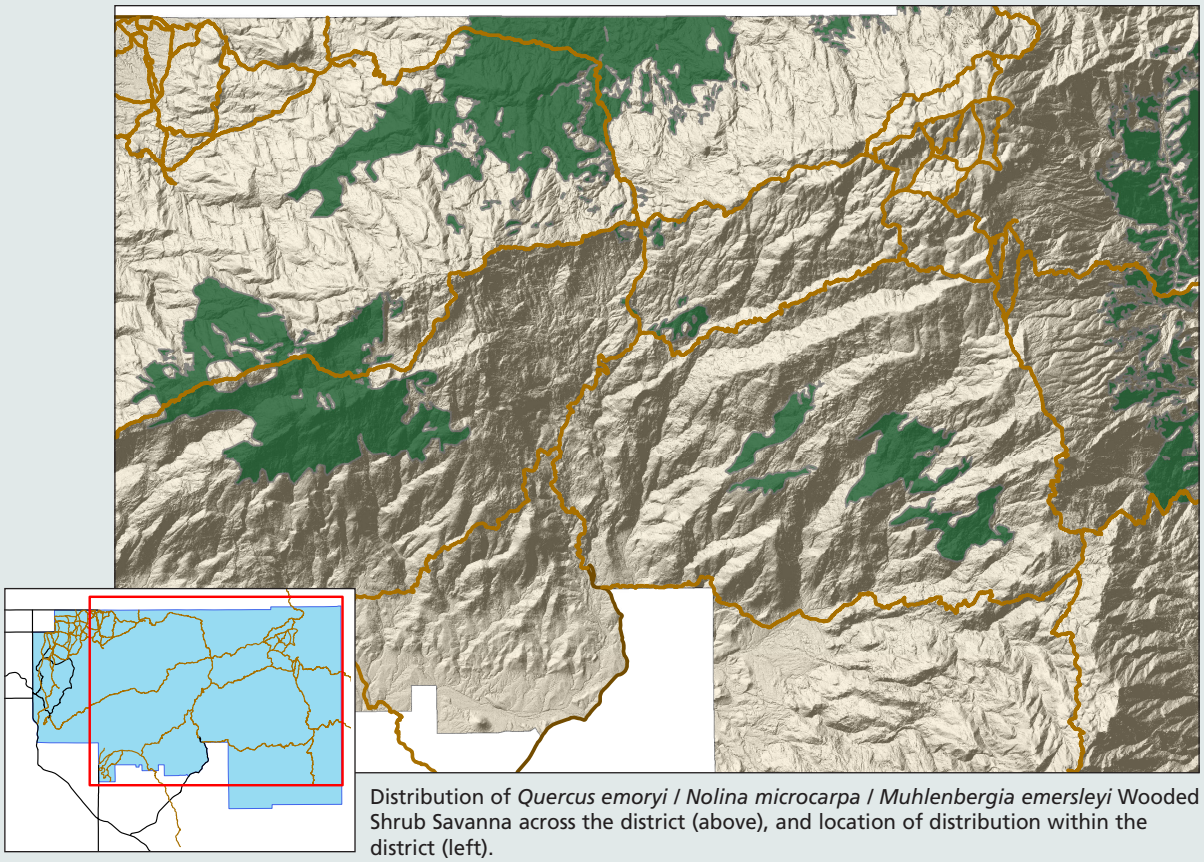
- *Quercus emoryi*
- *Nolina microcarpa*
- *Muhlenbergia emersleyi*
- *Agave schottii*

This wooded shrub savanna is characterized by a moderately sparse (<15% cover) canopy stratum (2–5 m) dominated by Emory oak (*Quercus emoryi*), a variable (10–20% cover) subcanopy stratum (0.5–2 m) dominated by beargrass (*Nolina microcarpa*), and a highly variable (5–40% cover) field stratum (<0.5 m) dominated by bullgrass (*Muhlenbergia emersleyi*). Mexican blue oak (*Quercus oblongifolia*) is a patchy (0.66) and transitional component of this community most commonly present at its lower elevational reaches. Alligator juniper (*Juniperus deppeana*) is an occasional (0.66), low-cover associate (1% cover) distributed throughout the community. The subcanopy is characterized by the consistent dominance (1.0) of beargrass (*N. microcarpa*) with a diverse mix of occasionally dominant and/or co-dominant associate shrubs and succulents, including common sotol (*Dasylirion wheeleri*), turpentine bush (*Ericameria laricifolia*), Wright's silktassel (*Garrya wrightii*), fragrant sumac (*Rhus aromatica*), gumhead (*Gymnosperma glutinosum*), and redberry buckthorn (*Rhamnus crocea*). The field stratum is characterized by a diverse mix of perennial grasses, succulents, and subshrubs most commonly dominated by very consistent (1.0) bullgrass (*M. emersleyi*).

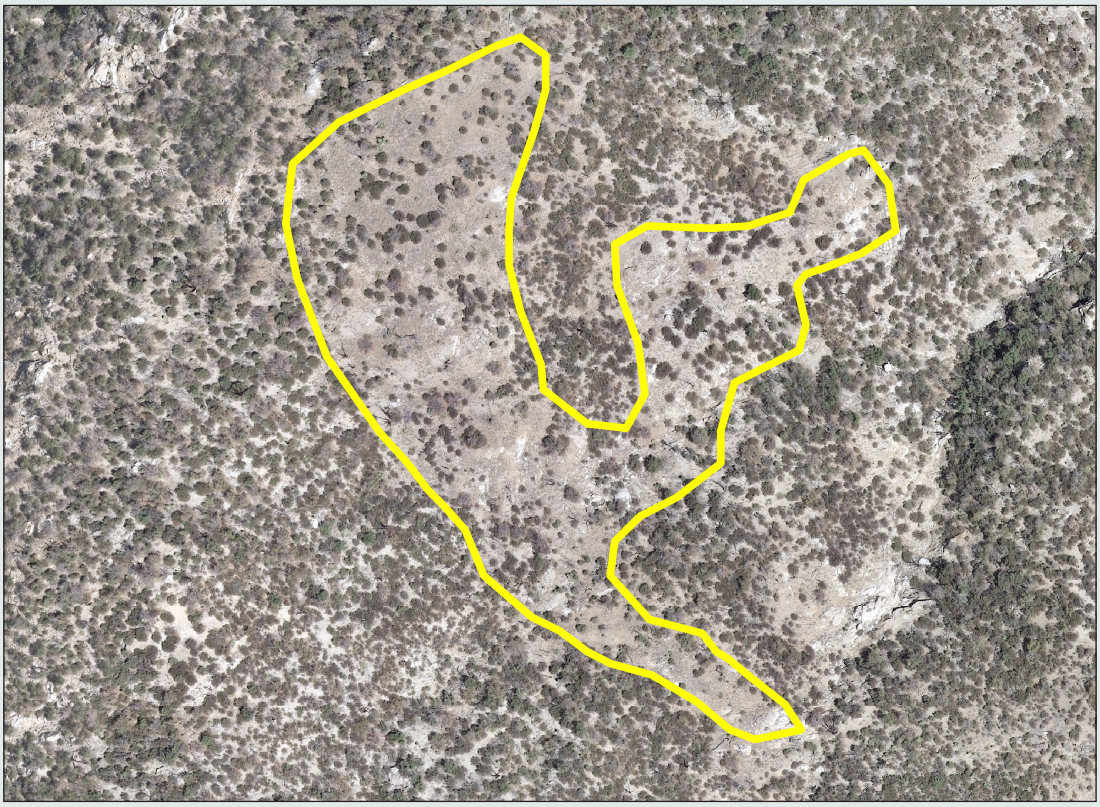
This community is contained within a two-association map class that covers 11% (2,962 ha/7,319 ac) of the Rincon Mountain District. This wooded shrub savanna is present on backslopes of varying grade (10–50+%) and aspect from an elevation of 1,320 to 1,640 meters (4,330–5,370 ft). The surface cover is 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.



Example of *Quercus emoryi* / *Nolina microcarpa* / *Muhlenbergia emersleyi* Wooded Shrub Savanna.



Distribution of *Quercus emoryi / Nolina microcarpa / Muhlenbergia emersleyi* Wooded Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

64. *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub Association

Mexican blue oak / Sideoats grama Scrub Association

Common name

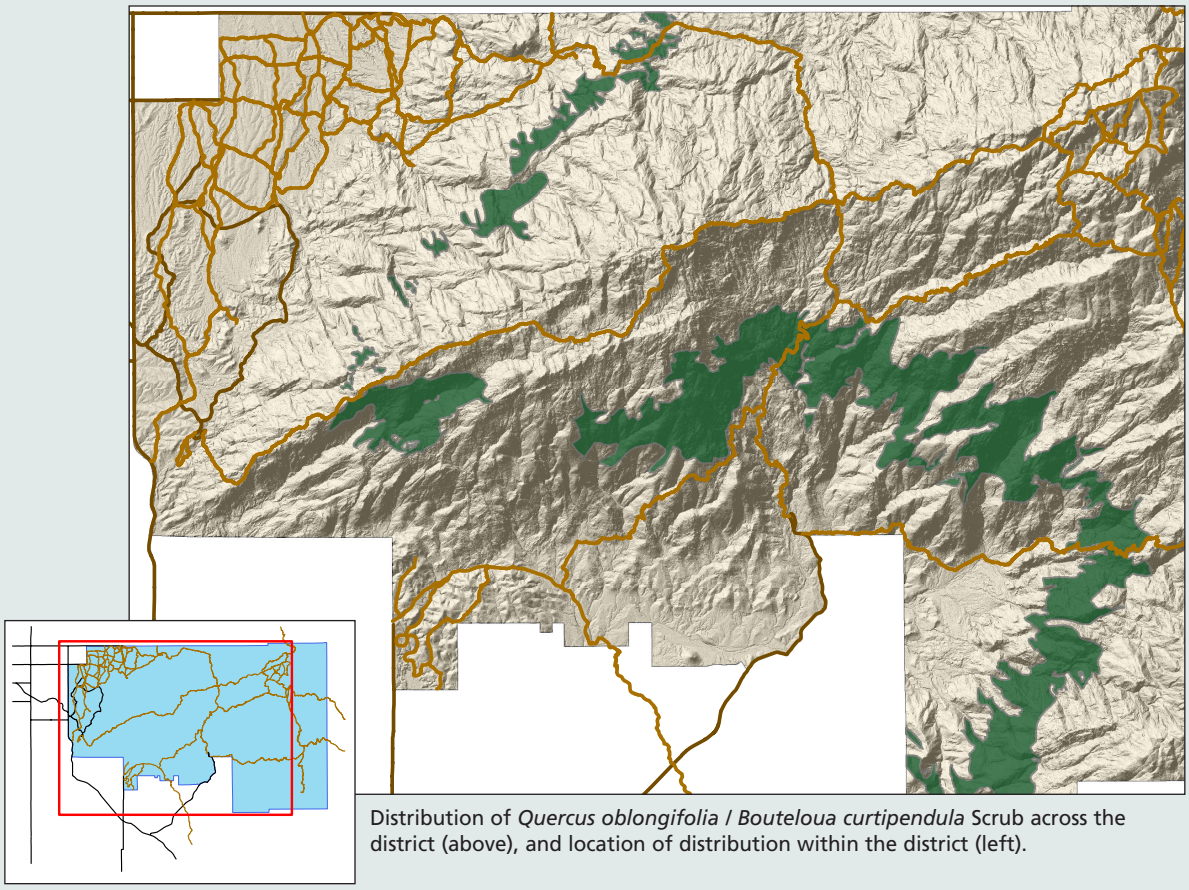
- *Quercus oblongifolia*
- *Nolina microcarpa*
- *Muhlenbergia emersleyi*
- *Bouteloua curtipendula*
- *Agave schottii*

This community is characterized by a moderately sparse (10–20% cover) canopy stratum (>2 m) dominated by Mexican blue oak (*Quercus oblongifolia*), a similarly open (5–20% cover) subcanopy (0.5–2 m) stratum dominated by beargrass (*Nolina microcarpa*) with a diverse mix of associates, and a variable (10–40% cover) field stratum (<0.5 m) dominated by a mix of perennial grasses. Mexican blue oak (*Q. oblongifolia*) is a consistent (1.0) dominant that typically presents as large (4–5 m), single-stem trees with cover of 10–20%. Emory oak (*Quercus emoryi*) is a patchy (0.66) associate most common at the higher elevational range of this community and/or where the aspect trends more to the north. The subcanopy is characterized by the consistent (1.0) presence, but variable dominance (0.67), of beargrass (*N. microcarpa*) with a diverse mix of associate shrubs and succulents. On average, beargrass (*N. microcarpa*) provides around 5% cover across the community, but local values can be highly variable, ranging from 1% up to 20%. Other noteworthy associates include pointleaf manzanita (*Arctostaphylos pungens*), Wright's silktassel (*Garrya wrightii*), common sotol (*Dasylirion wheeleri*), turpentine bush (*Ericameria laricifolia*), and cactus apple (*Opuntia engelmannii*). The field 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.

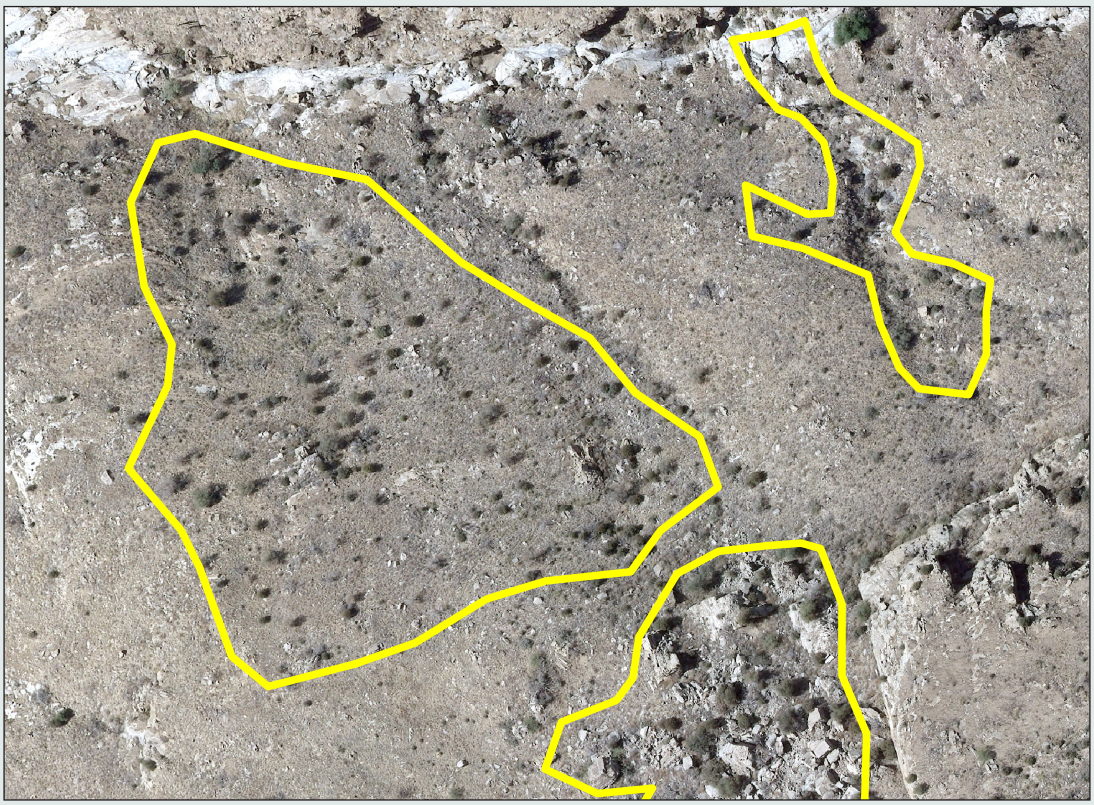
This community is contained within a two-association map class that covers 8.7% (2,360 ha/5,831 ac) of the Rincon Mountain District. This scrub is typically found on south to southwest-trending slopes of a generally steep grade (40%) from 1,400 to 1,800 meters (4,593–5,905 ft), but may be found on northern 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. Parent material is very diverse but is most commonly characterized by the presence of gneissic quartz monzonite.



Example of *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub.



Distribution of *Quercus oblongifolia* / *Bouteloua curtipendula* Scrub across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

65. *Quercus turbinella - Nolina microcarpa / Muhlenbergia emersleyi - Agave schottii* Shrub Savanna Association (P)

Sonoran scrub oak - Beargrass / Bullgrass - Schott's century plant Shrub Savanna Association (P)

Common species

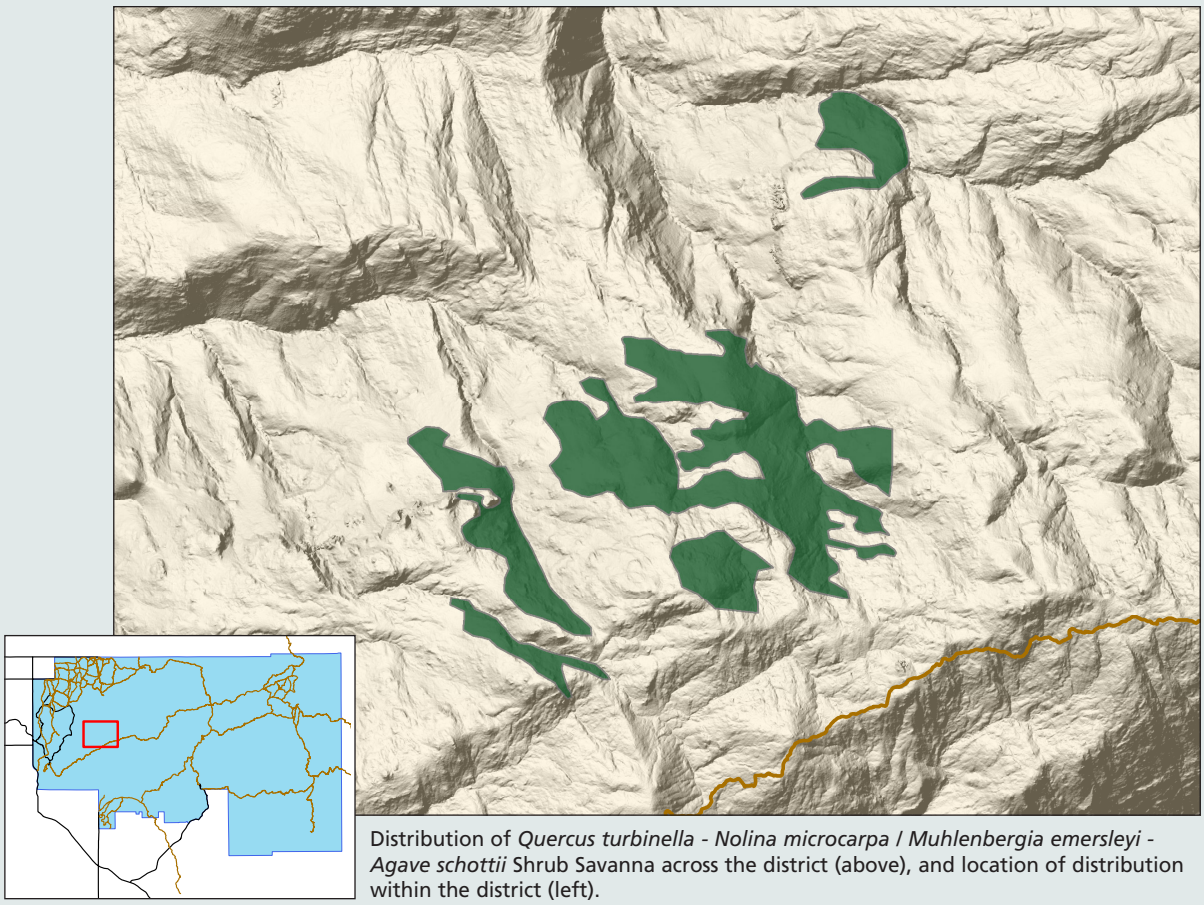
- *Quercus turbinella*
- *Nolina microcarpa*
- *Muhlenbergia emersleyi*
- *Agave schottii*

This shrub savanna 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% cover), with Emory oak (*Quercus emoryi*) and alligator juniper (*Juniperus deppeana*) providing the most conspicuous cover. Sonoran scrub oak (*Q. turbinella*) provides a consistent 5–15% cover across the community, with areas of high cover typically occurring on sheltered, north-facing slopes. This species is diagnostic of this community and should always be a dominant. Beargrass (*N. microcarpa*) is typically present as a subcanopy dominant, with cover of around 5%, but may reach up to 10% on more exposed slopes. When present, Wright's silktassel (*Garrya wrightii*) provides similar cover to the other dominants (5%), most often on the more sheltered, north-facing slopes. The field stratum is characterized by a highly variable (10–40%) mix of grasses and succulents dominated by bullgrass (*M. emersleyi*) and Schott's century plant (*A. schottii*), with occasional pockets of Lehmann lovegrass (*Eragrostis lehmanniana*) dominance.

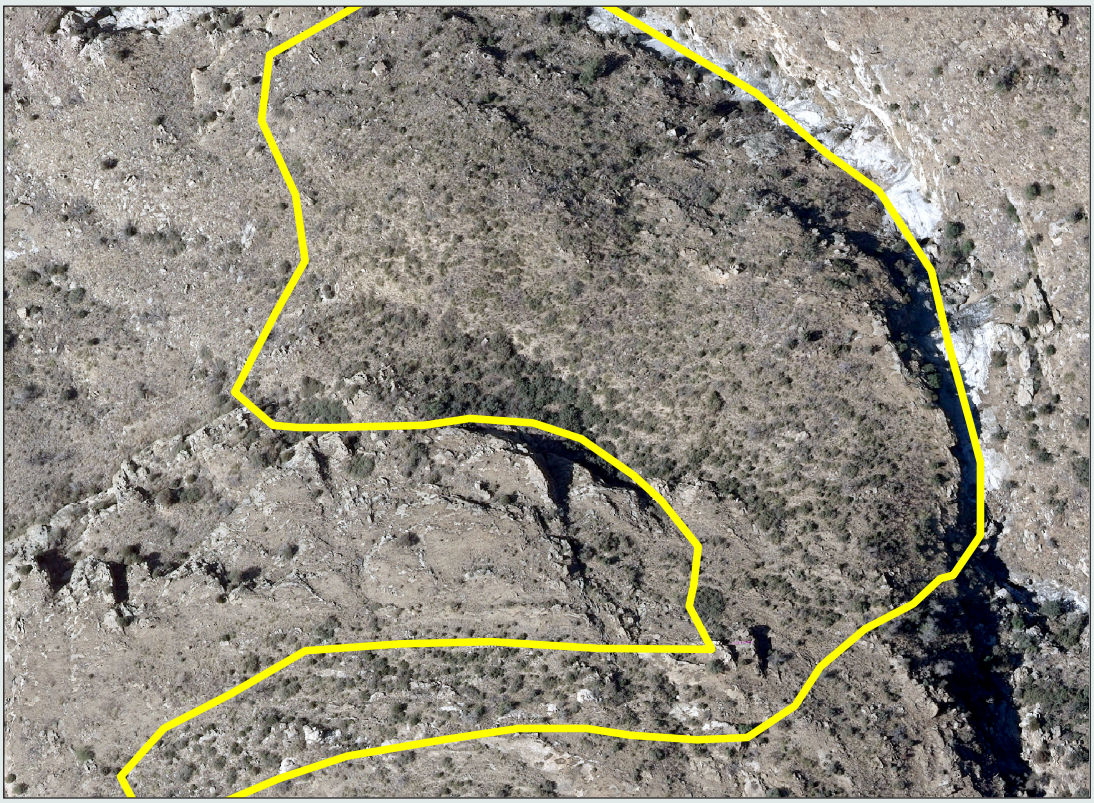
This community covers 0.12% (33 ha/81.5 ac) of the Rincon Mountain District, exclusively on the northern slopes of Tanque Verde Ridge within the boundaries of the historic Box Canyon, Windy, and/or Mother's Day fires. This shrub savanna is predominately present on north to northwest-facing, steep (35–50%) 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.



Example of *Quercus turbinella - Nolina microcarpa / Muhlenbergia emersleyi - Agave schottii* Shrub Savanna.



Distribution of *Quercus turbinella - Nolina microcarpa / Muhlenbergia emersleyi - Agave schottii* Shrub Savanna across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

66. *Pinus discolor* (*Quercus arizonica - Juniperus deppeana - Quercus hypoleucoides*) Woodland Association (P)

Border pinyon (Arizona white oak - Alligator juniper - Silverleaf oak) Woodland Association (P)

Common species

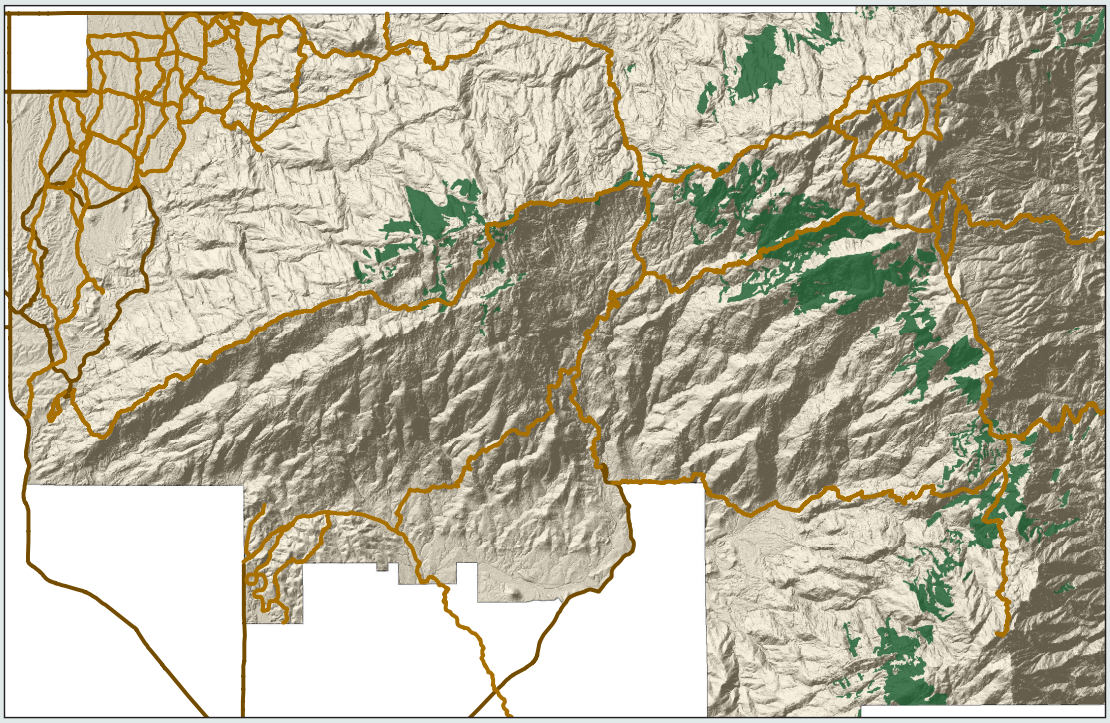
- *Pinus discolor*
- *Quercus arizonica*
- *Juniperus deppeana*
- *Quercus hypoleucoides*
- *Garrya wrightii*

This woodland community is characterized by a variably dense (30–60% cover) 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% cover) understory that often includes Wright's silktassel (*Garrya wrightii*) and longtongue muhly (*Muhlenbergia longiligula*). Of the four listed canopy species, border pinyon (*P. discolor*) provides the most consistent (1.0) dominance, providing cover of 10–50%, with an average around 25%. Other documented species include beargrass (*Nolina microcarpa*), gumhead (*Gymnosperma glutinosum*), pointleaf manzanita (*Arctostaphylos pungens*), yucca (*Yucca madrensis*), fragrant sumac (*Rhus aromatica*), Fendler's ceanothus (*Ceanothus fendleri*), California brickellbush (*Brickellia californica*), redberry buckthorn (*Rhamnus crocea*), and longtongue muhly (*M. longiligula*).

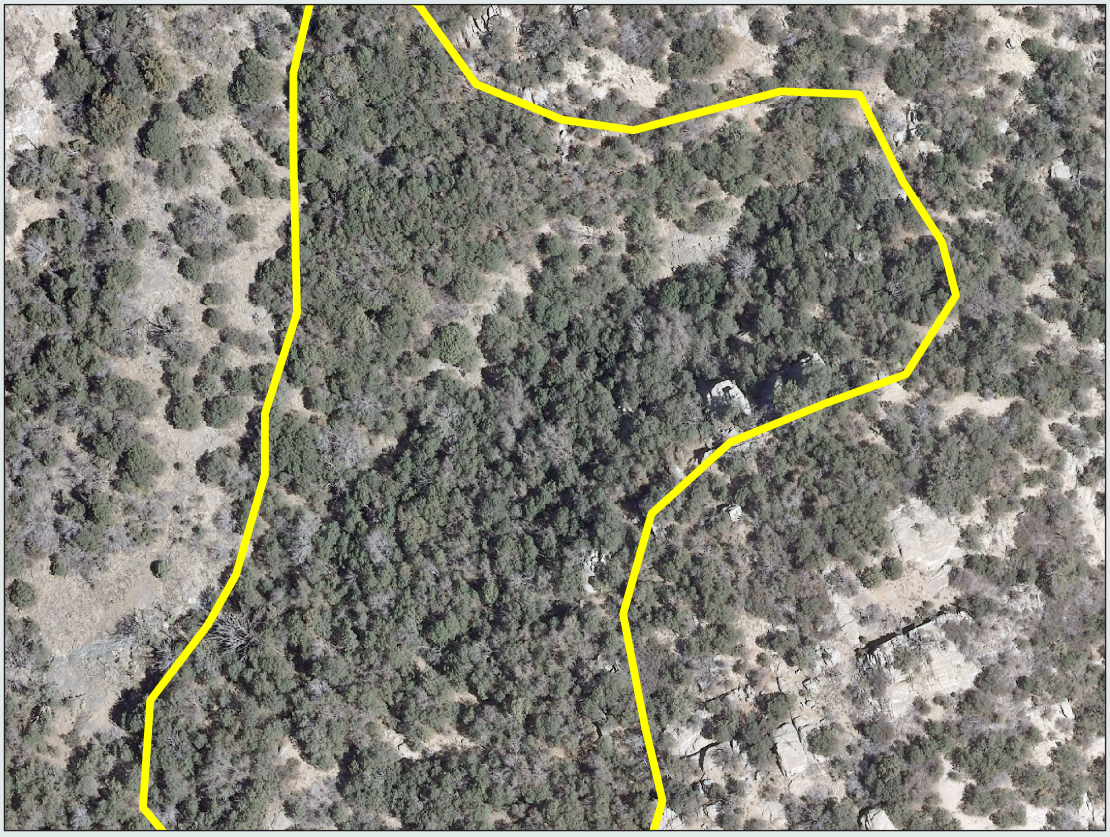
This community is contained within a two-association map class that covers 5.7% (1,544 ha/3,815 ac) of the Rincon Mountain District and is distributed throughout the upper, middle-elevation regions of the park. It is typically found on steep (35–50%), generally north-trending mountain backslopes from 1,676 to 2,133 meters (5,500–7,000 ft). The surface cover is characterized by moderately deep, well-drained, and flaggy sandy loam underlying a dominant layer of decomposing pine litter and duff. Bedrock outcrops are sporadic throughout this community and are typically composed of gneissic quartz monzonite.



Example of *Pinus discolor* (*Quercus arizonica - Juniperus deppeana - Quercus hypoleucoides*) Woodland.



Distribution of *Pinus discolor* (*Quercus arizonica - Juniperus deppeana - Quercus hypoleucoides*) Woodland across the district.



Example of satellite imagery for one polygon.

67. *Pinus discolor* / *Arctostaphylos* (*pungens - pringlei*) Wooded Shrubland Association (P)

Border pinyon / Manzanita (pointleaf - Pringle's) Wooded Shrubland Association (P)

Common species

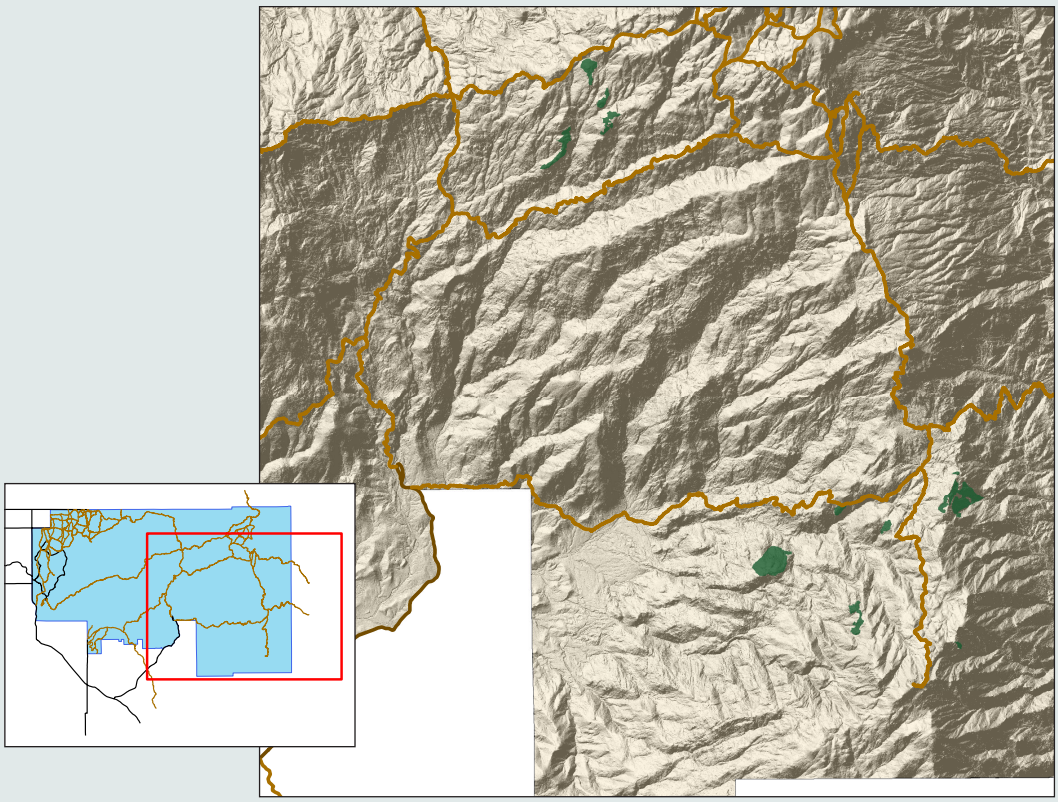
- *Pinus discolor*
- *Arctostaphylos pungens*
- *Arctostaphylos pringlei*

This wooded shrubland community is characterized by an open (10–30% cover) canopy stratum (>2 m) solely dominated by border pinyon (*Pinus discolor*), a variably dense (15–40% cover) subcanopy stratum (0.5–2 m) dominated by pointleaf manzanita (*Arctostaphylos pungens*) and Pringle's manzanita (*Arctostaphylos pungens*), and a very sparse (<<5%) field stratum (<0.5 m) without any consistent dominants or associates. This community forms a mosaic pattern, with formations ranging from moderately dense woodlands to sparsely wooded shrublands, or areas of shrub and tree co-dominance. Border pinyon (*P. discolor*) is a very consistent canopy dominant (1.0) with individuals 5 [7] meters tall providing 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. Other noteworthy species include Wright's silktassel (*Garrya wrightii*), beargrass (*Nolina microcarpa*), California brickellbush (*Brickellia californica*), yucca (*Yucca madrensis*), netleaf oak (*Quercus rugosa*), and bullgrass (*Muhlenbergia emersleyi*).

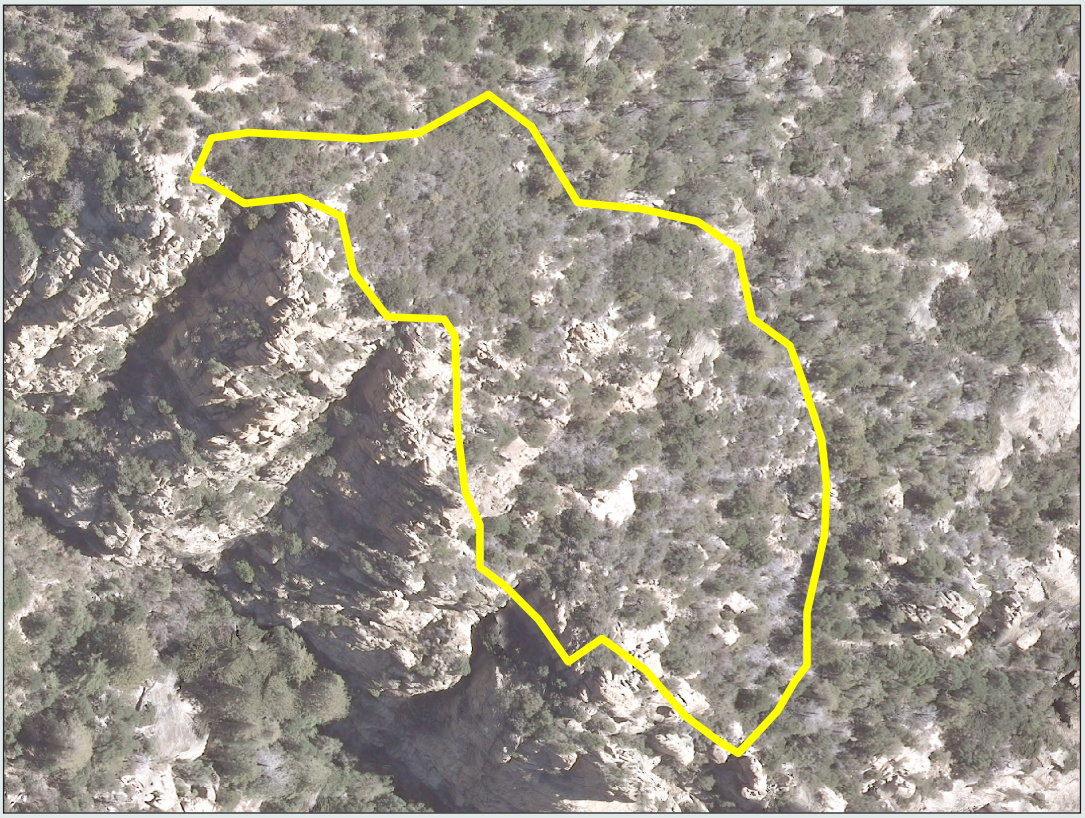
This community covers 0.25% (69 ha/170 ac) of the Rincon Mountain District and is distributed throughout the upper, mid-elevation regions of the park, from the slopes of Rincon Peak to Tanque Verde Ridge. It is typically found on backslopes of variable grade (6–50%) and aspect, from 1,900 to 2,200 meters (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, and are typically composed of gneissic quartz monzonite.



Example of *Pinus discolor* / *Arctostaphylos* (*pungens - pringlei*) Wooded Shrubland.



Distribution of *Pinus discolor / Arctostaphylos* (*pungens - pringlei*) Wooded Shrubland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

68. *Pinus discolor* / *Muhlenbergia emersleyi* Woodland Association

Border pinyon / Bullgrass Woodland Association

Common species

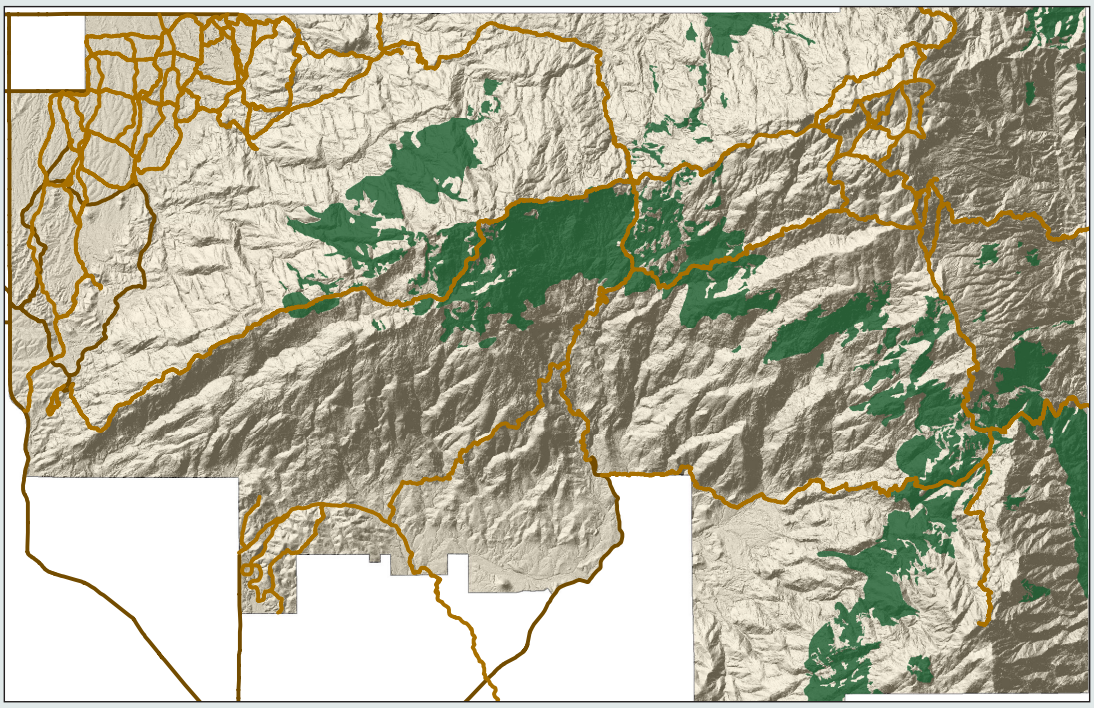
- *Pinus discolor*
- *Quercus emoryi*
- *Quercus arizonica*
- *Arctostaphylos pungens*
- *Muhlenbergia emersleyi*

This woodland community is characterized by an open (10–30 [40]% cover) 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. In general, Arizona white oak (*Q. arizonica*) is most common at higher elevations and/or in more sheltered locations, especially within included drainages. Emory oak (*Q. emoryi*) is most common in the lower-elevation examples and on exposed slopes. Other documented species include Mexican blue oak (*Quercus oblongifolia*), Toumey oak (*Quercus toumeyi*), velvet mesquite (*Prosopis velutina*), beargrass (*Nolina microcarpa*), Wright's silktassel (*Garrya wrightii*), catclaw mimosa (*Mimosa aculeaticarpa*), yucca (*Yucca madrensis*), Schott's century plant (*Agave schottii*), Texas bluestem (*Schizachyrium cirratum*), single threeawn (*Aristida schiedeana*), and tanglehead (*Heteropogon contortus*).

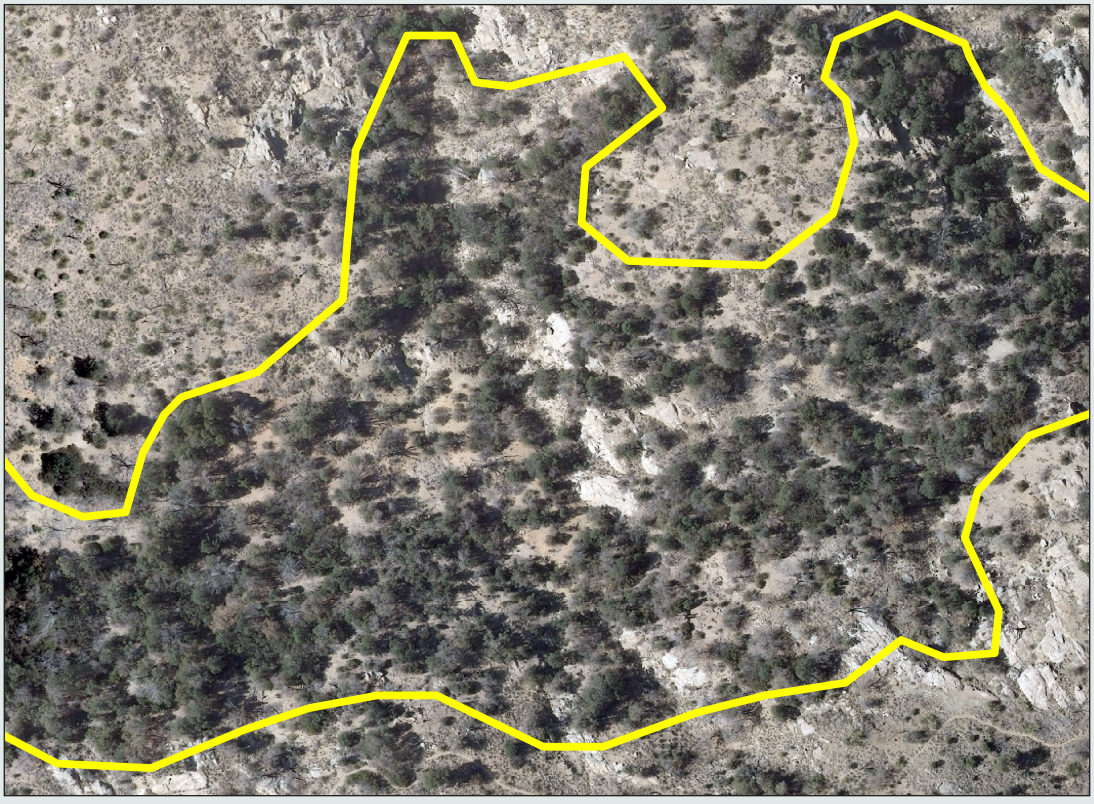
This community covers 13% (3,472 ha/8,572 ac) of the Rincon Mountain District and is primarily located on the slopes of Tanque Verde Ridge, just west of the Grass Shack campground. It is typically found on south-trending backslopes of variable grade (10–50%) from 1,580 to 1,940 meters (5,180–6,364 ft). 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.



Example of *Pinus discolor* / *Muhlenbergia emersleyi* Woodland.



Distribution of *Pinus discolor* / *Muhlenbergia emersleyi* Woodland across the district.



Example of satellite imagery for one polygon.

69. *Pinus discolor* / *Piptochaetium fimbriatum* Woodland Association

Border pinyon / Pinyon ricegrass Woodland Association

Common species

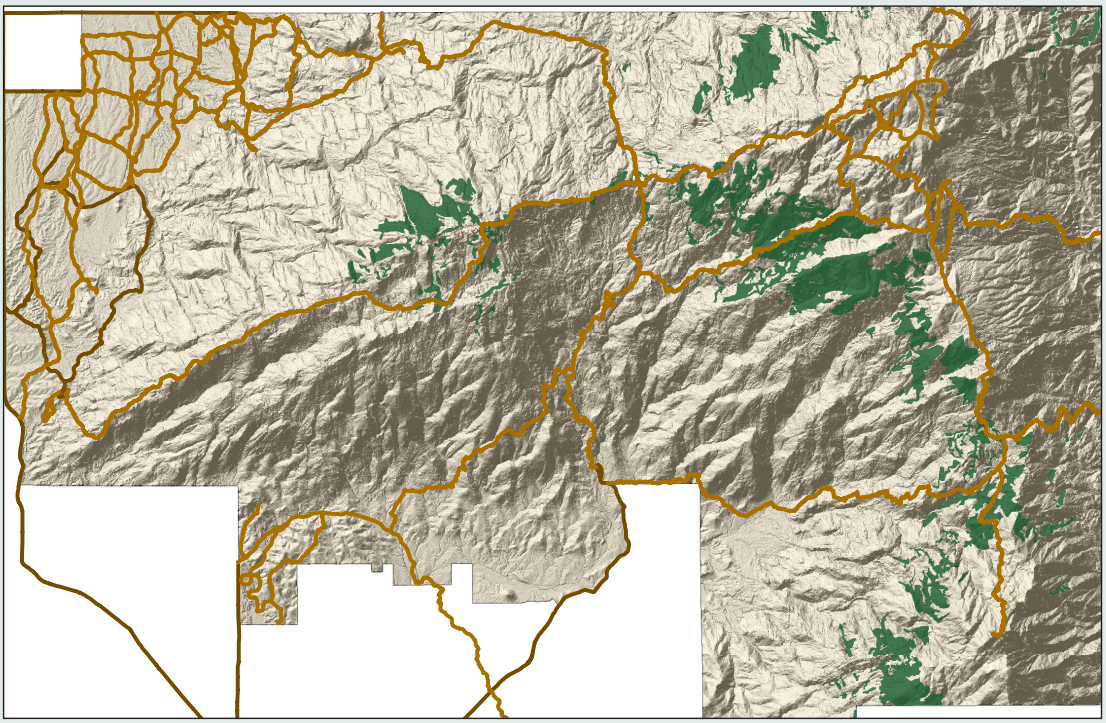
- *Pinus discolor*
- *Quercus arizonica*
- *Juniperus deppeana*
- *Quercus emoryi*
- *Piptochaetium fimbriatum*

This woodland community is characterized by a dense (40–70% cover) canopy (>2 m) dominated by border pinyon (*Pinus discolor*), alligator juniper (*Juniperus deppeana*), and oak (*Quercus* sp.), with an understory dominated (10–20% cover) by pinyon ricegrass (*Piptochaetium fimbriatum*). All three of the listed canopy trees provide consistent (1.0) presence across the community, with each typically contributing 15–30% cover. Local dominance can vary, with any of these species providing sole dominance or with similar dominance across all three. Pinyon ricegrass (*P. fimbriatum*) provides cover ranging from [5%] 10% to 20%, often in dense patches surrounded by an area without any field components. Other documented species include yucca (*Yucca madrensis*), pointleaf manzanita (*Arctostaphylos pungens*), beargrass (*Nolina microcarpa*), longtongue muhly (*Muhlenbergia longiligula*), and bullgrass (*Muhlenbergia emersleyi*).

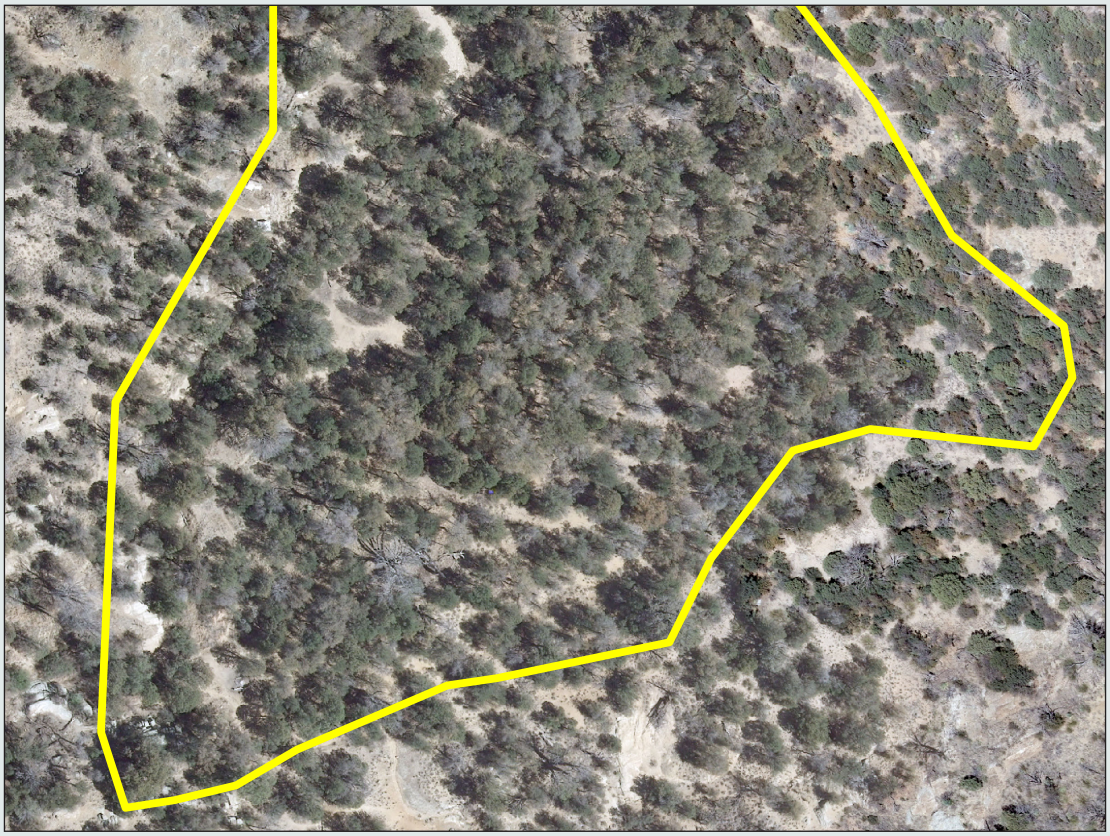
This community is contained within a two-association map class that covers 5.7% (1,544 ha/3,815 ac) of the Rincon Mountain District and is distributed throughout the unburned areas surrounding the Juniper Basin Campground. It is typically found on low-angle (<15%) slopes and includes drainages within sheltered basins around 1,850 meters (6,069 ft). The surface cover is characterized by moderately deep, well-drained, and flaggy sandy loam underlying a dominant layer of decomposing pine litter and duff.



Example of *Pinus discolor* / *Piptochaetium fimbriatum* Woodland.



Distribution of *Pinus discolor* / *Piptochaetium fimbriatum* Woodland across the district.



Example of satellite imagery for one polygon.

70. *Pinus discolor* / *Quercus rugosa* Woodland Association

Border pinyon / Netleaf oak Woodland Association

Common species

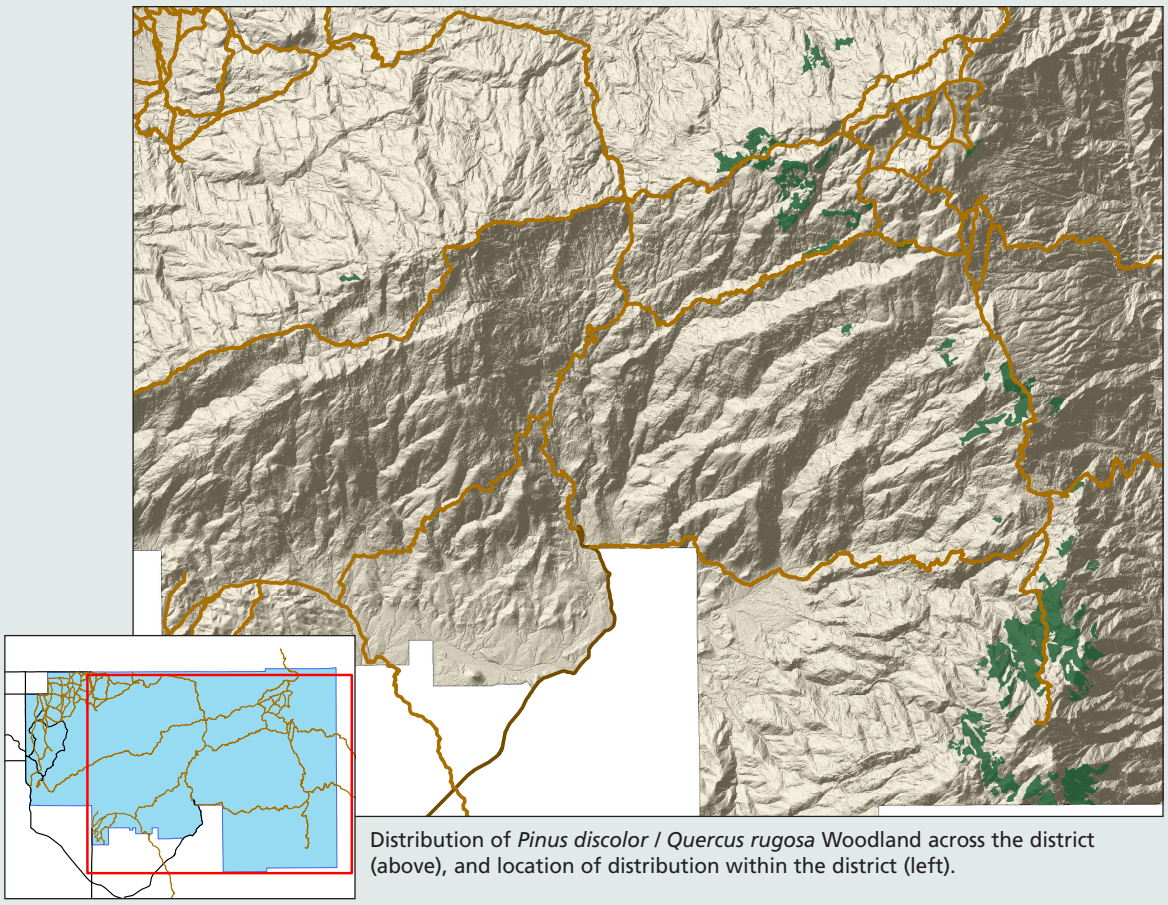
- *Pinus discolor*
- *Quercus rugosa*

This woodland community is characterized by a variably dense (30–60% cover) canopy stratum (>2 m) dominated by border pinyon (*Pinus discolor*) and a moderately dense (10–30% cover) 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 (*P. discolor*) is a very consistent canopy dominant (1.0), with individuals 3–6 meters tall providing cover typically ranging from 20% to 40% with dense areas containing cover up to 60%. Alligator juniper (*Juniperus deppeana*) is a consistent (1.0) associate that provides variable cover of usually less than 10%, with an average of around 5%. Netleaf oak (*Q. rugosa*) is a consistently (1.0) dominant shrub that typically provides 10–30% cover. On occasion, any of the following can become a subcanopy co-dominant, including silverleaf oak (*Quercus hypoleucoides*), Wright's silktassel (*Garrya wrightii*), pointleaf manzanita (*Arctostaphylos pungens*), and Pringle's manzanita (*Arctostaphylos pringlei*). Other noteworthy subcanopy components include dollarjoint prickly pear (*Opuntia chlorotica*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), longtongue muhly (*Muhlenbergia longiligula*), Pringle's speargrass (*Piptochaetium pringlei*), and muttongrass (*Poa fendleriana*).

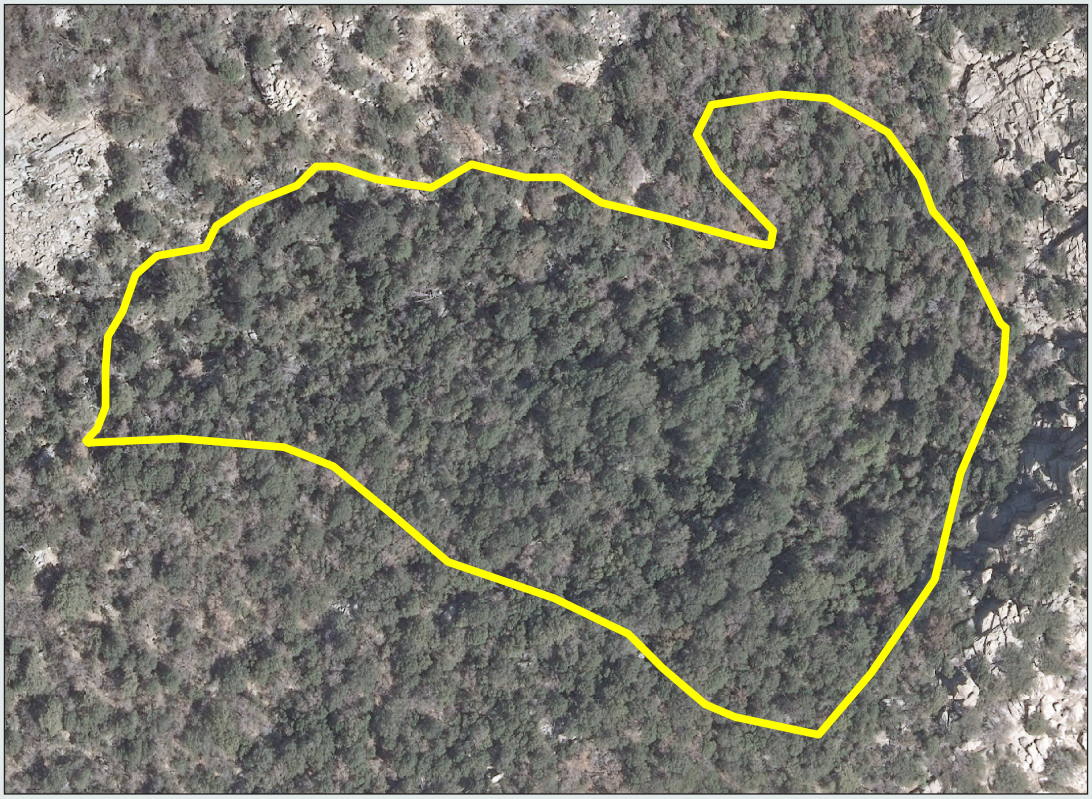
This community covers 1.8% (482 ha/1,191 ac) of the Rincon Mountain District and is widespread throughout the upper elevational areas of the park from Rincon Peak to Mica Mountain. It is typically found on mountain backslopes and shoulders of variable grade (6–50+%), with a north to northwest-trending 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.



Example of *Pinus discolor* / *Quercus rugosa* Woodland.



Distribution of *Pinus discolor* / *Quercus rugosa* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

71. *Pinus discolor* / *Quercus toumeyi* Woodland Association

Border pinyon / Toumey oak Woodland Association

Common species

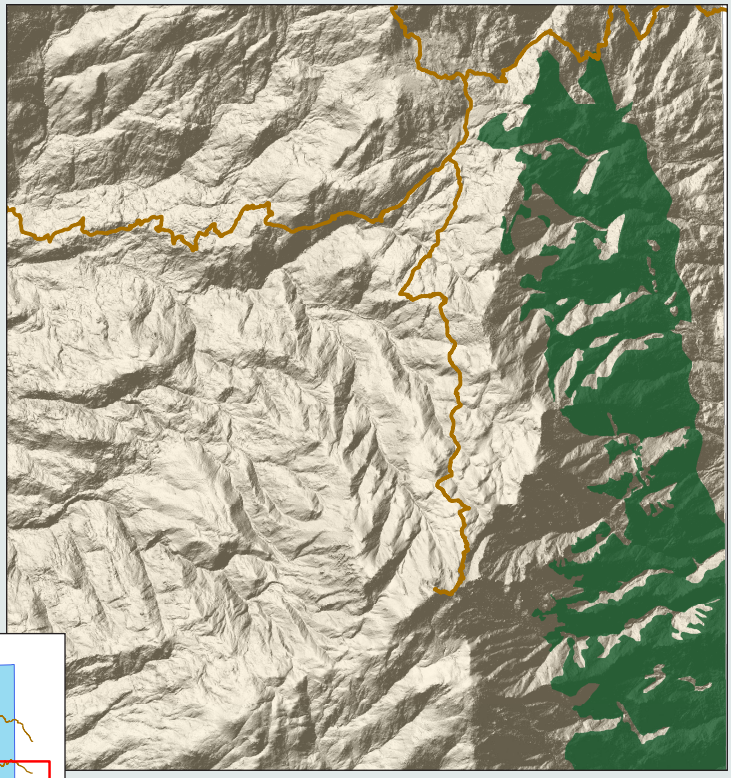
- *Pinus discolor*
- *Quercus toumeyi*
- *Arctostaphylos pungens*
- *Arctostaphylos pringlei*

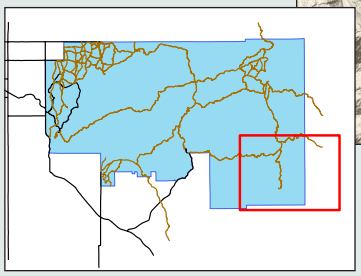
This community is characterized by a generally sparse ([5] 10–15% cover) canopy stratum (>2 m) solely dominated by border pinyon (*Pinus discolor*) and a slightly more dense (10–20% cover) subcanopy stratum (0.5–2 m) dominated by Toumey oak (*Quercus toumeyi*) and manzanita (*Arctostaphylos* sp.). Due to the high percentage of exposed bedrock found throughout this community, species composition and abundance are tied to the availability of soil. Border pinyon (*P. 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. Toumey oak (*Q. toumeyi*) is consistently present (1.0) and typically dominant (0.83), with cover of 5–10% 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. Manzanita (*Arctostaphylos* sp.) provides dominance in most (0.66) examples of this community, with pointleaf manzanita (*Arctostaphylos pungens*) commonly found at the lower elevational range and Pringle's manzanita (*Arctostaphylos pringlei*) at the upper.

This community covers 1.8% (499 ha/1,233 ac) of the Rincon Mountain District and is distributed across the low, eastern slopes of Rincon Peak. It 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.



Example of *Pinus discolor* / *Quercus toumeyi* Woodland.





Distribution of *Pinus discolor* / *Quercus toumeyi* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

72. *Quercus arizonica - Quercus emoryi* (*Platanus wrightii*) Intermittently Flooded Woodland Association (P)

Arizona white oak - Emory oak (Arizona sycamore) Intermittently Flooded Woodland Association (P)

Common species

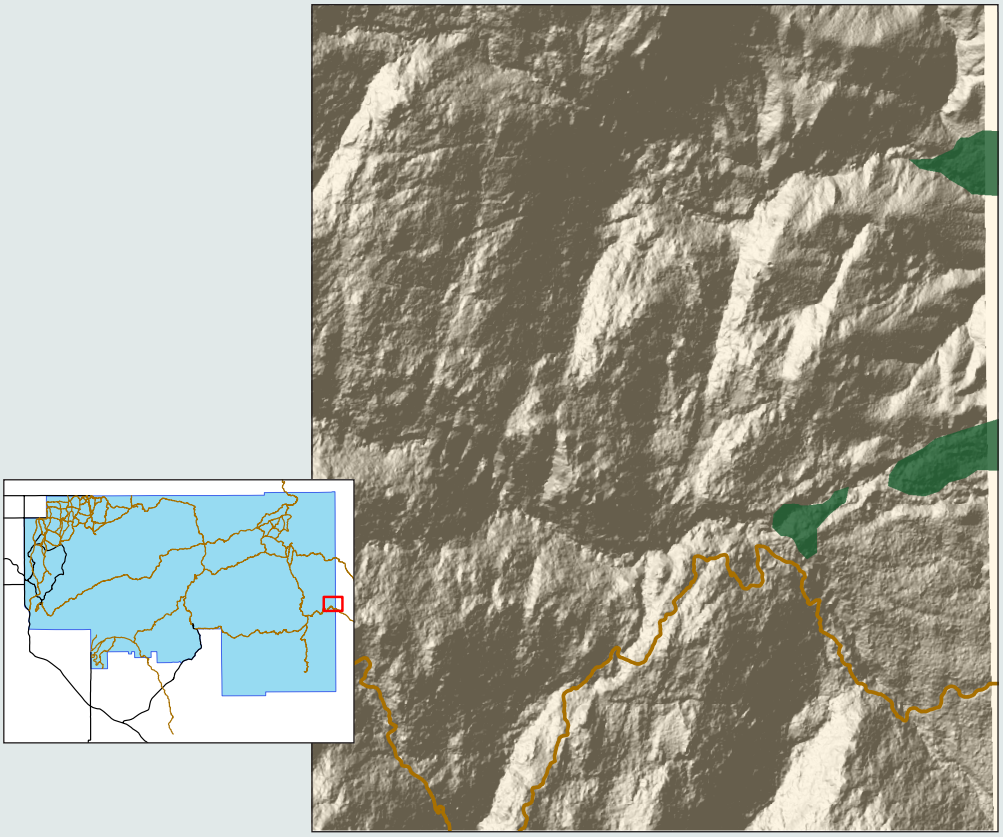
- *Quercus arizonica*
- *Quercus emoryi*
- *Platanus wrightii*

This community is characterized by a moderate to dense (27–50% cover) 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. Arizona sycamore (*Platanus wrightii*) is occasional (<5% cover) 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 understory is characterized by a diverse but low-cover (3–10%) mix of shrubs and subshrubs that include 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 aromatica*), and Chihuahuan brickellbush (*Brickellia floribunda*).

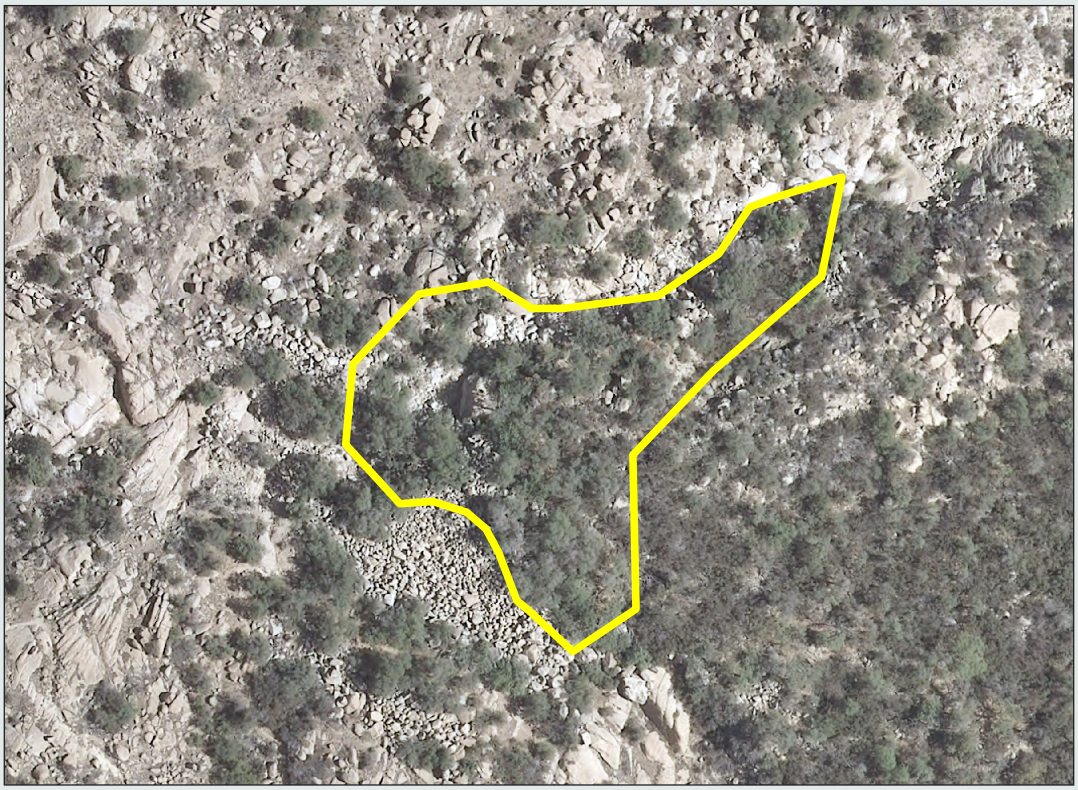
This community covers 0.006% (1.6 ha/4 ac) of the Rincon Mountain District, exclusively along the eastern boundary. This intermittently flooded woodland spans low-angle drainages and the adjacent slopes of variable aspects at an elevation around 1,350 meters (4,429 ft). Within the watercourse, the surface 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 oakleaf litter and duff.



Example of *Quercus arizonica - Quercus emoryi* (*Platanus wrightii*) Intermittently Flooded Woodland.



Distribution of *Quercus arizonica - Quercus emoryi* (*Platanus wrightii*) Intermittently Flooded Woodland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

73. *Cupressus arizonica* / *Quercus hypoleucoides* Forest Association

Arizona cypress / Silverleaf oak Forest Association

Common species

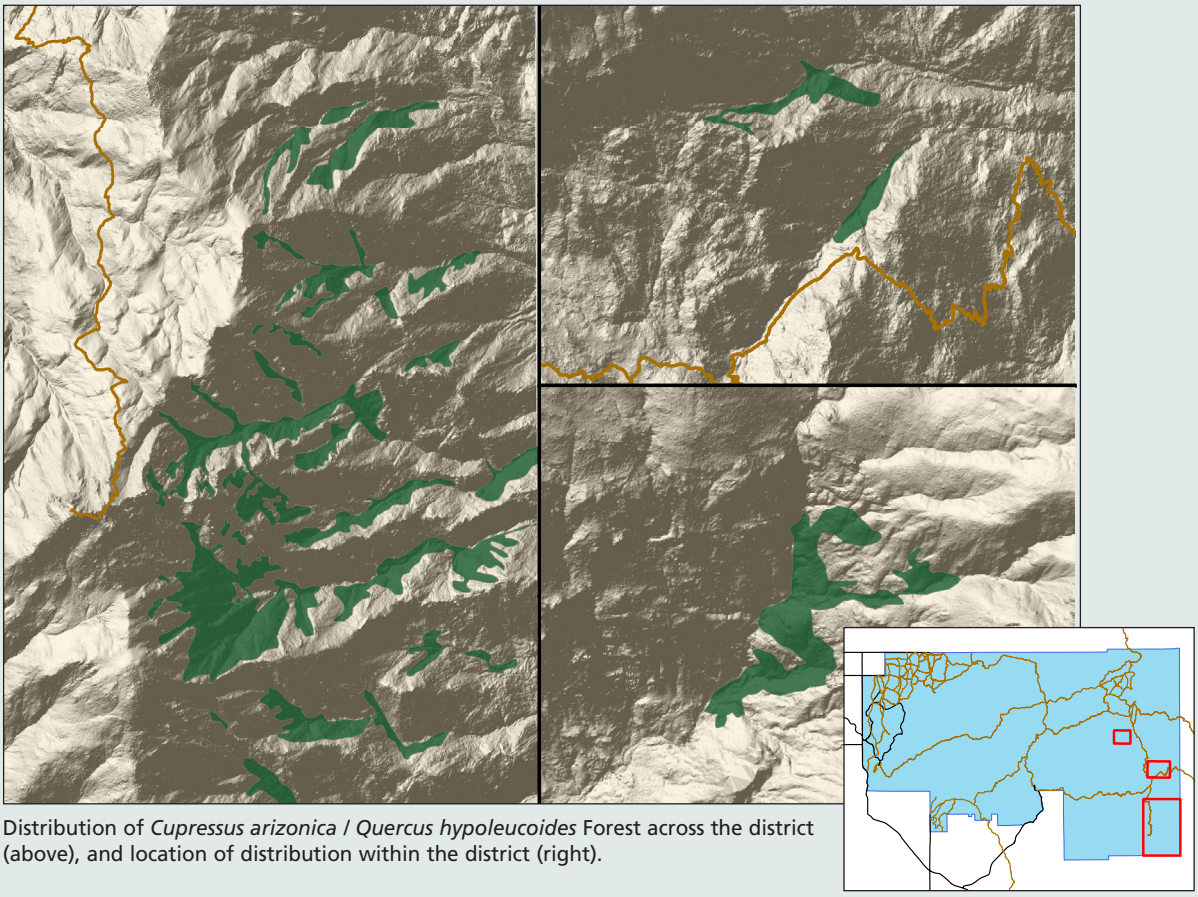
- *Cupressus arizonica*
- *Pinus discolor*
- *Quercus hypoleucoides*
- *Quercus arizonica*
- *Quercus rugosa*

This forest community is characterized by an open-to-closed (20–50% cover) 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. Arizona cypress (*C. arizonica*) is a diagnostic species present as tall (10–15 m) individuals with cover ranging from 10% to 40%. Other documented species include silverleaf oak (*Quercus hypoleucoides*), netleaf oak (*Quercus rugosa*), Arizona white oak (*Quercus arizonica*), pointleaf manzanita (*Arctostaphylos pungens*), Pringle's manzanita (*Arctostaphylos pringlei*), 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*).

This community covers 0.42% (115 ha/284 ac) in the Rincon Mountain District and is widespread across the eastern slopes of Rincon Peak, especially throughout Paige and Ash canyons. It 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, with the banks of shallow litter. The adjacent slopes are typically dominated by a dense layer of pine and oak litter with conspicuous outcrops of exposed bedrock.



Example of *Cupressus arizonica* / *Quercus hypoleucoides* Forest.



Distribution of *Cupressus arizonica* / *Quercus hypoleucoides* Forest across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

74. *Pinus* (*arizonica - ponderosa*) Regenerating Woodland Association (P)

Pine (Arizona - ponderosa) Regenerating Woodland Association (P)

Common species

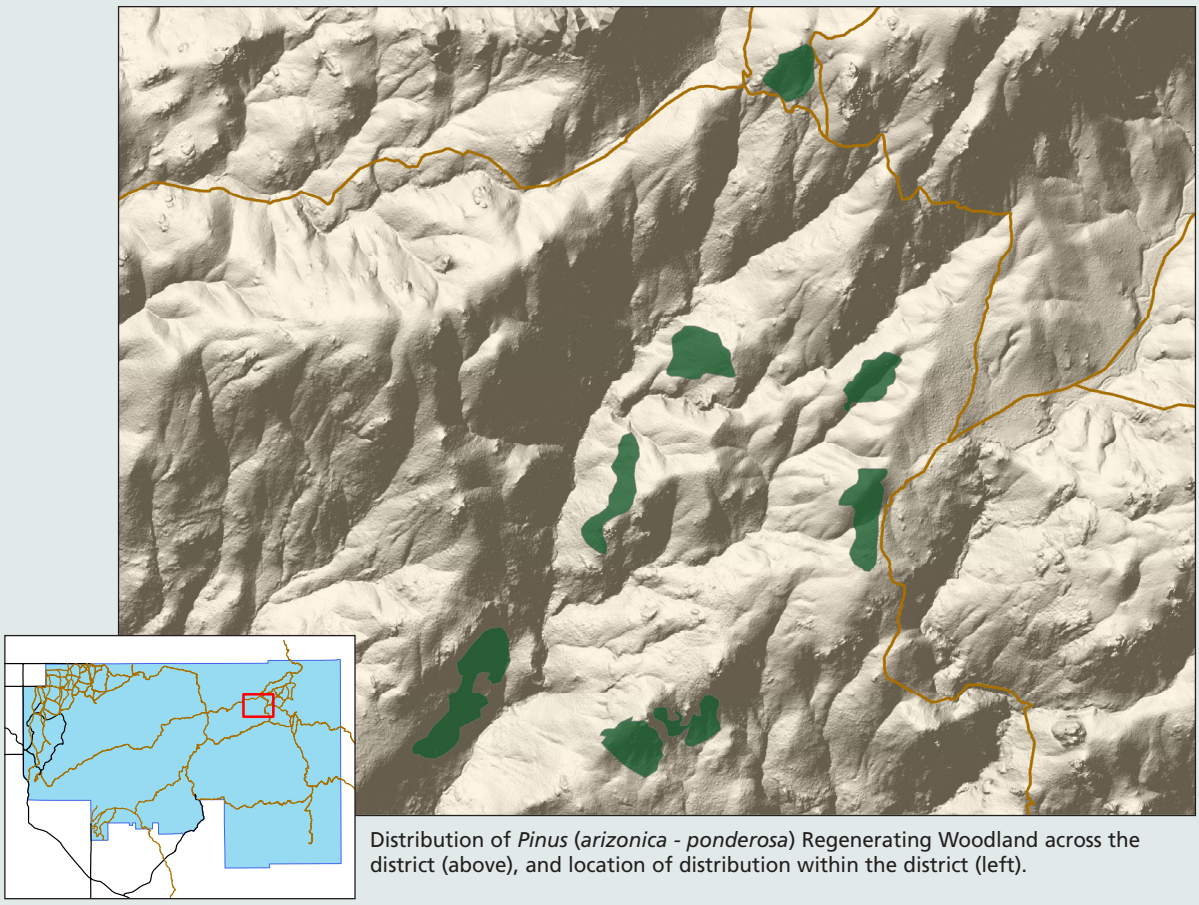
- *Pinus arizonica*
- *Pinus ponderosa*
- *Quercus hypoleucoides*

This regenerating woodland community is characterized by a variably dense (20–50+% cover) lower canopy (>2–5 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. Pre-fire, it 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 saplings (1–2 m) to tall poles (2–4 m) that are typically of the same age class within each mapped area. Arizona pine (*P. arizonica*) tends to dominate at the lower elevational range of this community and/or on steeper, more exposed slopes, while ponderosa pine (*P. ponderosa*) occupies the higher-elevation, more-sheltered slopes. In addition to the listed dominants, the low/subcanopies contain a number of associate trees and shrubs. The sparse (<5% cover) 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*).

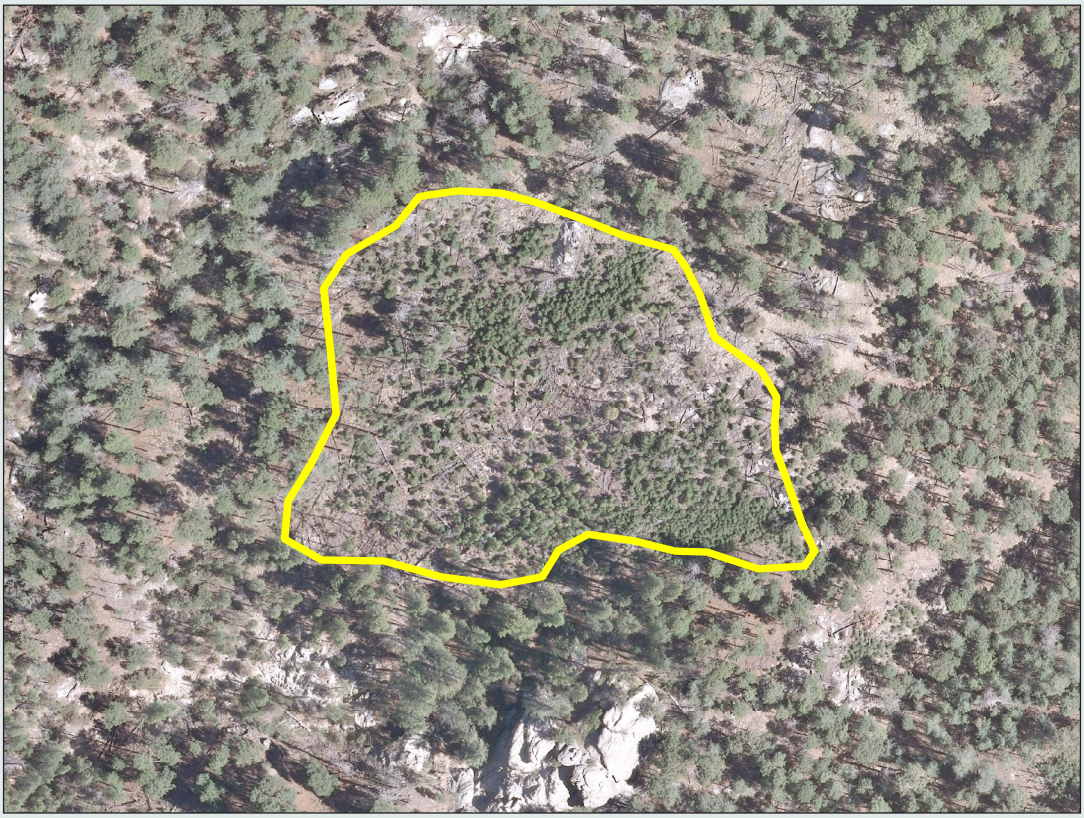
This community covers 0.03% (7 ha/17 ac) of the Rincon Mountain District and is present throughout the trail system that surrounds Manning Camp. It is typically found on mountain backslopes of variable grade (10–50+%) with a southern or eastern aspect from 2,140 to 2,480 meters (7,000–8,140 ft). The 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 signs of high-severity fire disturbance.



Example of *Pinus* (*arizonica - ponderosa*) Regenerating Woodland.



Distribution of *Pinus* (*arizonica* - *ponderosa*) Regenerating Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

75. *Pinus arizonica* / *Quercus hypoleucoides* Woodland Association (P)

Arizona pine / Silverleaf oak Woodland Association (P)

Common species

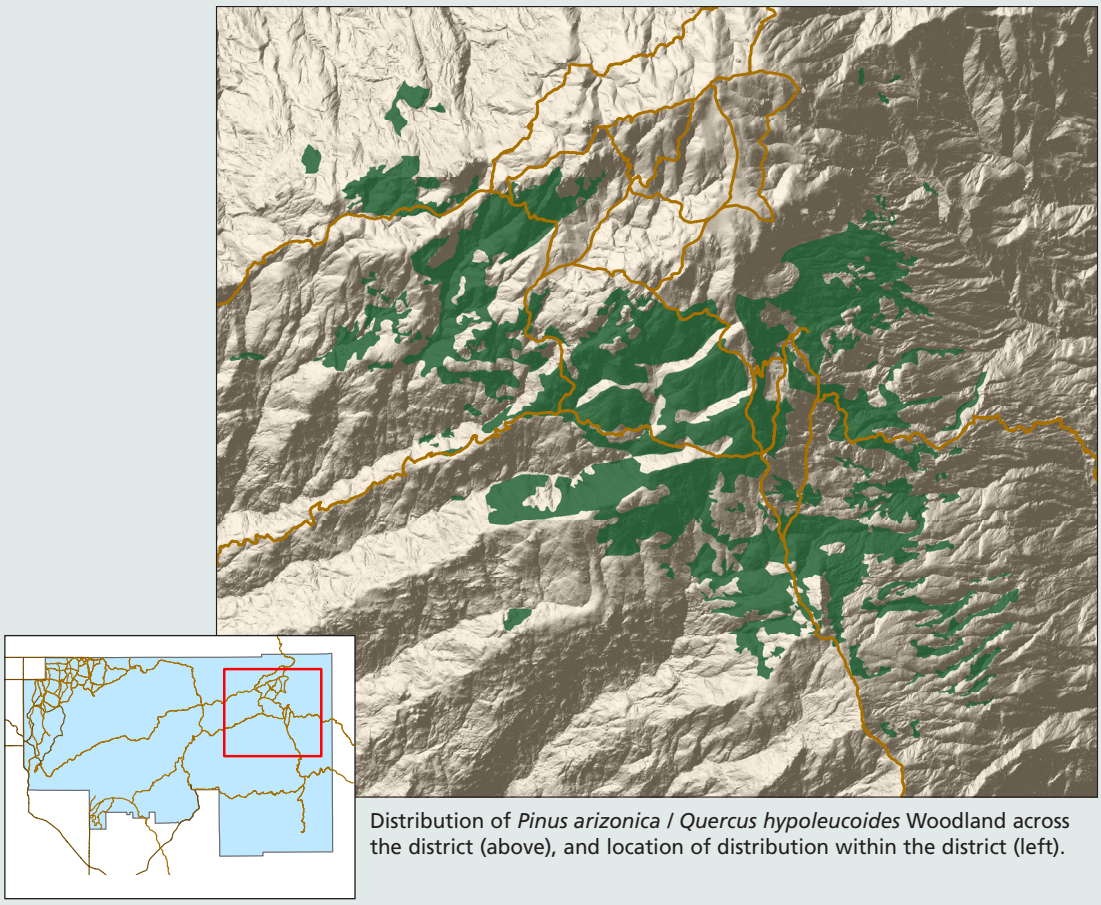
- *Pinus arizonica*
- *Quercus hypoleucoides*
- *Muhlenbergia longiligula*

This woodland community is characterized by a variably dense (30–65% cover) 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. Arizona pine (*P. arizonica*) is present as large (10–30 m) trees with variable cover ranging from 10% to 45%, with an average around 30%. Silverleaf oak (*Q. hypoleucoides*) provides very consistent (1.0) presence, often as a co-dominant or sub-dominant to Arizona pine (*P. 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% cover across the broader community. The lower canopy (2–5 m) is dominated by shorter, sometimes shrubby versions of the upper-canopy oaks and junipers. The subcanopy stratum (0.5–2 m) is generally quite sparse (<5% cover), with no consistent dominants or associates. The sparse (<10 [15]% cover) 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.

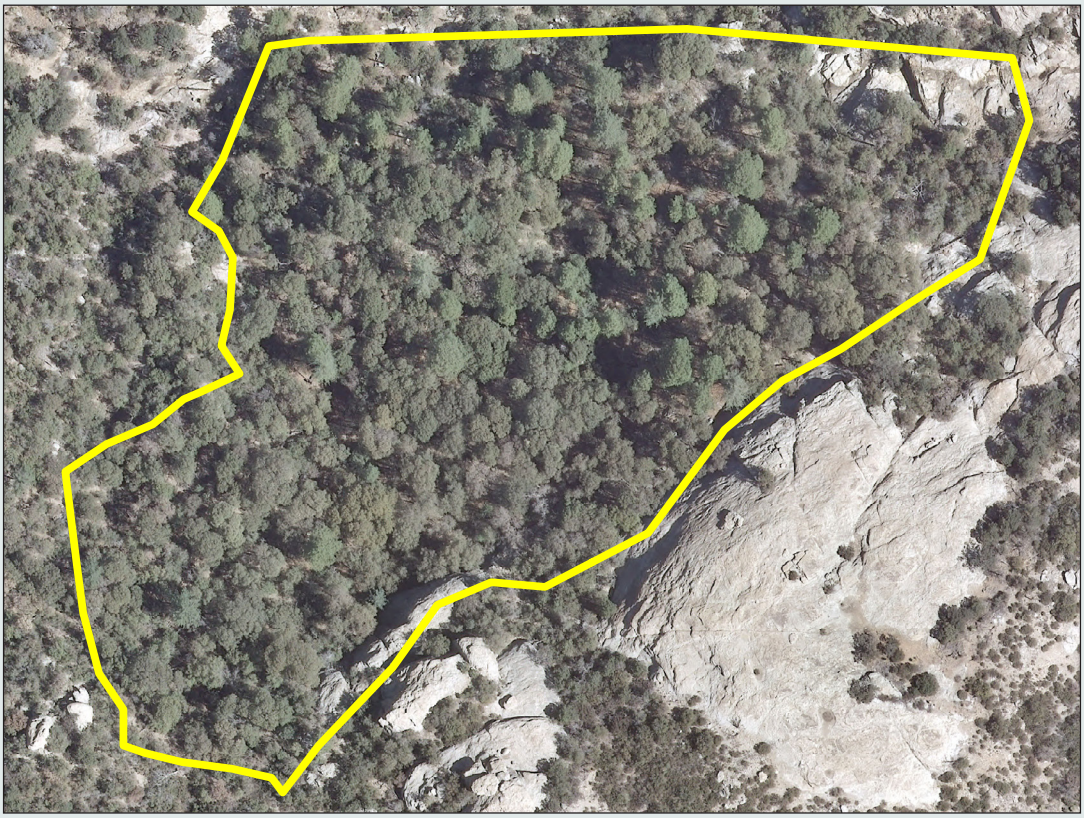
This community covers 2.6% (706 ha/1,744 ac) of the Rincon Mountain District and is found throughout the trail system that surrounds Manning Camp, on the slopes below Reef Rock, and on the upper slopes of Heartbreak Ridge. It is typically found on mountain backslopes of variable grade (10–50+%) with 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.



Example of *Pinus arizonica* / *Quercus hypoleucoides* Woodland.



Distribution of *Pinus arizonica* / *Quercus hypoleucoides* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

76. *Pinus leiophylla* / *Quercus hypoleucoides* Woodland Association

Chihuahuan pine / Silverleaf oak Woodland Association

Common species

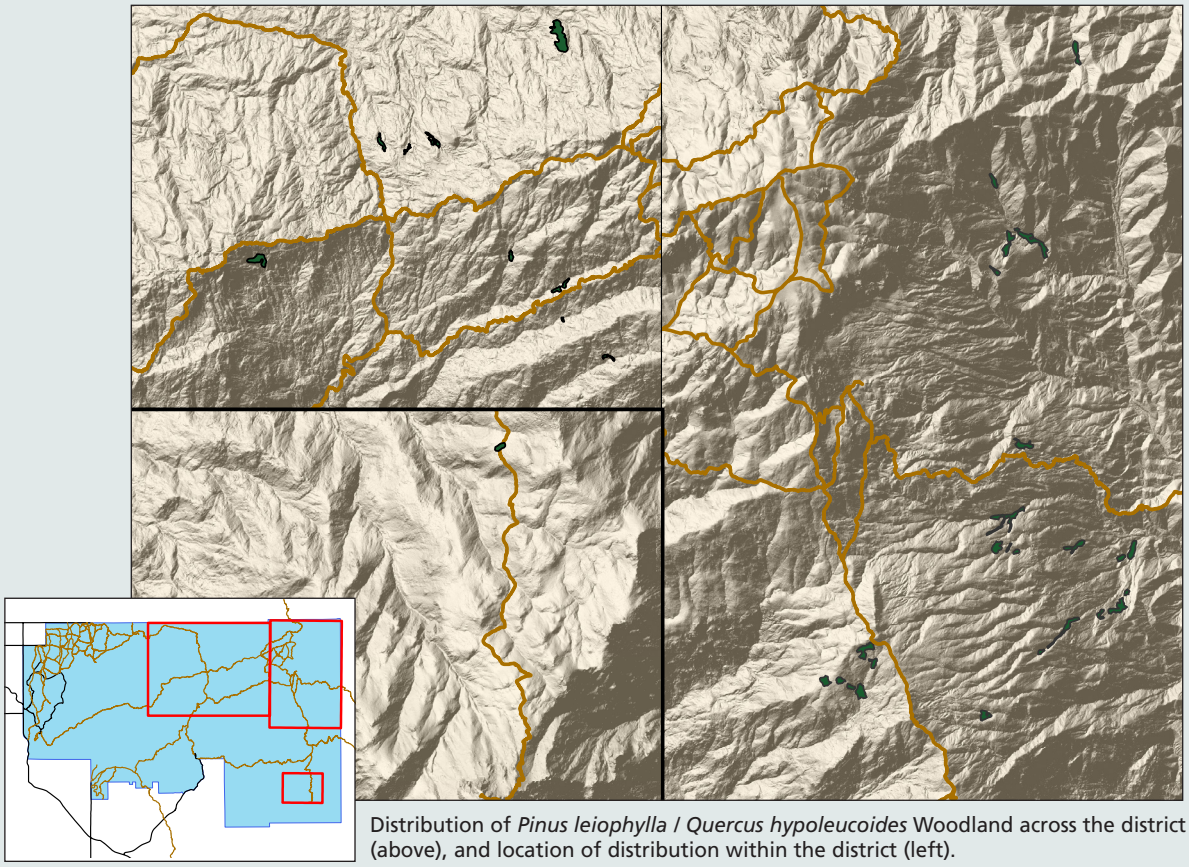
- *Pinus leiophylla*
- *Quercus hypoleucoides*
- *Quercus arizonica*
- *Muhlenbergia longiligula*

This woodland community is characterized by a variably dense (10–40% cover) overstory canopy (>10 m) dominated by Chihuahuan pine (*Pinus leiophylla*) with a variable (10–40% cover) mid-canopy (5–10 m) dominated by silverleaf oak (*Quercus hypoleucoides*). Chihuahuan pine (*P. leiophylla*) is present as large (10–20 m) trees with average cover of 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. In the mid-canopy, silverleaf oak (*Q. hypoleucoides*) is present as consistent (1.0), medium-sized (4–8 m) trees with cover ranging from sparse associate (<5%) to dominant (10–30%). 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 of around 8%, occasionally becoming co-dominant with silverleaf oak (*Q. hypoleucoides*). The subcanopy stratum (0.5–2 m) is generally quite variable (1–25% cover) and is most commonly dominated by shrubby versions of the mid-canopy oak species. The sparse (<10% cover) field stratum (<0.5 m) is characterized by a low-cover mix of graminoids and perennial forbs.

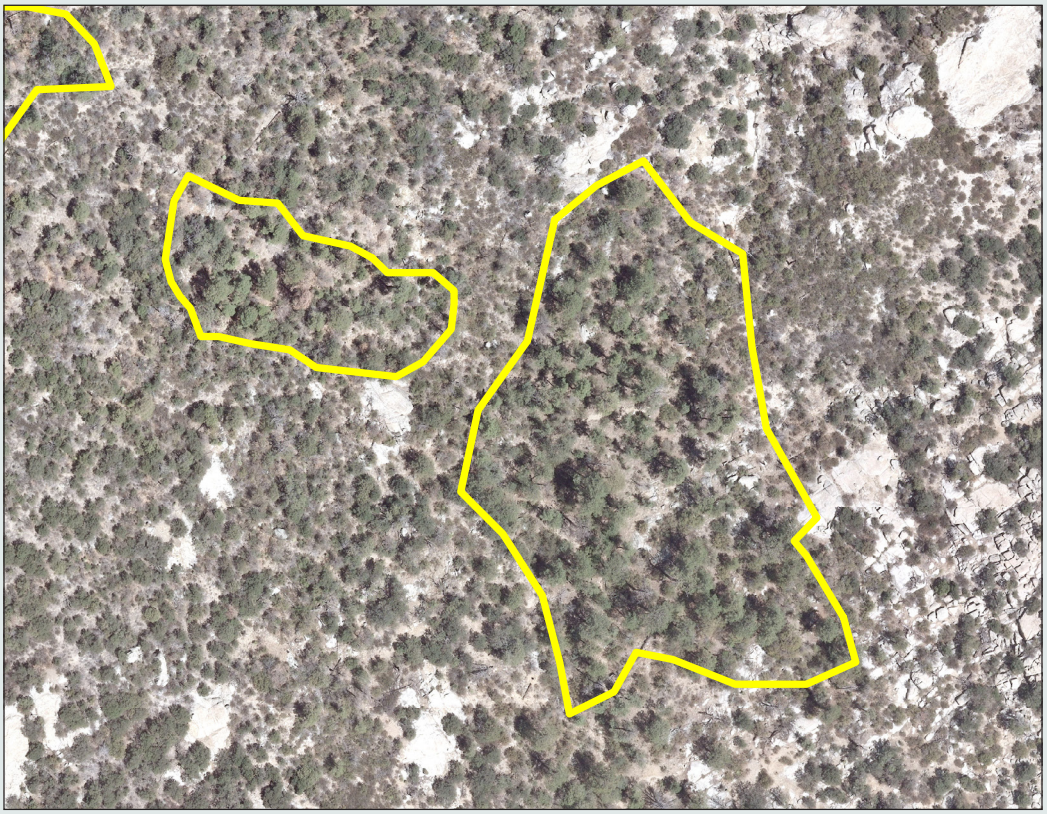
This community covers 0.13% (35 ha/86 ac) of the Rincon Mountain District and is found near Tanque Verde Peak, Cow Head Saddle, Heartbreak Ridge, and Rincon Peak. It is present within the transitional area between the short-statured pinyon woodland and the large conifer forests at the top of the range.



Example of *Pinus leiophylla* / *Quercus hypoleucoides* Woodland.



Distribution of *Pinus leiophylla* / *Quercus hypoleucoides* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

77. *Pinus ponderosa* / *Quercus arizonica* - *Quercus emoryi* Woodland Association

Ponderosa pine / Arizona white oak - Emory oak Woodland Association

Common species

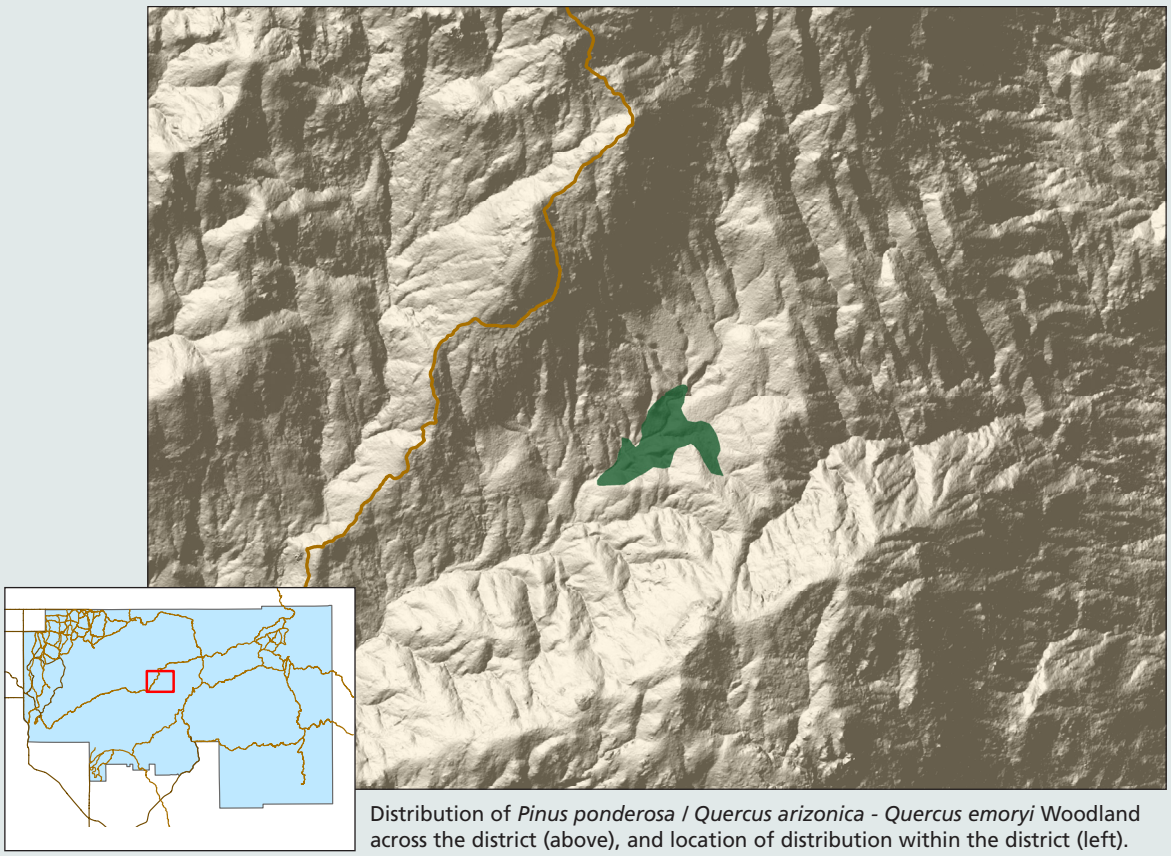
- *Pinus ponderosa*
- *Quercus arizonica*
- *Quercus emoryi*
- *Muhlenbergia emersleyi*

This woodland community is characterized by a moderately dense (40–60% cover) 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*). 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 (*Q. arizonica*) and Emory oak (*Q. emoryi*) are consistent (1.0) subdominants to ponderosa pine (*P. ponderosa*), as medium-sized (5–15 m) trees with average cover of around 10% each. The subcanopy stratum (0.5–2 m) is generally quite sparse (<5% cover), with no consistent dominants or associates. The moderately sparse (10–20% cover) field stratum (<0.5 m) is characterized by the consistent presence (1.0) and typical dominance of bullgrass (*M. emersleyi*). On average, this species provides around 15% cover, typically in areas with low overstory canopy.

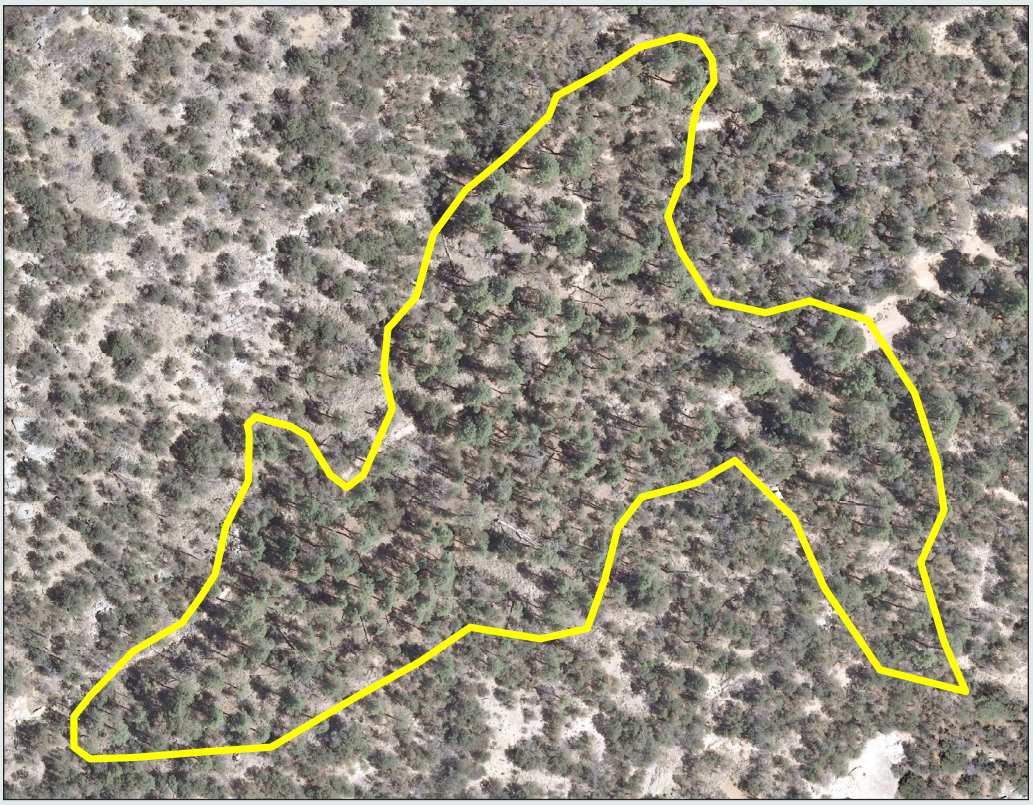
This community covers 0.007% (1.9 ha/4.7 ac) of the Rincon Mountain District and occupies only one location, a small basin east of Juniper Basin Campground. It is typically found on low-angle (20%) slopes and in sheltered basins around 1,900 meters (6,233 ft). The surface cover is characterized by moderately 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.



Example of *Pinus ponderosa* / *Quercus arizonica* - *Quercus emoryi* Woodland.



Distribution of *Pinus ponderosa / Quercus arizonica - Quercus emoryi* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

78. *Pinus ponderosa* / *Quercus hypoleucoides* Woodland Association

Ponderosa pine / Silverleaf oak Woodland Association

Common species

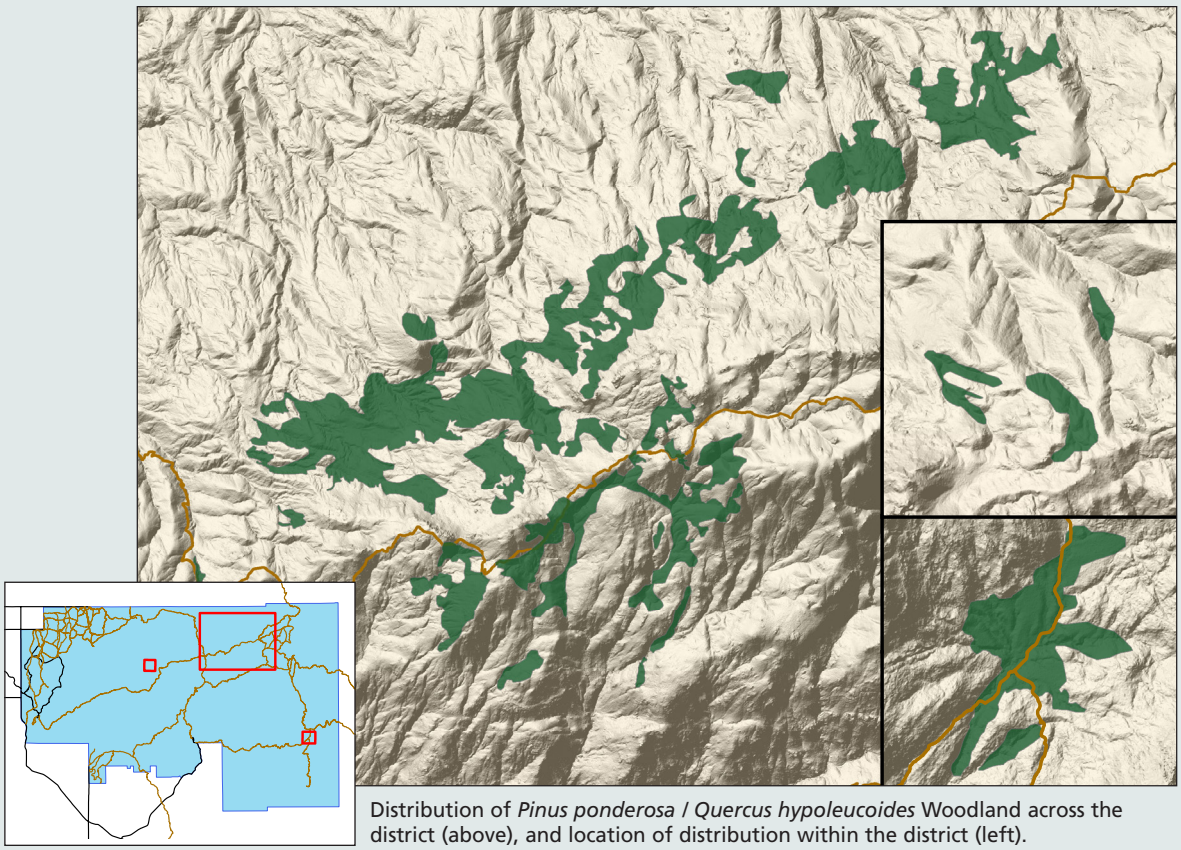
- *Pinus arizonica*
- *Quercus hypoleucoides*
- *Juniperus deppeana*
- *Muhlenbergia longiligula*

This woodland community is characterized by a variably dense (30–65% cover) 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. Ponderosa pine (*P. ponderosa*) is present as large (10–30 m) trees with variable cover ranging from 10% to 45%, with an average around 30%. Silverleaf oak (*Q. hypoleucoides*) provides very consistent (1.0) presence, often as a co-dominant or subdominant to ponderosa pine (*P. ponderosa*). Silverleaf oak (*Q. hypoleucoides*) is typically present as medium-sized (5–15 m) trees with cover ranging from a sparse (<5% cover) associate to a co-dominant with some inclusions up to 40% cover. 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 of around 7%. The lower canopy (2–5 m) is dominated by shorter, sometimes shrubby versions of the upper-canopy oaks and junipers. The subcanopy stratum (0.5–2 m) is generally quite sparse (<5% cover), with no consistent dominants or associates. The sparse (<10% [15]% cover) 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.

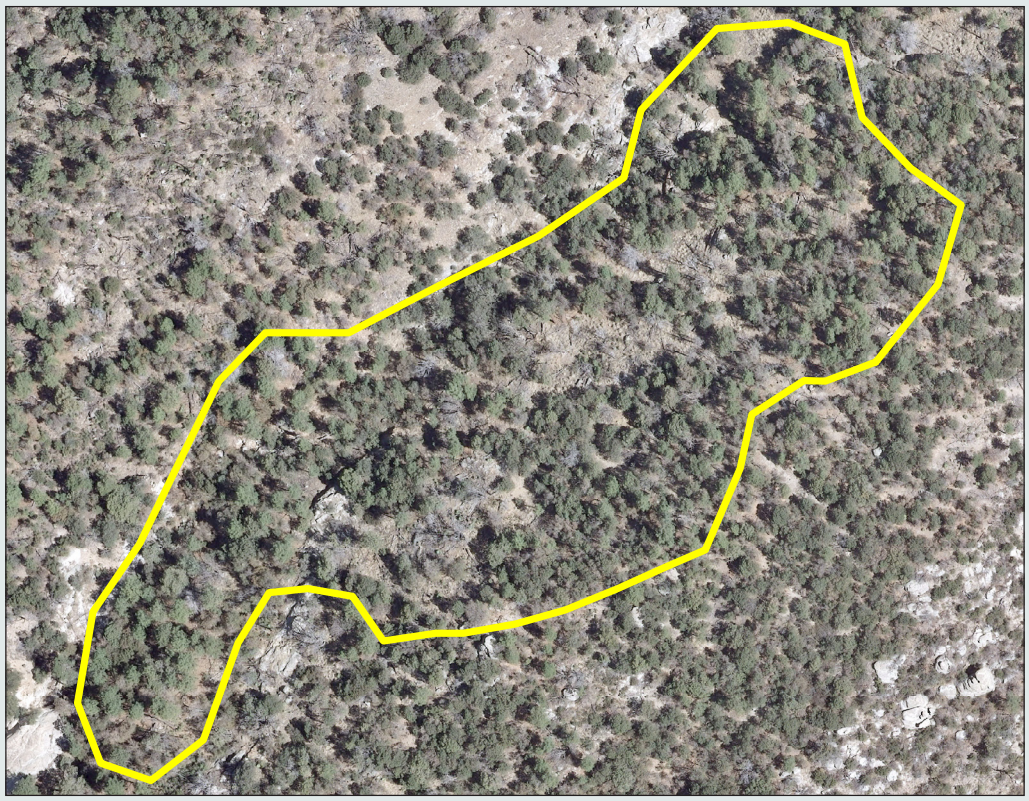
This community covers 0.75% (204 ha/504 ac) of the Rincon Mountain District and is present on the northern slopes of Mica Mountain and in the Happy Valley Saddle. It is typically found on mountain backslopes and ridges of variable grade (10–40%) from 1,820 to 2,353 meters (5,971–7,719 ft). The surface 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.



Example of *Pinus ponderosa* / *Quercus hypoleucoides* Woodland.



Distribution of *Pinus ponderosa / Quercus hypoleucoides* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

79. *Pseudotsuga menziesii* / *Quercus rugosa* Forest Association

Douglas fir / Netleaf oak Forest Association

Common species

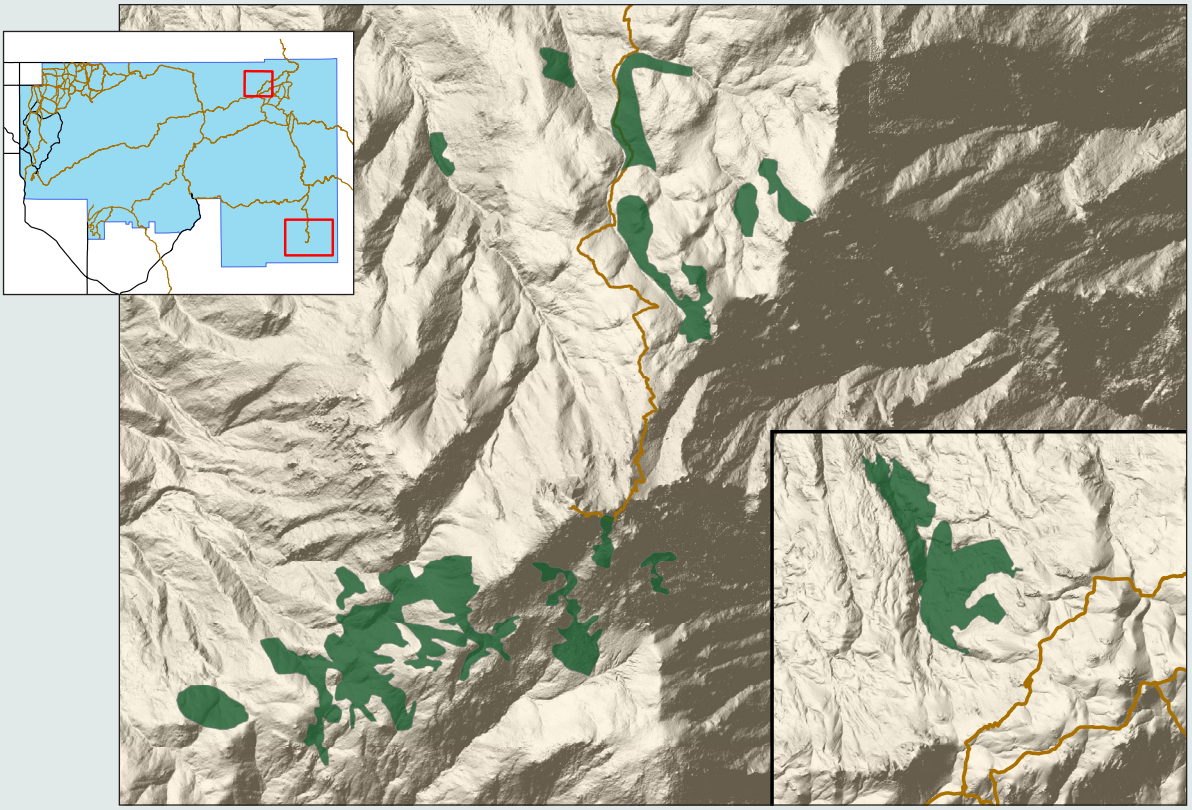
- *Pseudotsuga menziesii*
- *Pinus ponderosa*
- *Quercus hypoleucoides*
- *Quercus rugosa*

This forested community is characterized by a variable (40–70% cover) canopy (>2 m) with cover split between an overstory of conifers and an understory canopy of oaks. Douglas fir (*Pseudotsuga menziesii*) is present as large (15–20 m) trees with variable cover of 10–25%. Ponderosa pine (*Pinus ponderosa*) and Arizona pine (*Pinus arizona*) are slightly lower in the canopy (10–16 m), with variable cover of 10–30%. Overall, silverleaf oak (*Quercus hypoleucoides*) provides cover of 5–20%, with heights typically around 5 meters but sometimes reaching above 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. The subcanopy stratum (0.5–2 m) is characterized by a sparse (<10% cover) mix of shrubs with no consistent dominants or common associates. The field stratum (<0.5 m) is also sparse (<10% cover), with no clear dominants or associates.

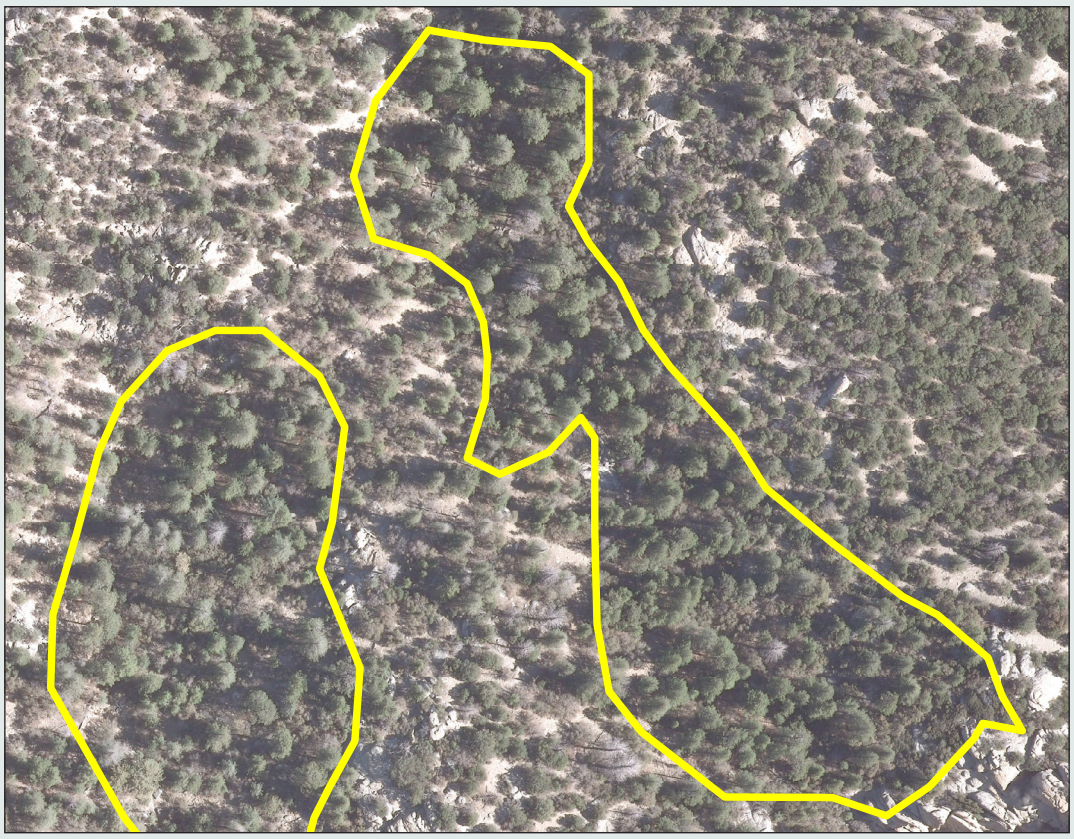
This community covers 0.2% (58 ha/144 ac) of the Rincon Mountain District and is found on the north slope of Mica Mountain and Rincon Peak. It is typically located on moderately steep (20–40%), exclusively north-facing backslopes and deep, sheltered drainages from 2,000 to 2,300 meters (6,561–7,545 ft). 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.



Example of *Pseudotsuga menziesii* / *Quercus rugosa* Forest.



Distribution of *Pseudotsuga menziesii* / *Quercus rugosa* Forest across the district (above), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

80. [*Quercus arizonica - Quercus hypoleucoides*] Intermittently Flooded Woodland Association (P)

[Arizona white oak - Silverleaf oak] Intermittently Flooded Woodland Association (P)

Common species

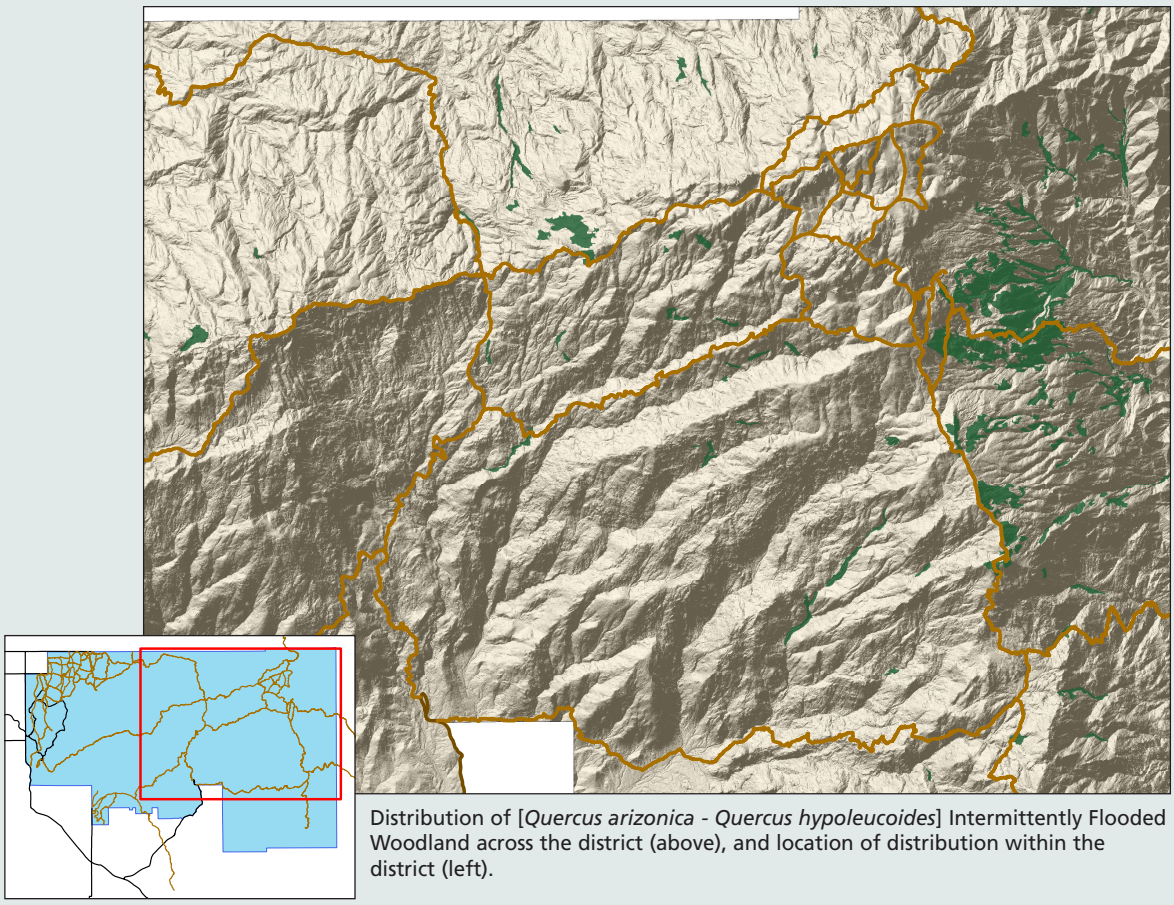
- *Quercus arizonica*
- *Quercus hypoleucoides*
- *Garrya wrightii*

This woodland community is characterized by a variably dense (50–70% cover) 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 (*Garrya wrightii*). These species follow a distinct elevational/exposure gradient in which Arizona white oak (*Q. arizonica*) is most dominant in the low-elevation/more exposed examples, while silverleaf oak (*Q. 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 of 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 Wright's silktassel (*Garrya wrightii*), black cherry (*Prunus serotina*), velvet ash (*Fraxinus velutina*), Arizona madrone (*Arbutus arizonica*), Arizona sycamore (*Platanus wrightii*), and Arizona walnut (*Juglans major*).

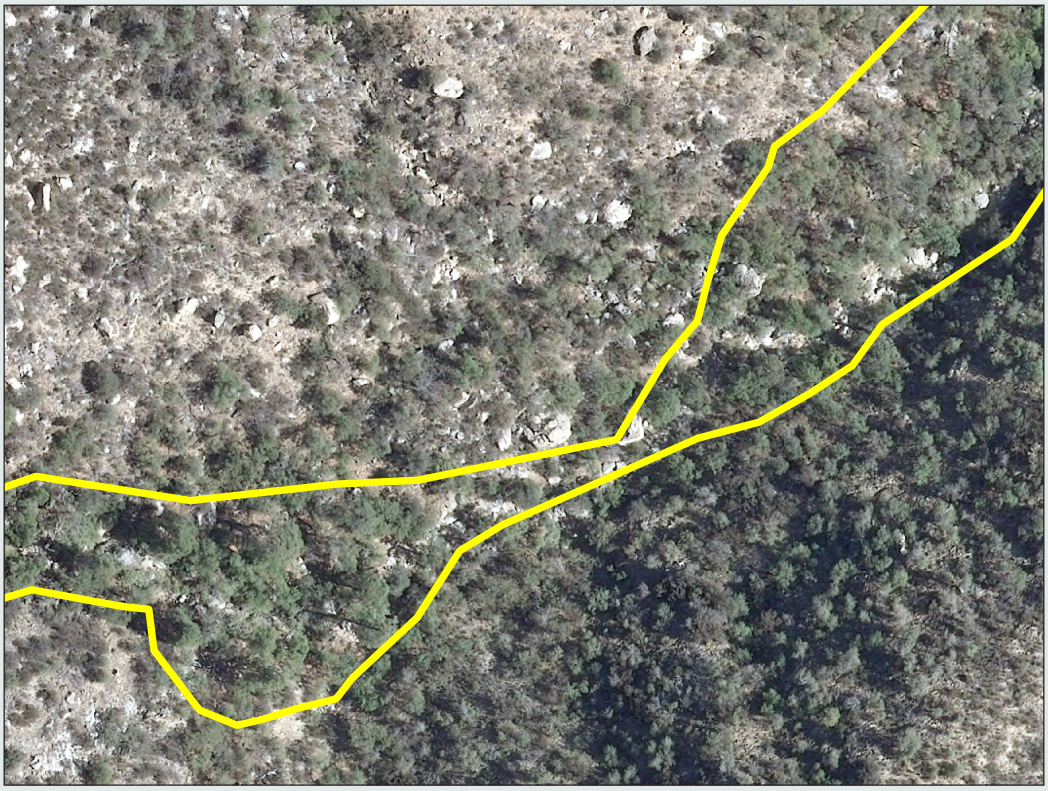
This community is contained within a two-association map class that covers 1.5% (410 ha/1,013 ac) of the Rincon Mountain District. This woodland is typically found in mid-elevation drainages and sheltered gullies throughout the pinyon/oak woodland communities and up to the large conifer/oak forests ranging from 1,350 to 2,200 meters (4,429–7,217 ft) in elevation. The surface cover is characterized by a mix of large boulders interspersed with fine gravel, often covered with a dense layer of oakleaf litter.



Example of [*Quercus arizonica - Quercus hypoleucoides*] Intermittently Flooded Woodland.



Distribution of [*Quercus arizonica - Quercus hypoleucoides*] Intermittently Flooded Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

81. [*Quercus hypoleucoides - Quercus arizonica*] Woodland Association (P)

[Silverleaf oak - Arizona white oak] Woodland Association (P)

Common species

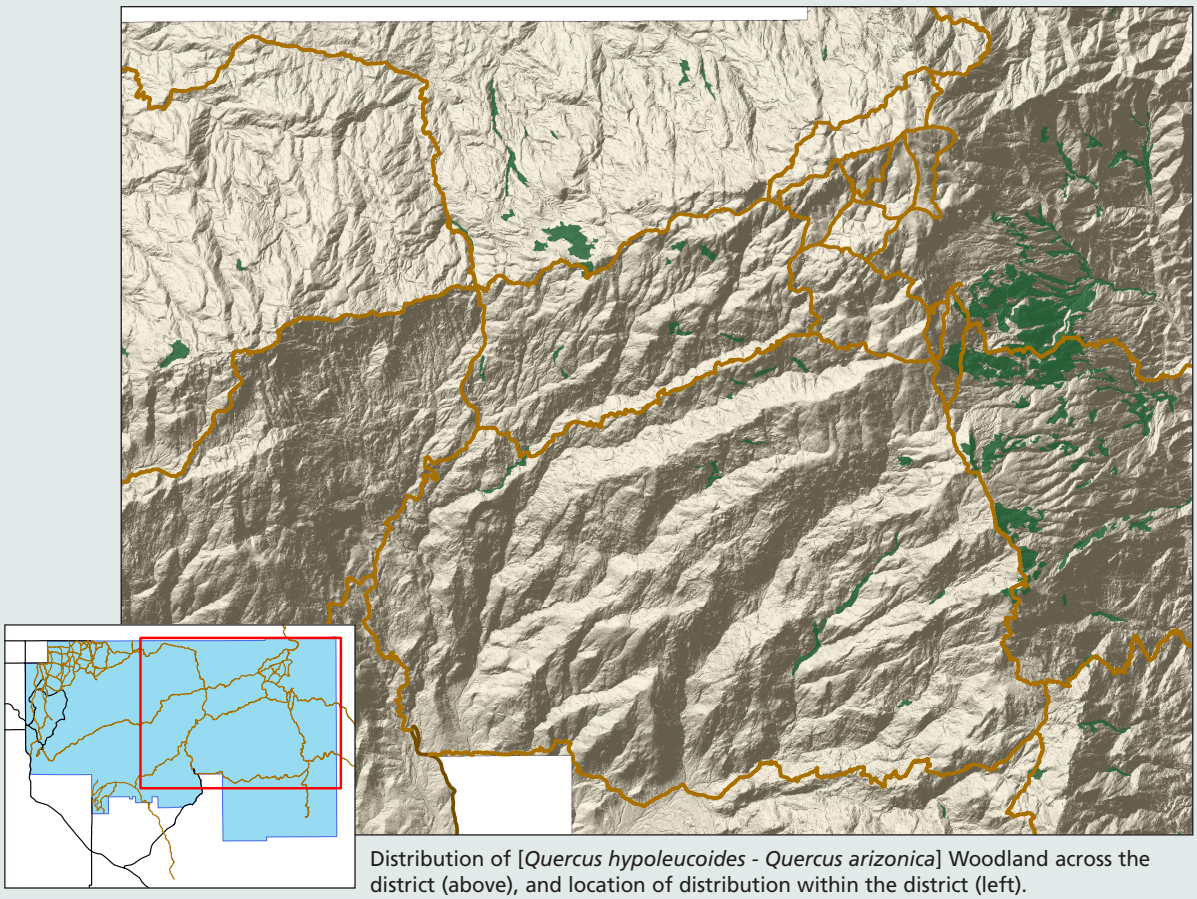
- *Quercus hypoleucoides*
- *Quercus arizonica*

This woodland community is characterized by a variably dense (30–65% cover) canopy (>5 m) co-dominated by silverleaf oak (*Quercus hypoleucoides*) and Arizona white oak (*Quercus arizonica*), with a sparse (<5% cover) 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*). The understory includes Arizona madrone (*Arbutus arizonica*), netleaf oak (*Quercus rugosa*), yucca (*Yucca madrensis*), beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), Pringle's manzanita (*Arctostaphylos pringlei*), Wright's silktassel (*Garrya wrightii*), and longtongue muhly (*Muhlenbergia longiligula*).

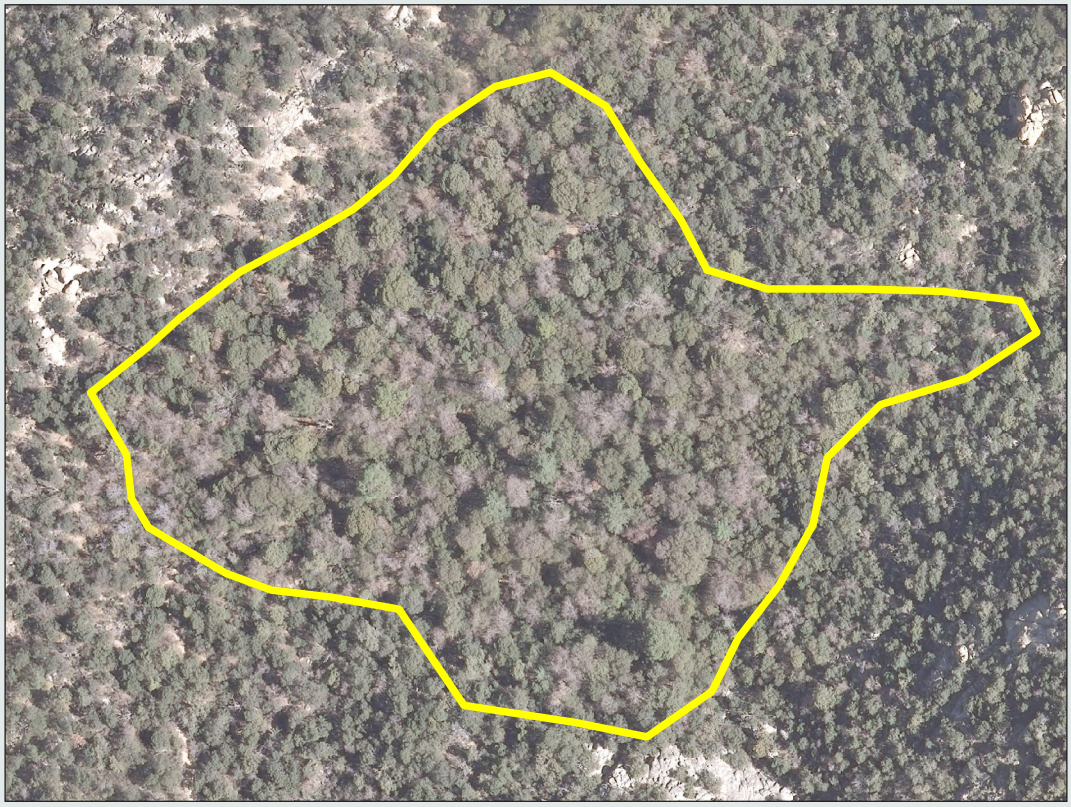
This community is contained within a two-association map class that covers 1.5% (410 ha/1,013 ac) of the Rincon Mountain District with the main examples occurring across the slopes below Reef Rock and Heartbreak Ridge. This woodland community is typically found on mountain backslopes of variable grade (10–50+%) from 1,860 to 2,160 meters (6,102–7,086 ft). 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.



Example of [*Quercus hypoleucoides - Quercus arizonica*] Woodland.



Distribution of [*Quercus hypoleucoides - Quercus arizonica*] Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

82. [*Quercus hypoleucoides - Quercus rugosa*] Intermittently Flooded Woodland Association (P)

[Silverleaf oak - Netleaf oak] Intermittently Flooded Woodland Association (P)

Common species

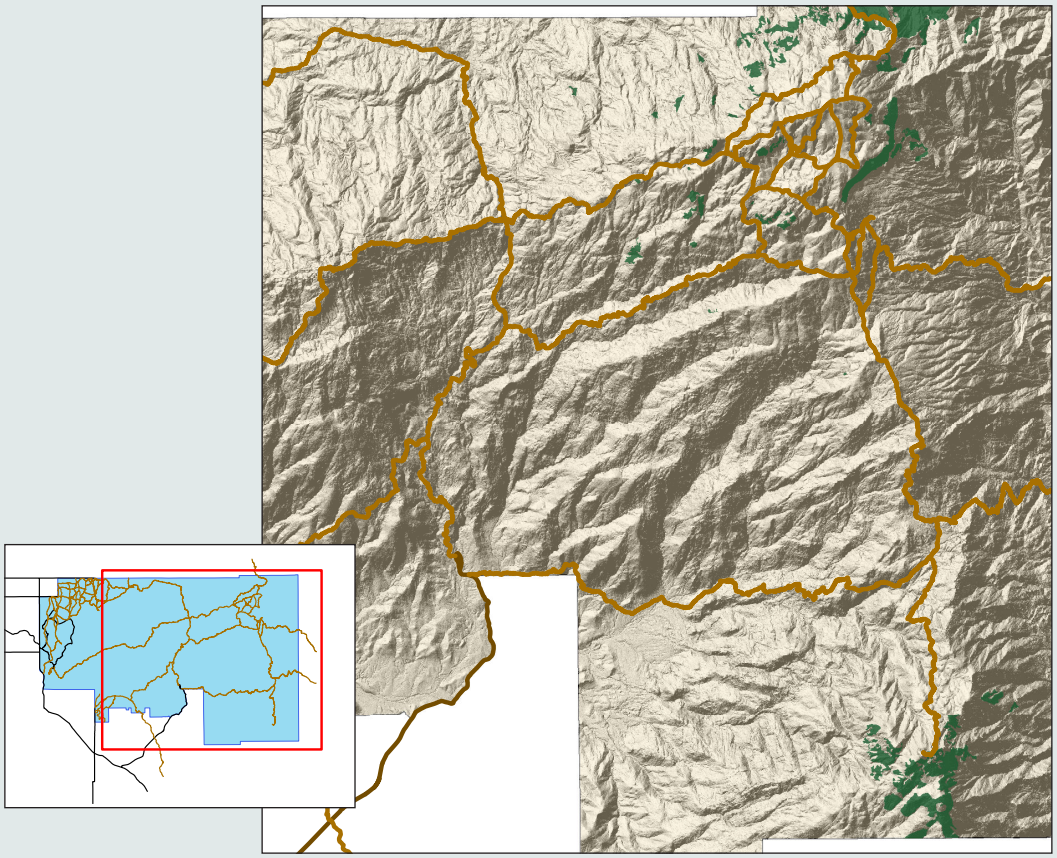
- *Quercus rugosa*
- *Quercus hypoleucoides*
- *Garrya wrightii*

This community is characterized by a variably dense (50–70% cover) 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 (*Garrya wrightii*). These species follow a distinct elevational/exposure gradient in which silverleaf oak (*Q. hypoleucoides*) is most dominant in the low-elevation/more exposed examples, while netleaf oak (*Q. 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 should never out-compete 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 Wright's silktassel (*G. wrightii*), black cherry (*Prunus serotina*), Arizona madrone (*Arbutus arizonica*), and Arizona walnut (*Juglans major*).

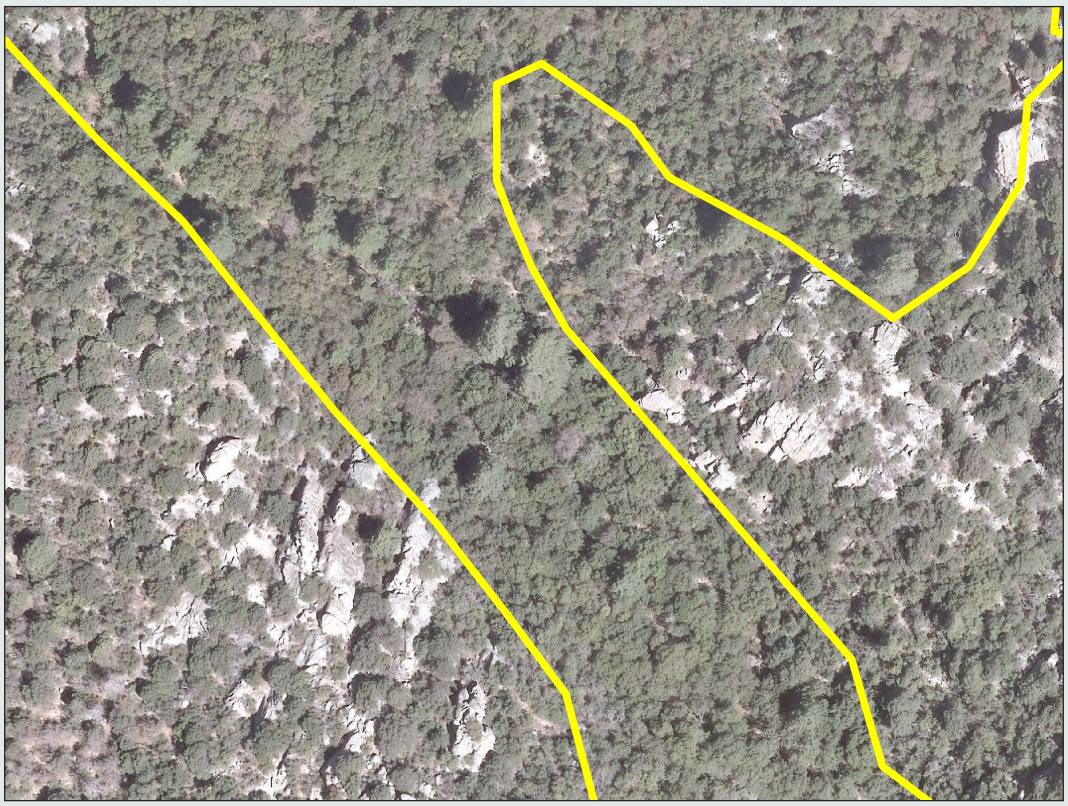
This community is contained within a two-association map class that covers 0.65% (179 ha/442 ac) of the Rincon Mountain District. This intermittently flooded woodland is typically found in mid-elevation drainages and sheltered gullies throughout the large conifer/oak forests ranging from 1,800 to 2,200 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.



Example of [*Quercus hypoleucoides - Quercus rugosa*] Intermittently Flooded Woodland.



Distribution of [*Quercus hypoleucoides - Quercus rugosa*] Intermittently Flooded Woodland across the district (left), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

83. [*Quercus rugosa - Quercus hypoleucoides*] Woodland Association (P)

[Netleaf oak - Silverleaf oak] Woodland Association (P)

Common species

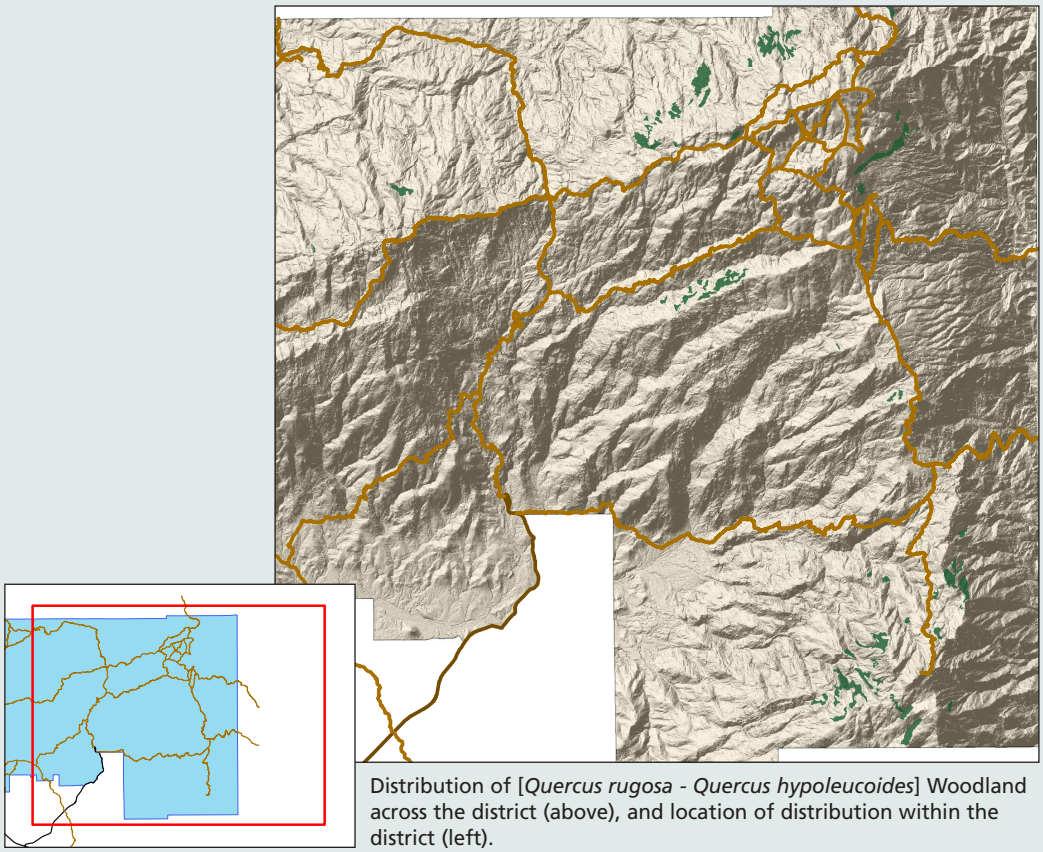
- *Quercus hypoleucoides*
- *Quercus rugosa*
- *Muhlenbergia longiligula*

This woodland community is characterized by a variably dense (30–65% cover) canopy (>5 m) co-dominated by silverleaf oak (*Quercus hypoleucoides*) and netleaf oak (*Quercus rugosa*), with a sparse (<5% cover) understory. 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*). The understory is a mix of shrubs, succulents, and perennial grasses, including beargrass (*Nolina microcarpa*), Fendler's ceanothus (*Ceanothus fendleri*), Pringle's manzanita (*Arctostaphylos pringlei*), Wright's silktassel (*Garrya wrightii*), longtongue muhly (*Muhlenbergia longiligula*), muttongrass (*Poa fendleri*), and Arizona wheatgrass (*Elymus arizonica*).

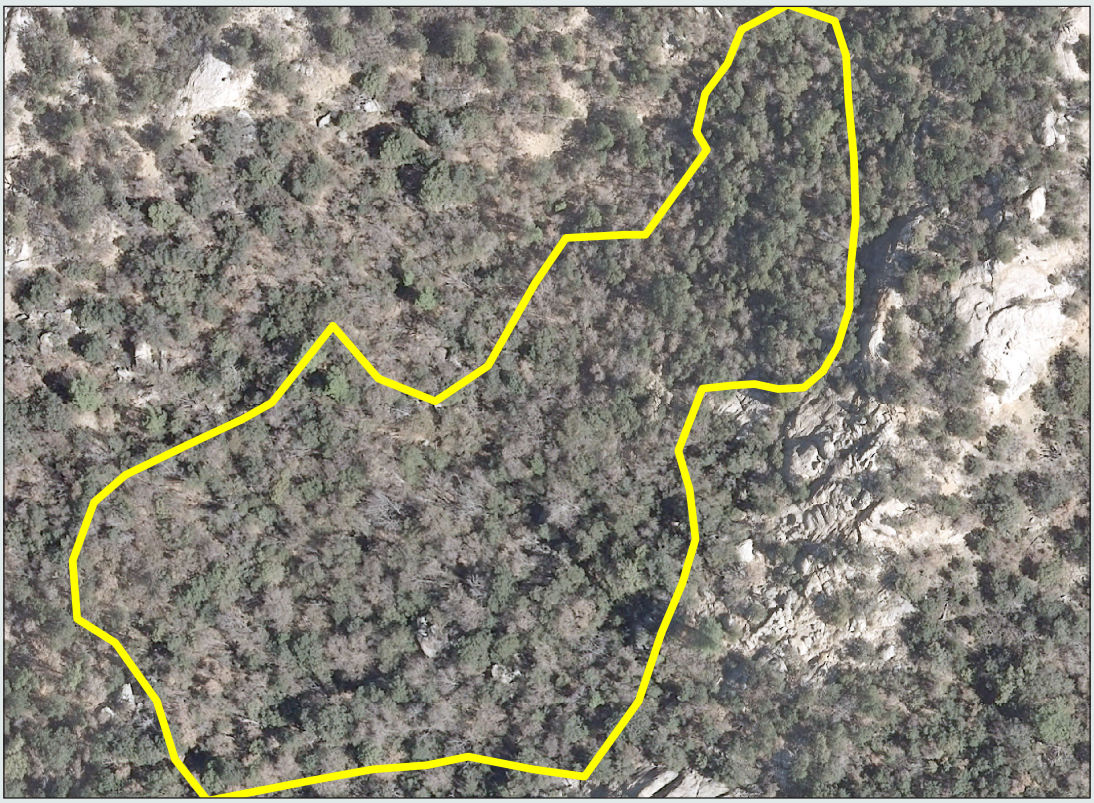
This community is contained within a two-association map class that covers 0.7% (179 ha/442 ac) of the Rincon Mountain District. Main examples occur around Rincon Peak, upper Madrona Canyon, below Reef Rock, and on the north slopes of Mica Mountain. This woodland community spans mountain backslopes of variable grade (10–50+%) from 2,000 to 2,500 meters (6,561–8,202 ft). 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.



Example of [*Quercus rugosa - Quercus hypoleucoides*] Woodland.



Distribution of [*Quercus rugosa - Quercus hypoleucoides*] Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

84. *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland Association

Gambel oak / Mountain snowberry Shrubland Association

Common species

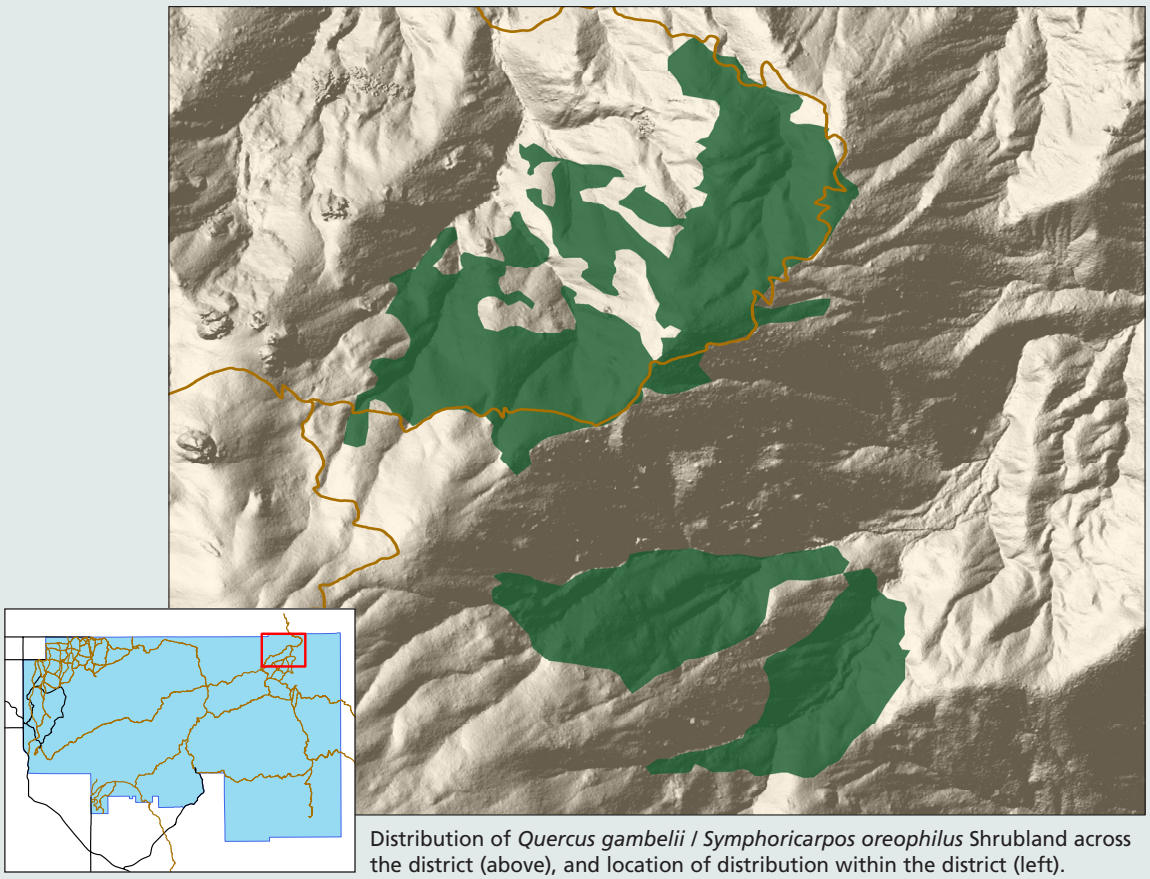
- *Quercus gambelii*
- *Symphoricarpos oreophilus*
- *Pteridium aquilinum*

This community is characterized by a lower canopy (2–5 m) solely dominated (10–20% cover) by regenerating Gambel oak (*Quercus gambelii*), with a variable understory most commonly dominated by mountain snowberry (*Symphoricarpos oreophilus*) or western brackenfern (*Pteridium aquilinum*). In the lower canopy, Gambel oak (*Q. gambelii*) is present as short (3–5 m), narrow-canopied regenerating trees with cover ranging from 10% to 20% across the community. The subcanopy stratum (0.5–2 m) presents as two distinct variations, one dominated by mountain snowberry (*S. oreophilus*) and one by western brackenfern (*P. aquilinum*). When dominant, mountain snowberry (*S. oreophilus*) provides cover of 5–10%, usually as small (0.5–1 m) shrubs often spanning the field (<0.5 m) and subcanopy strata. In the other variation, western brackenfern (*P. aquilinum*) provides variable cover of 15–40%, also spanning the field and subcanopy strata. Beyond the shorter versions of the species documented in the subcanopy, the field stratum (<0.5 m) is a sparse (5% cover) mix of subshrubs, forbs, and grasses, without any consistent dominants or associates.

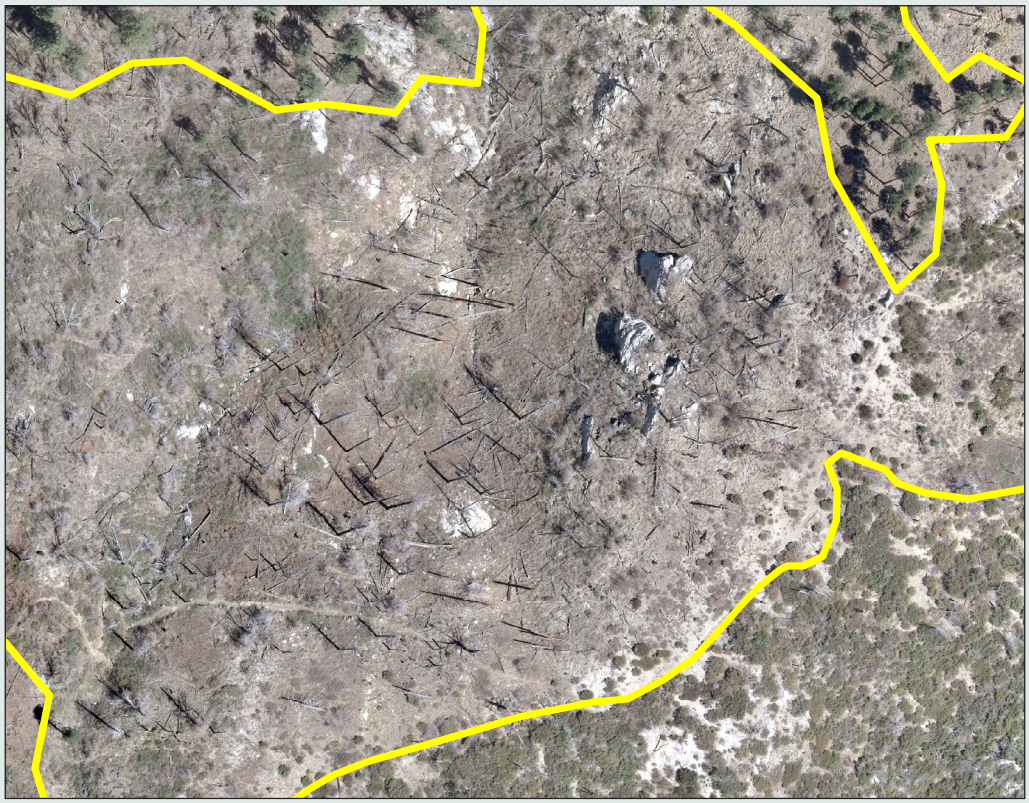
This community covers 0.1% (37 ha/92 ac) of the Rincon Mountain District and is scattered along the north slopes of Mica Mountain, with the largest examples located on the slopes northeast of the secondary fire lookout. It is typically found on moderately steep (30%), north-facing, upper backslopes from 2,250 to 2,500 meters (7,381–8,200 ft). The surface cover is characterized by a mix of well-drained skeletal loam ranging from very shallow to moderately deep, underlying a dominant layer of bare soil and fine gravel with patches of dense litter. All examples of this community showed evidence of historic fire disturbance and occur within the boundaries of the Helen's 2 (2003), Rincon (1994), and/or Manning Camp (1953) fires.



Example of *Quercus gambelii* / *Symphoricarpos oreophilus* Shrubland.



Distribution of *Quercus gambelii / Symphoricarpos oreophilus* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

85. (*Symphoricarpos oreophilus*) / *Ageratina herbacea* Shrubland Association (P)

(Mountain snowberry) / Fragrant snakeroot Shrubland Association (P)

Common species

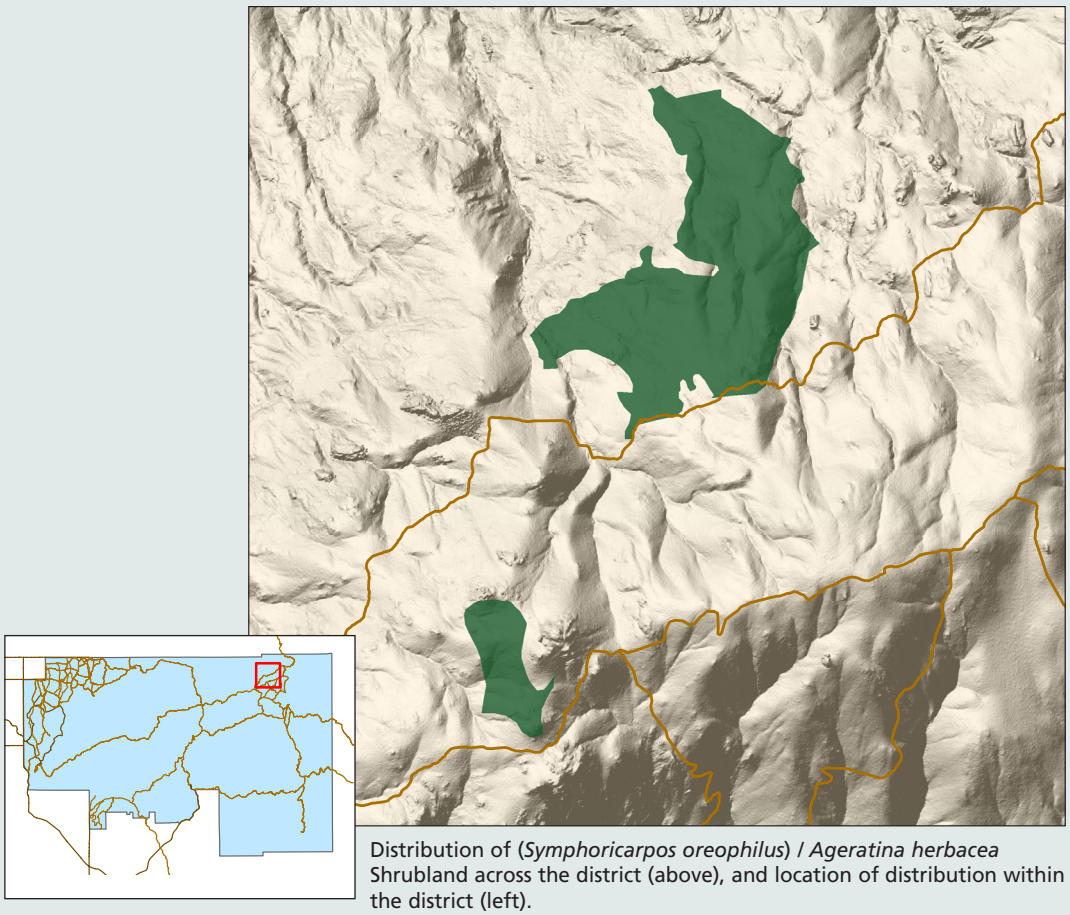
- *Symphoricarpos oreophilus*
- *Ageratina herbacea*

This shrubland community is characterized by a canopy (>5 m) of snags and a variable (10–30% cover) field stratum (<0.5 m) of mixed shrubs and grasses most commonly dominated by fragrant snakeroot (*Ageratina herbacea*), with mountain snowberry (*Symphoricarpos oreophilus*) as a common associate. The subcanopy stratum (0.5–2 m) is characterized by a low-cover (5–10% cover) mix of shrubs most commonly dominated by mountain snowberry (*S. oreophilus*). 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.

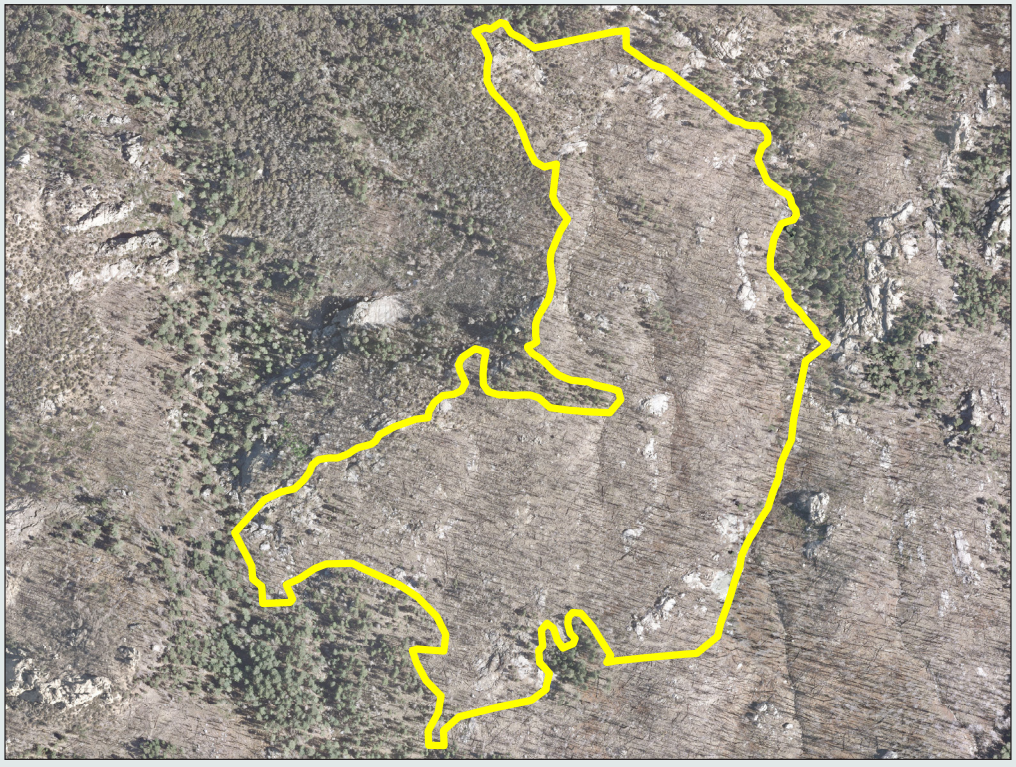
This community covers 0.08% (24 ha/59 ac) of the Rincon Mountain District and is present in areas of historic fire disturbance around the Mica Mountain summit. It is restricted to variably steep (23–70%), north-facing backslopes above 2,482 meters (8,149 ft). This community is a result of historic fire disturbance, specifically, the Helen's 2 fire that occurred in June 2003. The surface cover is predominantly bare soil and gravel with consistent downed wood throughout.



Example of (*Symphoricarpos oreophilus*) / *Ageratina herbacea* Shrubland.



Distribution of (*Symphoricarpos oreophilus*) / *Ageratina herbacea* Shrubland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

86. *Muhlenbergia virescens - Pteridium aquilinum - Ceanothus fendleri* Herbaceous Association (P)

Screwleaf muhly - Western brackenfern - Fendler's ceanothus Herbaceous Association (P)

Common species

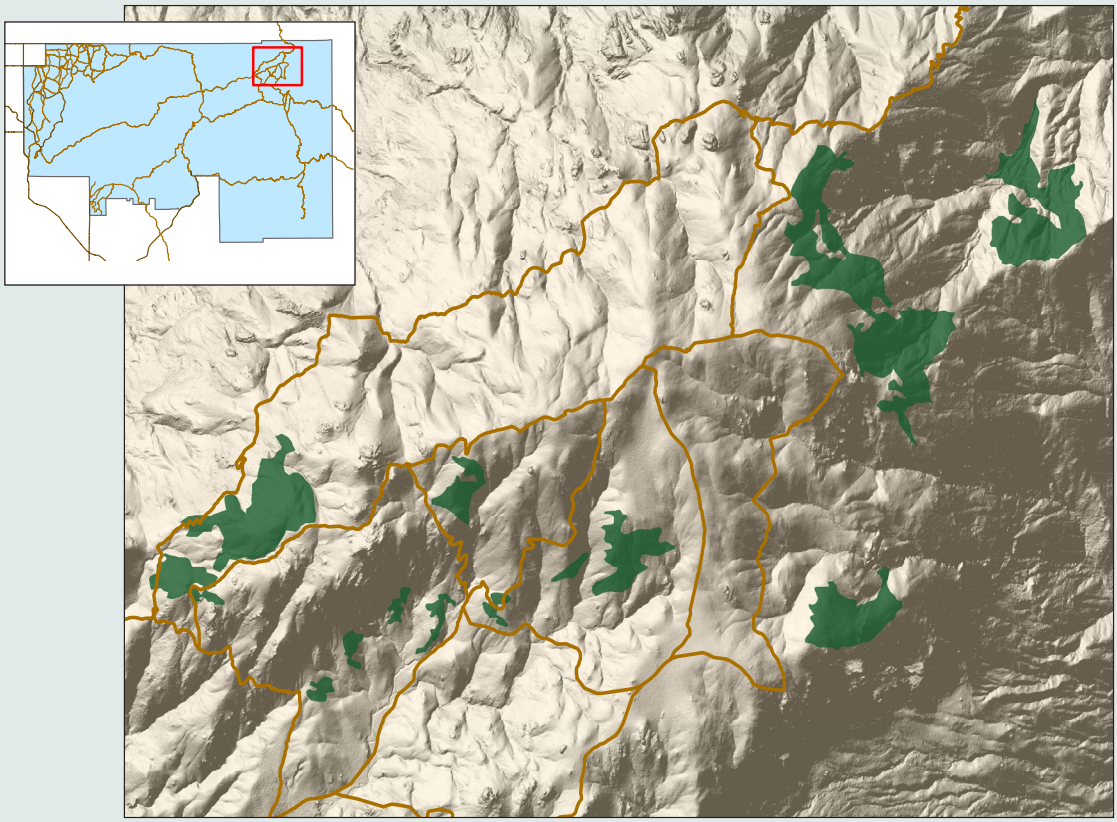
- *Muhlenbergia virescens*
- *Pteridium aquilinum*
- *Ceanothus fendleri*

This herbaceous community is characterized by a variably dense (30–50+% cover) 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*). The subcanopy stratum (0.5–2 m) is characterized by a low-cover (5%) mix of shrubs and regenerating trees without any consistent dominants or common associates. This community is defined by the dense (30–50+% cover) field stratum dominated by a suite of species that include western brackenfern (*P. aquilinum*), screwleaf muhly (*M. virescens*), and Fendler's ceanothus (*C. fendleri*). Of these, screwleaf muhly (*M. virescens*) is the most consistent (1.0) species, providing cover of 15–40% when dominant (0.6). Western brackenfern (*P. aquilinum*) is a slightly less-consistent (0.86) species, providing cover of 10–30% when dominant (0.6). Fendler's ceanothus (*C. fendleri*) is a consistent (0.86), but less-dominant (0.43) species, with average cover of less than 10%. Local dominance of these species is quite variable, with any combination—from a single species to all three—contributing dominant cover.

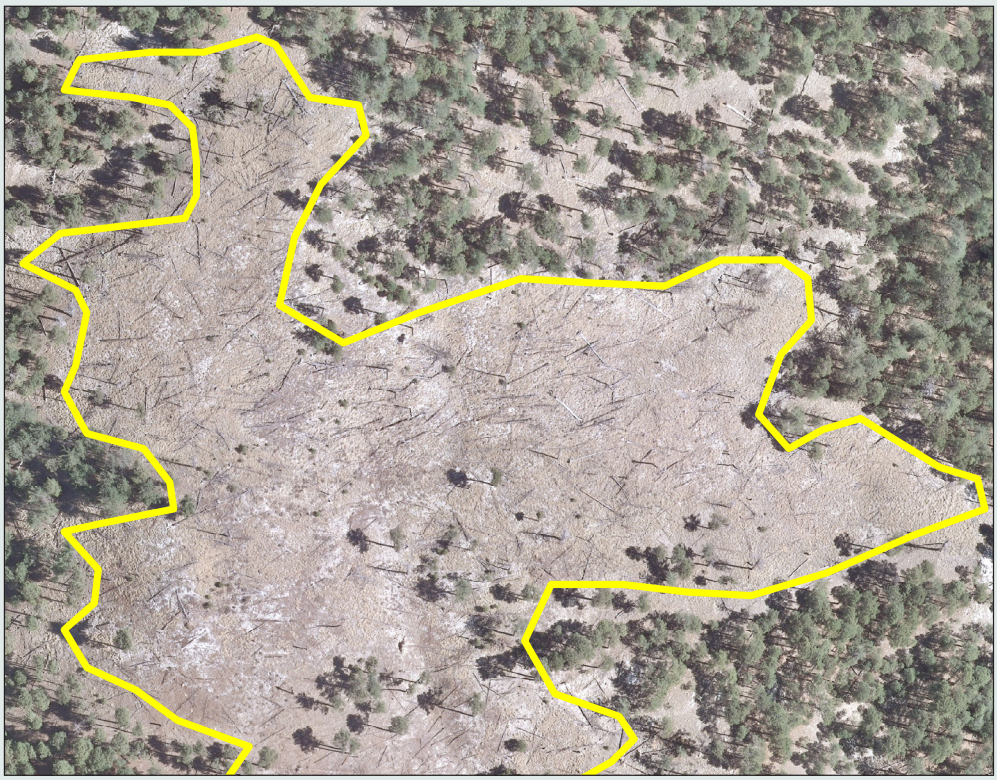
This community covers 0.2% (55 ha/137 ac) of the Rincon Mountain District, often in areas of historic fire disturbance around the Mica Mountain summit. It is restricted to variably steep (15–50%), generally north-trending backslopes above 2,482 meters (8,149 ft). The surface cover is predominantly bare 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 Fire in 2003.



Example of *Muhlenbergia virescens - Pteridium aquilinum - Ceanothus fendleri* Herbaceous Association.



Distribution of *Muhlenbergia virescens - Pteridium aquilinum - Ceanothus fendleri* Herbaceous Association across the district (above), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

87. *Pteridium aquilinum* Herbaceous Association (P)

Western brackenfern Herbaceous Association (P)

Common species

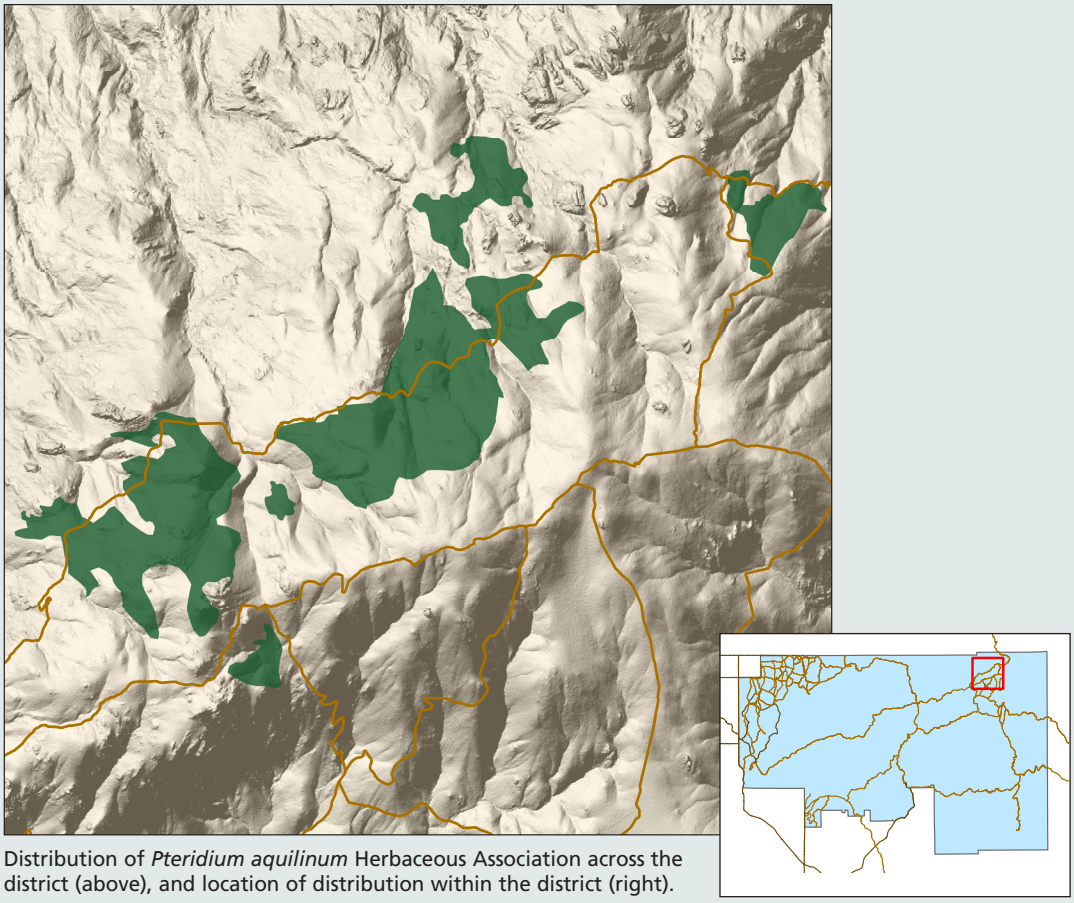
- *Pteridium aquilinum*

This herbaceous community is characterized by a canopy (>5 m) of snags and a variably dense (30–60% cover) subcanopy (0.5–2 m) stratum dominated by western brackenfern (*Pteridium aquilinum*). Pre-fire, this community was dominated by large conifers, mainly Douglas fir (*Pseudotsuga menziesii*), white fir (*Abies concolor*), ponderosa pine (*Pinus ponderosa*), and southwestern white pine (*Pinus strobiformis*), in the upper canopy (>5 m). Currently, living canopy trees are extremely rare. The lower canopy (2–5 m) is quite sparse (<5% cover), without any consistent dominants or common associates. The subcanopy stratum is consistently dominated by a dense (25–50+% cover) layer of western brackenfern (*P. aquilinum*). The field stratum is a low-cover (<10%), diverse mix of forbs, subshrubs, and graminoids, with no consistent dominants or common associates.

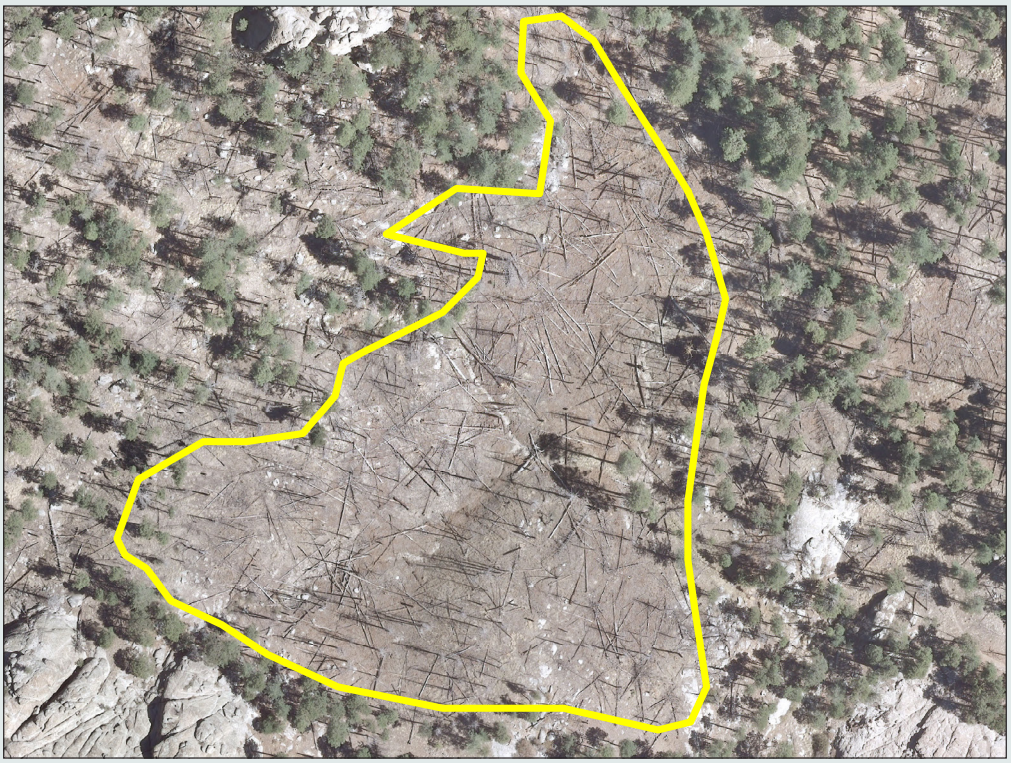
This community covers 0.2% (50 ha/124 ac) of the Rincon Mountain District and is present in areas of historic fire disturbance around the Mica Mountain summit. It is restricted to variably steep (23–70%), north-facing backslopes above 2,482 meters (8,149 ft). This community is a result of historic fire disturbance, specifically the Helen's 2 Fire that occurred in June 2003. The surface cover is dominated by dense fern litter with downed wood throughout.



Example of *Pteridium aquilinum* Herbaceous Association.



Distribution of *Pteridium aquilinum* Herbaceous Association across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

88. *Populus tremuloides* Forest Association

Quaking aspen Forest Association

Common species

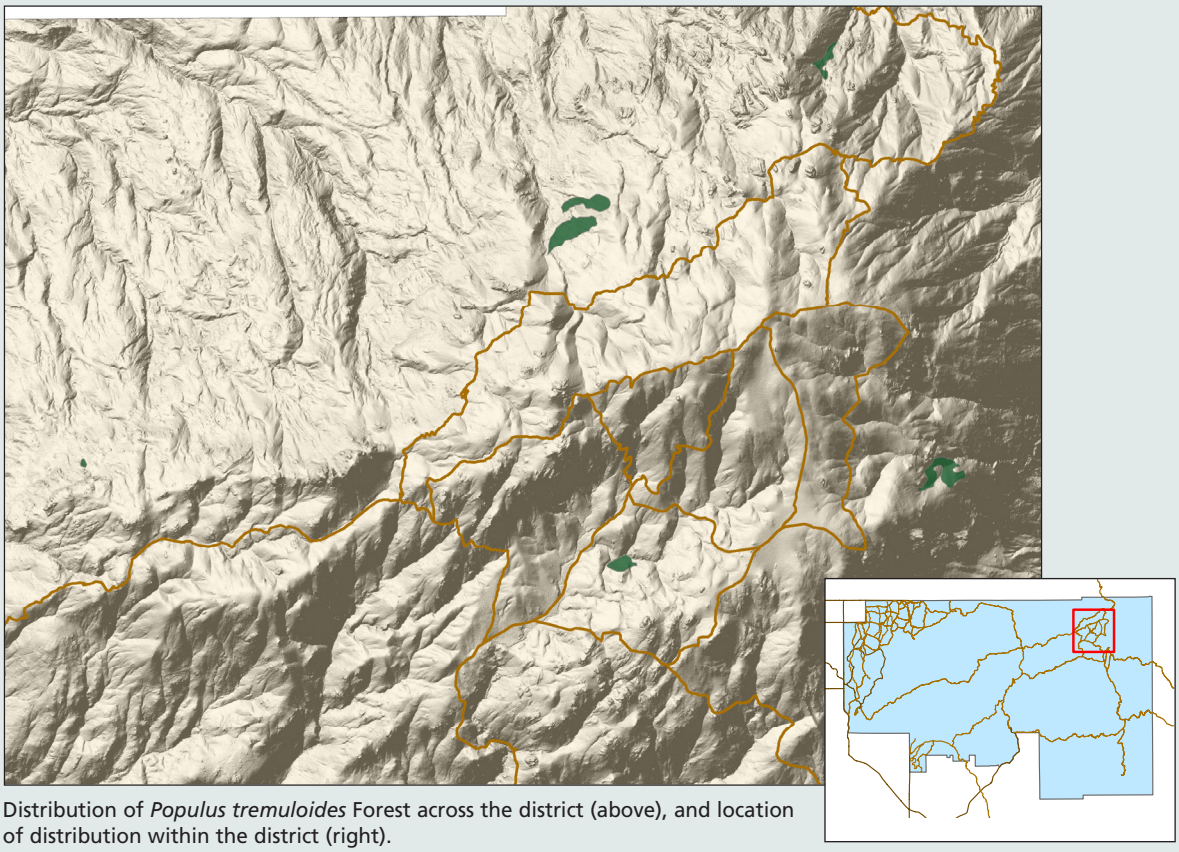
- *Populus tremuloides*

This forest community is characterized by a dense (40–60% cover) canopy (>2 m) solely dominated by quaking aspen (*Populus tremuloides*), with a variable understory not containing 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 (*P. tremuloides*) are present in various layers of the canopy structure, and 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) and overall cover is similar to mature groves. 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 of 20–60%. California buckthorn (*Frangula californica*) and mountain snowberry (*Symphoricarpos oreophilus*) were each dominant in at least one example of this community, with cover of around 15% and 20%, respectively. The regenerating groves tend to have a sparse to non-existent subcanopy (0.5–2 m), with cover of less than 5%.

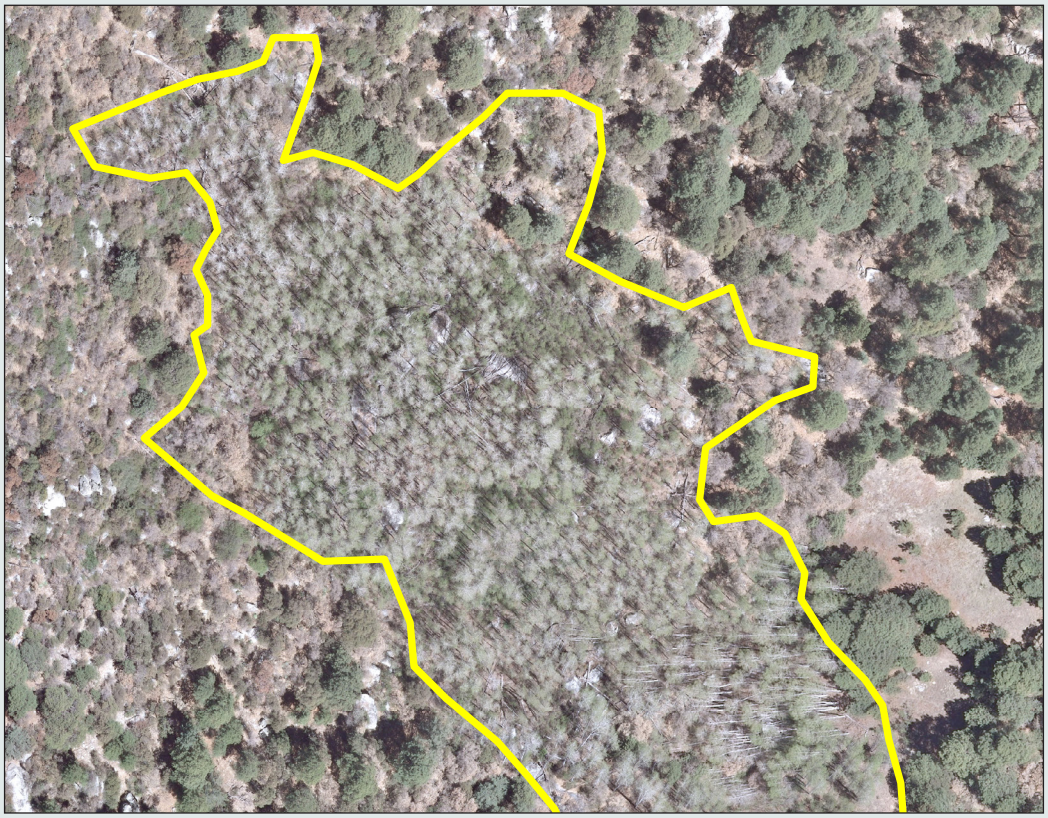
This community covers 0.03% (9 ha/23 ac) of the Rincon Mountain District and is found throughout the upper-elevation reaches of the range, with the largest occurrence located southwest of Spud Rock Campground. It is found on variably steep (20–50%) and predominantly north to northeast-facing slopes from 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.



Example of *Populus tremuloides* Forest.



Distribution of *Populus tremuloides* Forest across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

89. *Pinus arizonica* (*Pinus strobiformis*) / *Muhlenbergia virescens* Forest Association (P)

Arizona pine (Southwestern white pine) / Screwleaf muhly Forest Association (P)

Common species

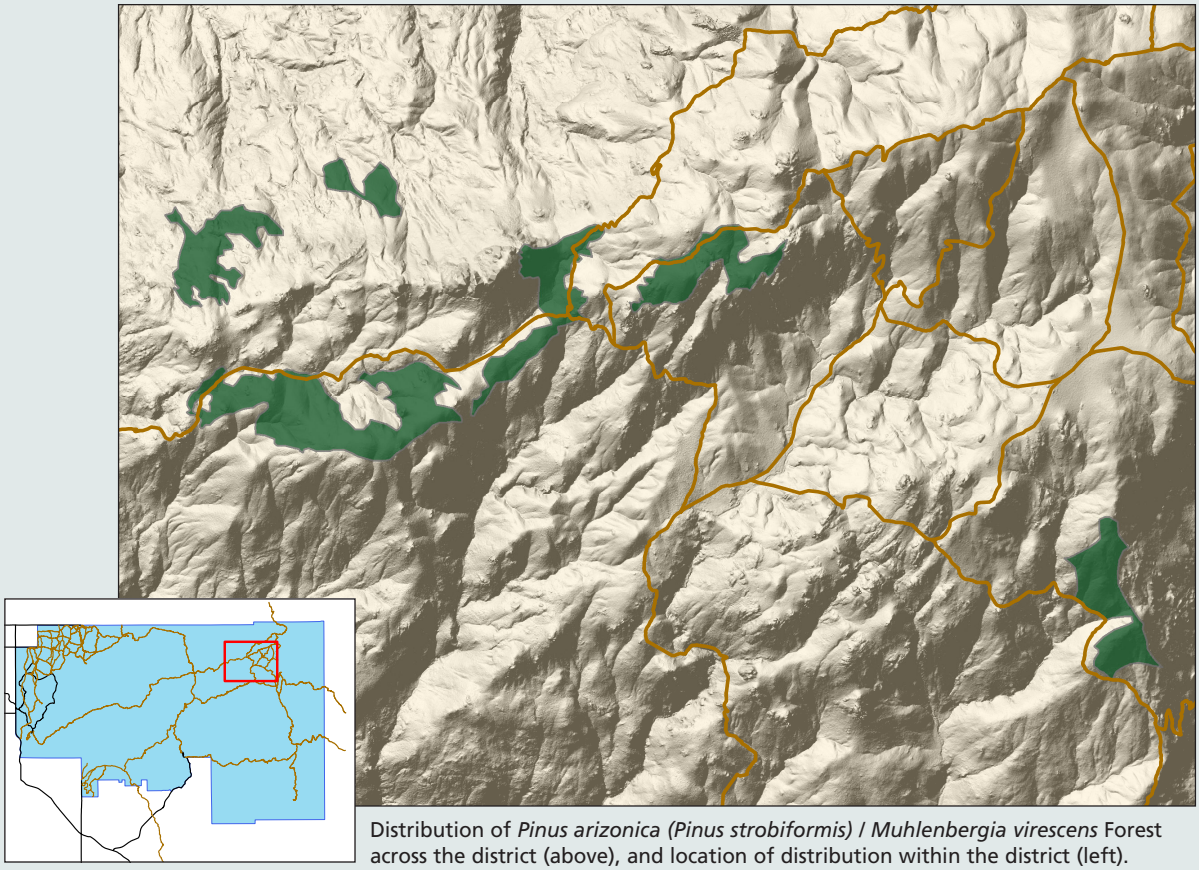
- *Pinus arizonica*
- *Pinus strobiformis*
- *Muhlenbergia virescens*
- *Muhlenbergia tricholepis*

This forest community is characterized by a variably dense (30–60% cover) 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. Gambel oak (*Quercus gambelii*) is an occasional (0.5) associate that can provide noteworthy inclusions with cover up to 10%. The lower canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5% cover), with no clear dominants or common associates. 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 (*M. virescens*) is the most consistent, with average cover of around 10%, with some areas ranging up to 20%. In order from most to least dominant, other noteworthy graminoids include pine dropseed (*Muhlenbergia tricholepis*), White Mountain sedge (*Carex geophila*), prairie Junegrass (*Koeleria macrantha*), mountain muhly (*Muhlenbergia montana*), Pringle's speargrass (*Piptochaetium pringlei*), and Arizona wheatgrass (*Elymus arizonica*).

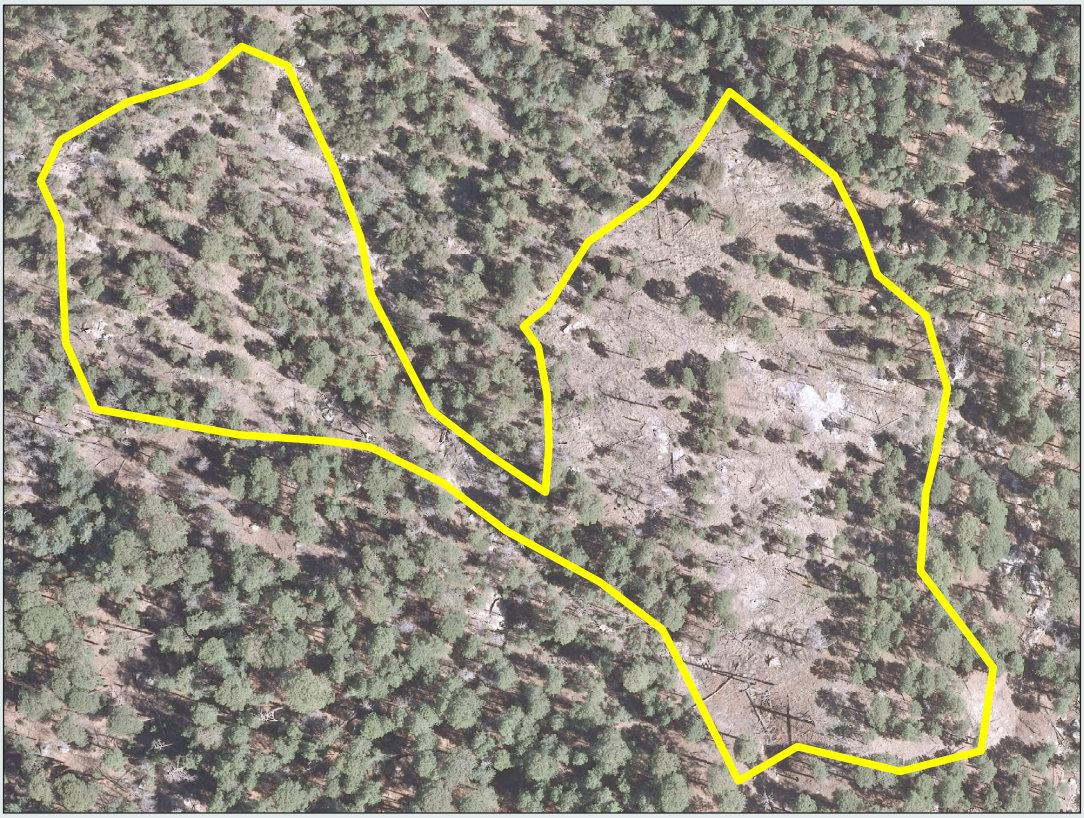
This community covers 0.18% (49 ha/121 ac) of the Rincon Mountain District and is present where the low-angle basin around the Manning Camp trail system begins to drop off to the south. It is found on moderate (20–30%) slopes of varying aspects above 2,400 meters (7,874 ft). The surface cover is dominated 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.



Example of *Pinus arizonica (Pinus strobiformis) / Muhlenbergia virescens* Forest.



Distribution of *Pinus arizonica (Pinus strobiformis) / Muhlenbergia virescens* Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

90. *Pinus arizonica* / *Pteridium aquilinum* Forest Association (P)

Arizona pine / Western brackenfern Forest Association (P)

Common species

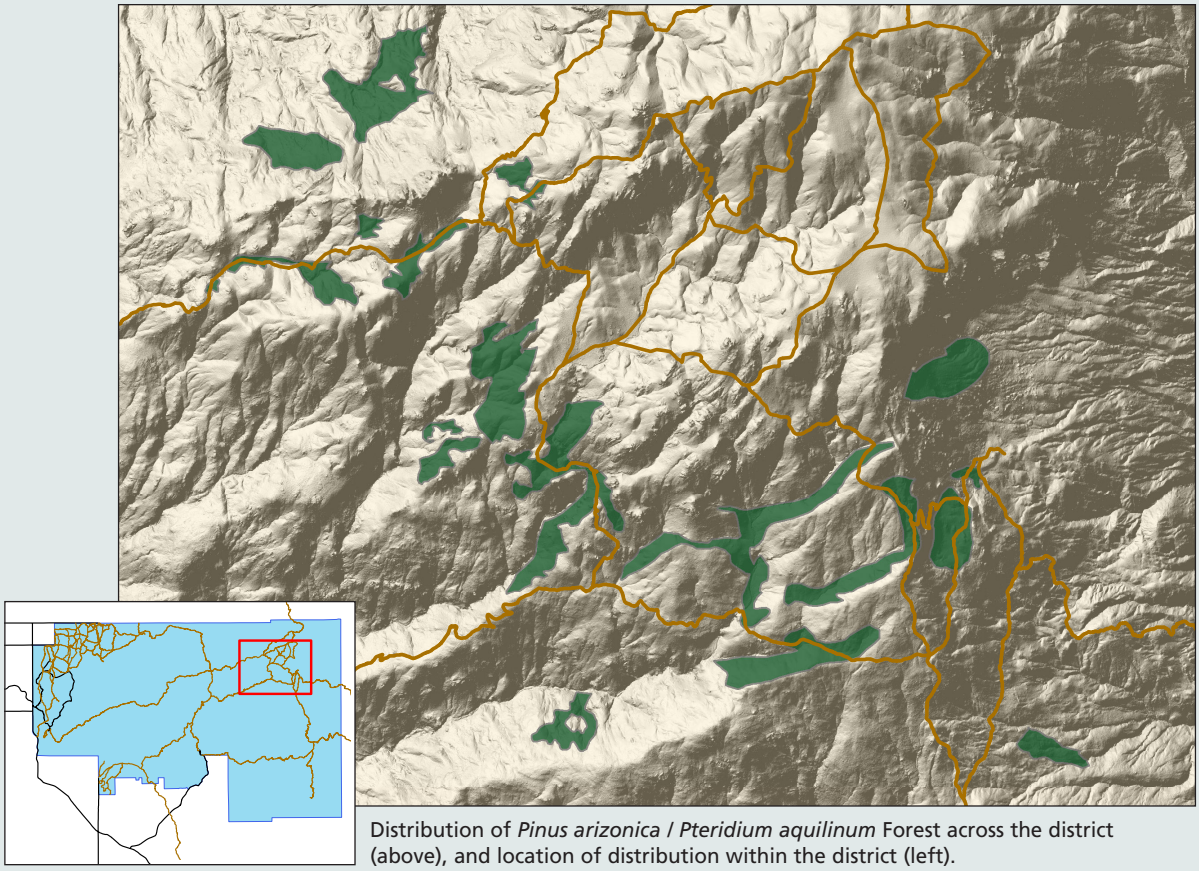
- *Pinus arizonica*
- *Pinus strobiformis*
- *Quercus gambelii*
- *Pteridium aquilinum*

This forest community is characterized by a variably dense (40–80% cover) upper canopy (>5 m) solely dominated by Arizona pine (*Pinus arizonica*), with a understory dominated (20–40% cover) by western brackenfern (*Pteridium aquilinum*). Arizona pine (*P. arizonica*) is present as large ([15] 20–30 m) trees with variable cover of 40–60%. Southwestern white pine (*Pinus strobiformis*) and Gambel oak (*Quercus gambelii*) are consistent (0.80) associates. The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5% cover), 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. The field stratum (<0.5 m) is characterized by the sole dominance of western brackenfern (*P. aquilinum*). This species contributes cover ranging from 15% to 40%, with the highest cover occurring in and along low-angle drainages.

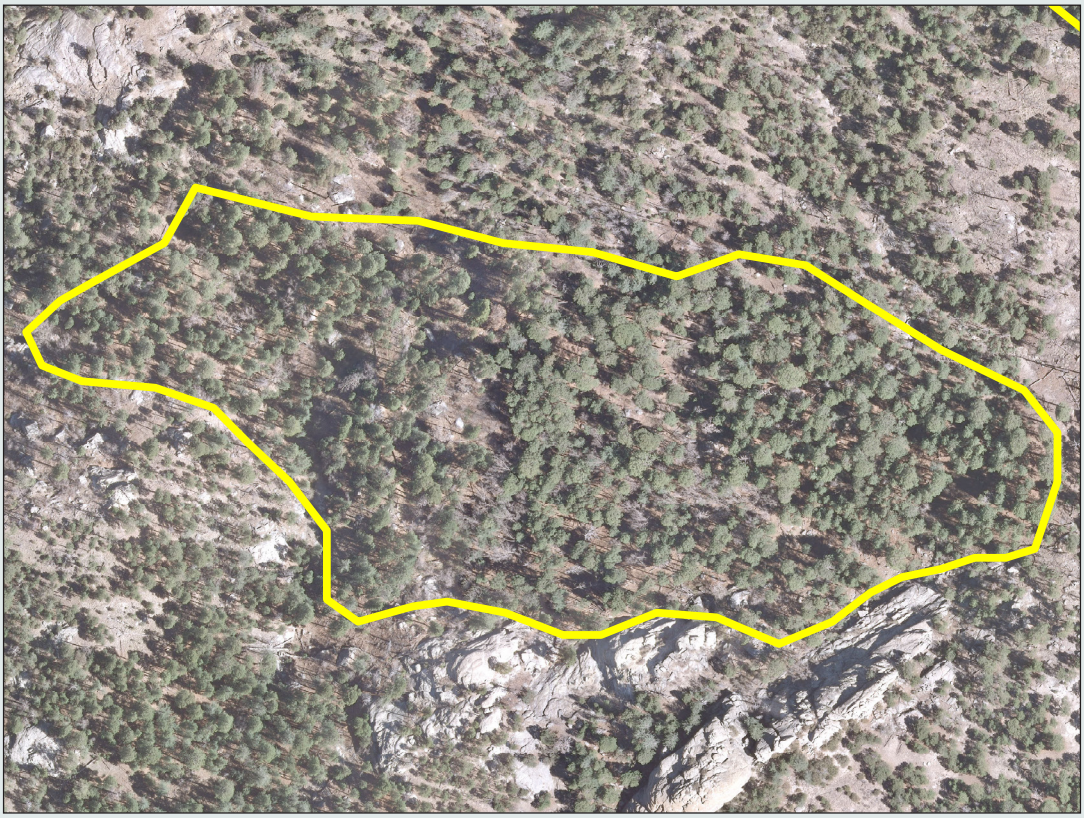
This community is contained within a two-association map class that covers 0.5% (125 ha/309 ac) of the Rincon Mountain District and is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and the Mica Mountain summit. It is found on low-angle (<20%) slopes and along 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.



Example of *Pinus arizonica* / *Pteridium aquilinum* Forest.



Distribution of *Pinus arizonica* / *Pteridium aquilinum* Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

91. *Pinus arizonica* Forest Association (P)

Arizona pine Forest Association (P)

Common species

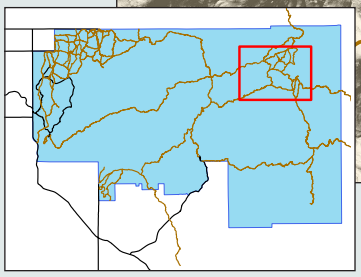
- *Pinus arizonica*
- *Pinus strobiformis*

This forest community is characterized by a variably dense (40–80% cover) upper canopy (>5 m) solely dominated by Arizona pine (*Pinus arizonica*), with a sparse understory containing no consistent dominants or common associates. Arizona pine (*P. arizonica*) is present as large (10–20 m) trees with variable cover of 30–60%. Southwestern white pine (*Pinus strobiformis*) is an inconsistent (0.33) associate that typically occurs at the upper elevational range of this community. The understory strata are extremely sparse (<5% cover) and may include California buckthorn (*Frangula californica*), Fendler's ceanothus (*Ceanothus fendleri*), New Mexico locust (*Robinia neomexicana*), and/or Wright's silktassel (*Garrya wrightii*), 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*).

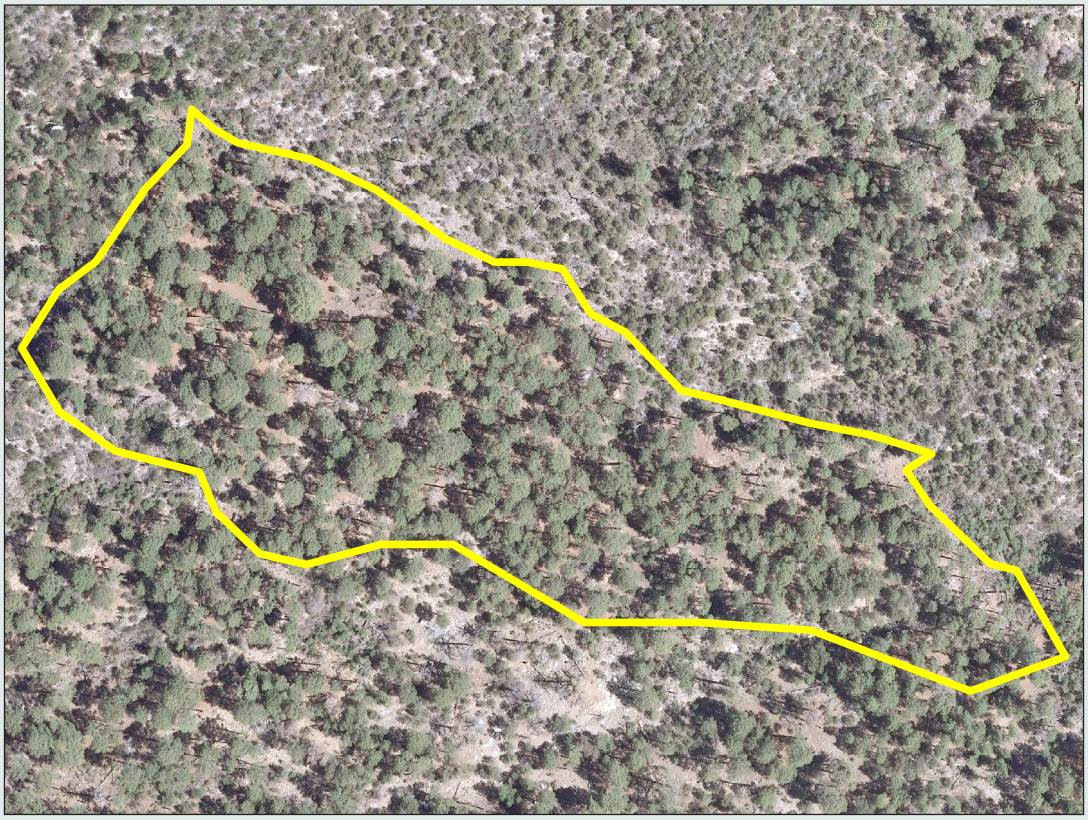
This community is contained within a two-association map class that covers 0.5% (125 ha/309 ac) of the Rincon Mountain District and is present on the slopes of Heartbreak Ridge and the low-angle, south-trending areas surrounding Manning Camp. It is typically found on moderate (20%) slopes with a generally 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.



Example of *Pinus arizonica* Forest.



Distribution of *Pinus arizonica* Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

92. *Pinus ponderosa - Pinus strobiformis* Forest Association

Ponderosa pine - Southwestern white pine Forest Association

Common species

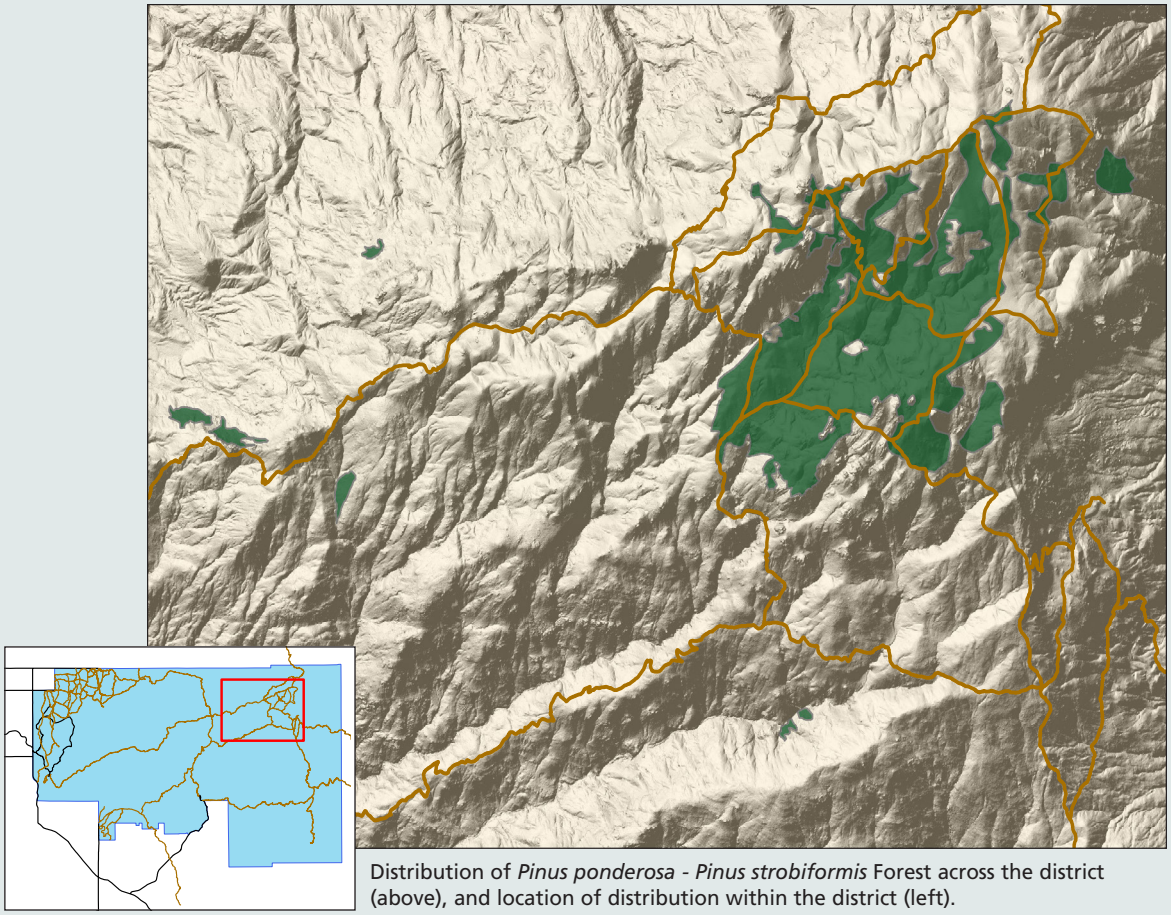
- *Pinus ponderosa*
- *Pinus strobiformis*
- *Quercus gambelii*

This forest community is characterized by a variably dense (40–80% cover) upper canopy (>5 m) solely dominated by ponderosa pine (*Pinus ponderosa*), with a sparse understory containing no consistent dominants or common associates. Ponderosa pine (*P. ponderosa*) is present as large (10–20 m) trees with variable cover of 30–70%. Other documented tree species include southwestern white pine (*Pinus strobiformis*), Gambel oak (*Quercus gambelii*), Chihuahuan pine (*Pinus leiophylla*), alligator juniper (*Juniperus deppeana*), silverleaf oak (*Quercus hypoleucoides*), Arizona white oak (*Quercus arizonica*), and netleaf oak (*Quercus rugosa*). The sparse (<5% cover) understory may include mountain snowberry (*Symphoricarpos oreophilus*), Fendler's ceanothus (*Ceanothus fendleri*), California buckthorn (*Frangula californica*), 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*).

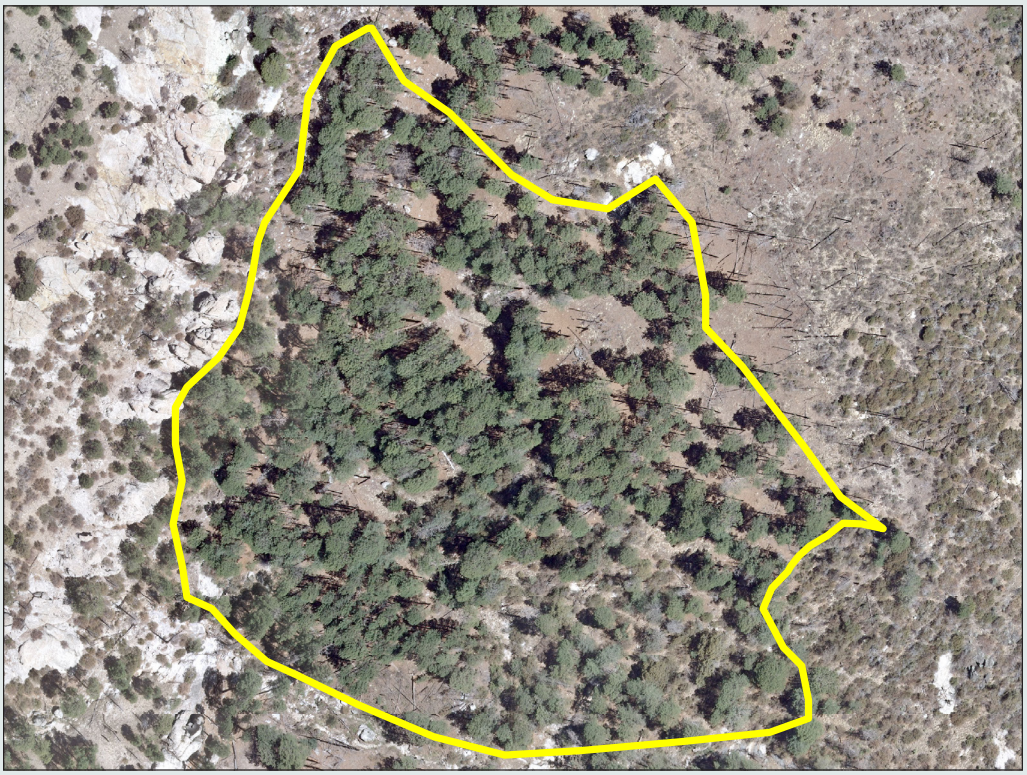
This community is contained within a two-association map class that covers 0.7% (192 ha/474 ac) of the Rincon Mountain District and is present throughout the trail system that surrounds Manning Camp and Devil's Bathtub, with some occurrences on the south side of Rincon Peak. It is found on moderate (20%) 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.



Example of *Pinus ponderosa - Pinus strobiformis* Forest.



Distribution of *Pinus ponderosa - Pinus strobiformis* Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

93. *Pinus ponderosa* (*Pinus strobiformis*) / *Muhlenbergia virescens* Woodland Association (P)

Ponderosa pine (Southwestern white pine) / Screwleaf muhly Woodland Association (P)

Common species

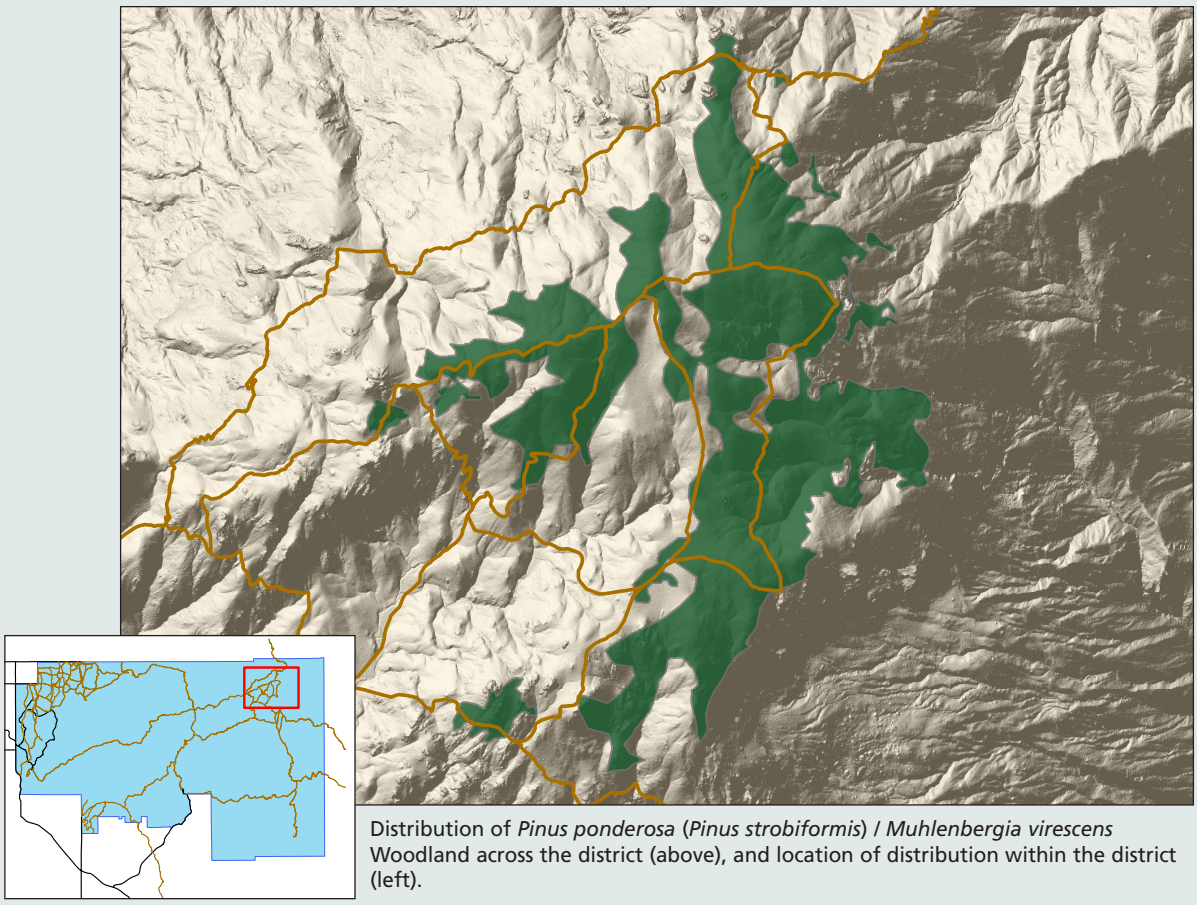
- *Pinus ponderosa*
- *Pinus strobiformis*
- *Muhlenbergia virescens*
- *Muhlenbergia tricholepis*

This woodland community is characterized by a variably open (10–40% cover) upper canopy (>5 m) dominated by ponderosa pine (*Pinus ponderosa*) with southwestern white pine (*Pinus strobiformis*) and a similar (10–40% cover) field layer (<0.5 m) dominated by perennial grasses, typically screwleaf muhly (*Muhlenbergia virescens*). The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5% cover), with no clear dominants or common associates. The field stratum (<0.5 m) is characterized by a mix of perennial graminoids most commonly dominated by screwleaf muhly (*M. virescens*). Other noteworthy species include pine dropseed (*Muhlenbergia tricholepis*), 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*).

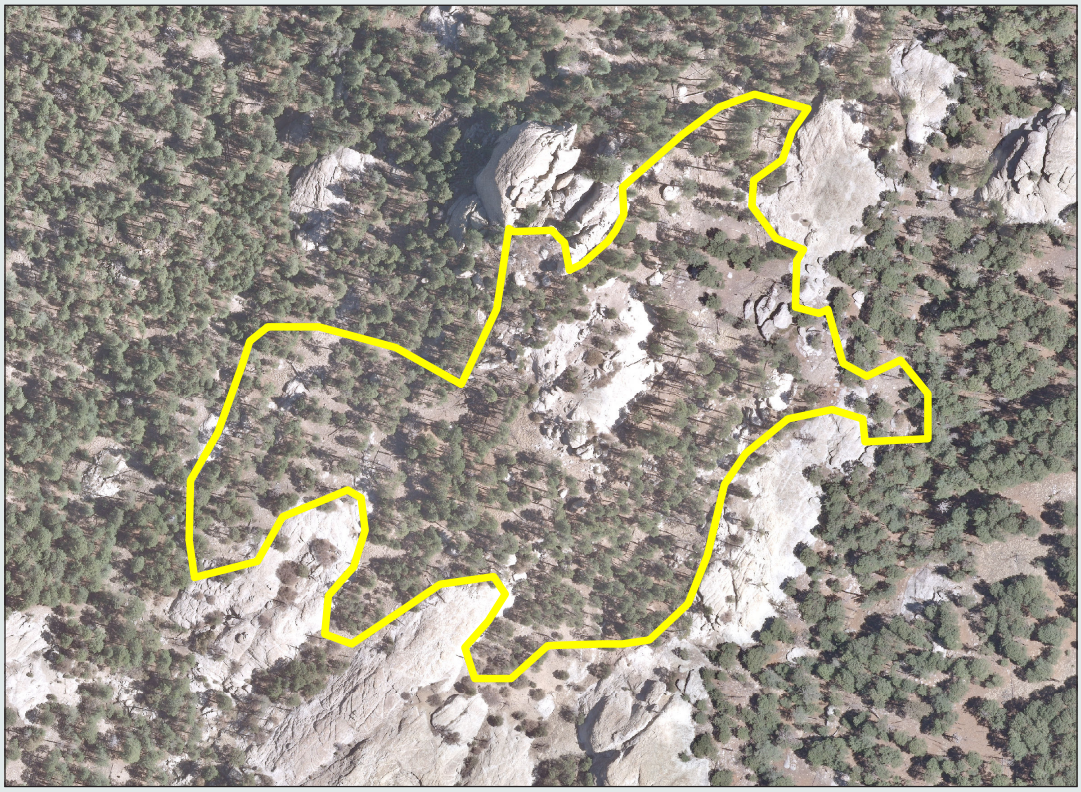
This community covers 0.5% (145 ha/358 ac) of the Rincon Mountain District and is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and the Mica Mountain summit. It is typically found on moderate (20%) slopes of varying aspects above 2,400 meters (7,874 ft). The 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.



Example of *Pinus ponderosa* (*Pinus strobiformis*) / *Muhlenbergia virescens* Woodland.



Distribution of *Pinus ponderosa* (*Pinus strobiformis*) / *Muhlenbergia virescens* Woodland across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

94. *Pinus ponderosa* / *Pteridium aquilinum* Forest Association

Ponderosa pine / Western brackenfern Forest Association

Common species

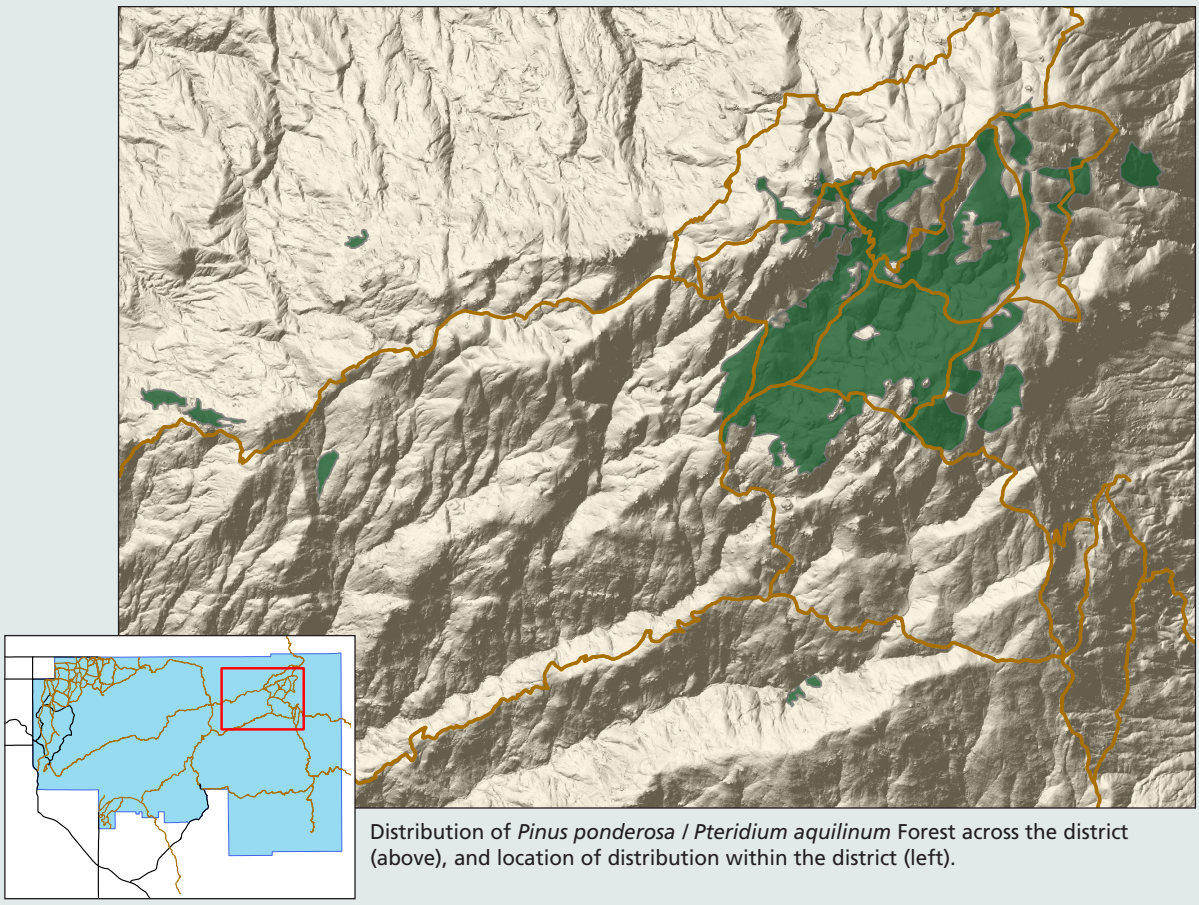
- *Pinus ponderosa*
- *Pinus strobiformis*
- *Pteridium aquilinum*

This forest community is characterized by a variably dense (40–80% cover) upper canopy (>5 m) solely dominated by ponderosa pine (*Pinus ponderosa*), with an understory dominated (20–40% cover) by western brackenfern (*Pteridium aquilinum*). Ponderosa pine (*P. ponderosa*) is present as large ([15] 20–30 m) trees with variable cover of 40–60%. 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 of 15–30%, at times becoming a subdominant or co-dominant tree. Gambel oak (*Quercus gambelii*) is another consistent (0.80) associate with cover of usually less than 5%. The field stratum (<0.5 m) is characterized by the sole dominance of western brackenfern (*P. aquilinum*). This species contributes cover of 15–40%, 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*).

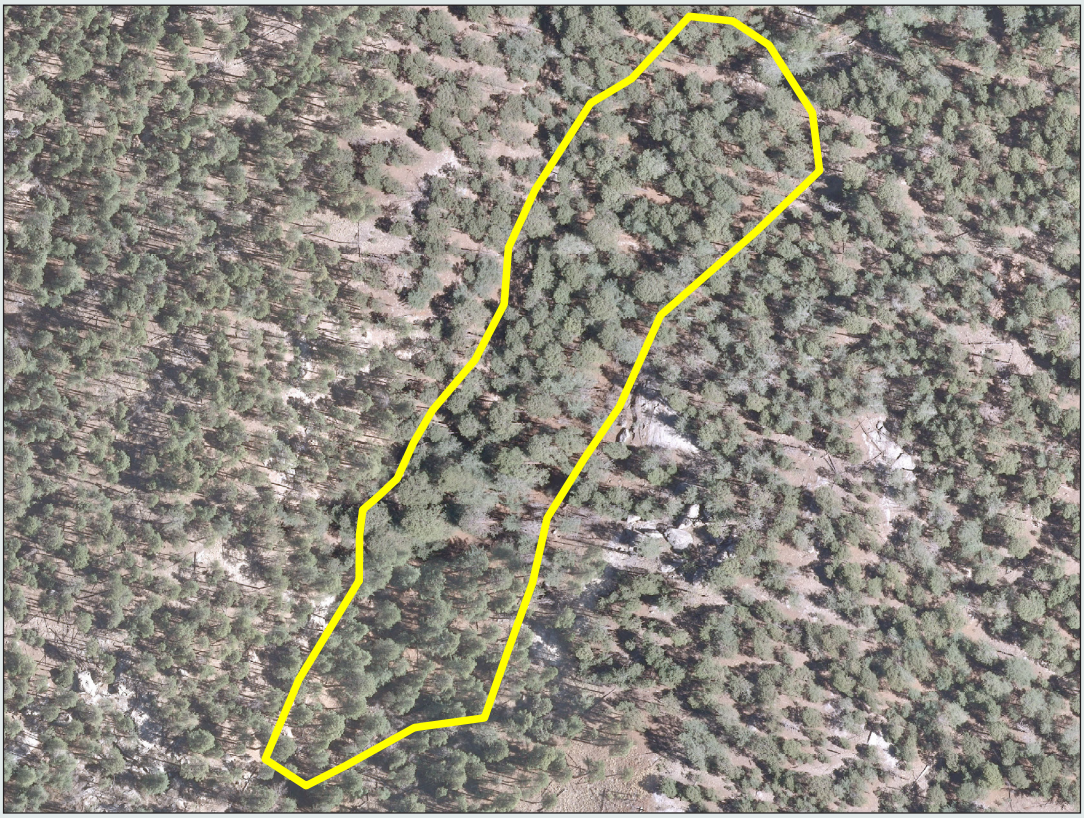
This community is contained within a two-association map class that covers 0.7% (192 ha/474 ac) of the Rincon Mountain District and is present throughout the trail system that surrounds Manning Camp, Spud Rock, Helen's Dome, and the Mica Mountain summit. It is found on low-angle (<20%) slopes and along 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.



Example of *Pinus ponderosa* / *Pteridium aquilinum* Forest.



Distribution of *Pinus ponderosa / Pteridium aquilinum* Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

95. *Pseudotsuga menziesii - Pinus* (*arizonica - ponderosa*) / (*Quercus gambelii*) Forest Association (P)

Douglas fir - Pine (Arizona - ponderosa) / (Gambel oak) Forest Association (P)

Common species

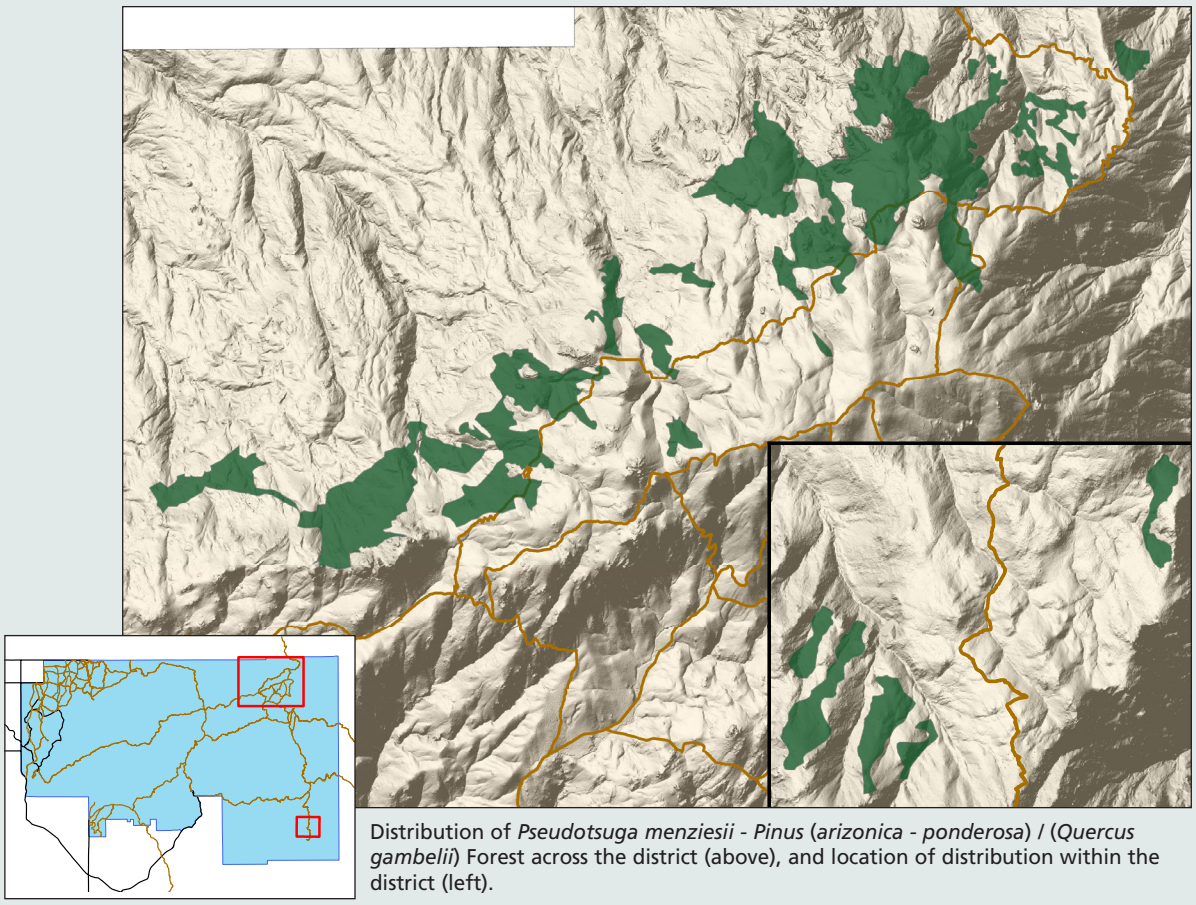
- *Pseudotsuga menziesii*
- *Pinus arizonica*
- *Pinus ponderosa*
- *Quercus gambelii*

This forest community is characterized by a dense (30–60% cover) 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 (*P. menziesii*) is present as large (10–20 m) trees with variable cover of 20–30%. Overall, the two pines are slightly lower in the canopy (8–15 m), with similar cover ranging from 15% to 30%. In general, either Arizona pine (*P. arizonica*) or ponderosa pine (*P. ponderosa*) is present, typically not co-occurring. Gambel oak (*Q. gambelii*) is variably positioned in the canopy structure, with heights ranging from low (5 m) trees in the understory to large (13 m) trees with heights similar to the conifers. The subcanopy stratum (0.5–2 m) is extremely sparse (<5% cover) and may include New Mexico locust (*Robinia neomexicana*), mock orange (*Philadelphus* sp.), rock spirea (*Holodiscus dumosa*), and/or California false indigo (*Amorpha californica*). The field stratum (<0.5 m) is also sparse (<10% cover), 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*).

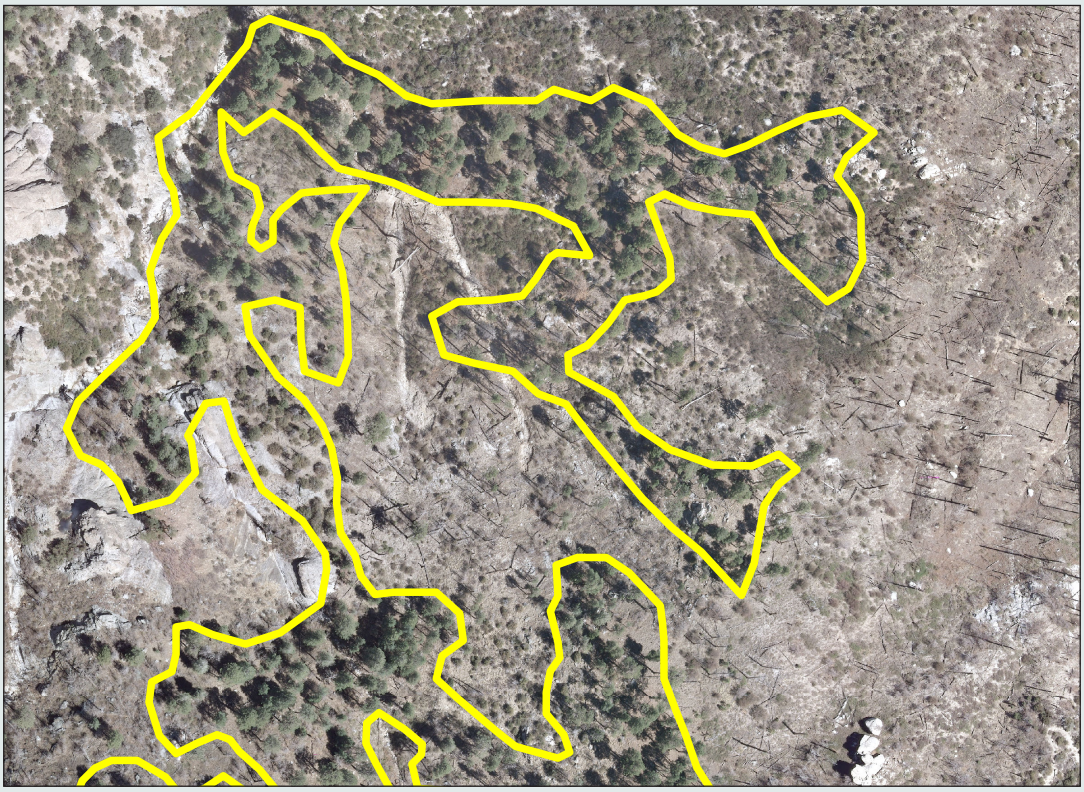
This community covers 0.5% (126 ha/311 ac) of the Rincon Mountain District and is present near the summits of Mica Mountain and Rincon Peak. It is typically located on moderately steep (20–30 [50] %), exclusively north-facing backslopes above 2,150 meters (7,053 ft). Often, this community is found north of large topographic/geologic features (e.g., Rincon Peak, Mica Mountain, and Helen's Dome) that create areas 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.



Example of *Pseudotsuga menziesii - Pinus* (*arizonica - ponderosa*) / (*Quercus gambelii*) Forest.



Distribution of *Pseudotsuga menziesii - Pinus* (*arizonica - ponderosa*) / (*Quercus gambelii*) Forest across the district (above), and location of distribution within the district (left).



Example of satellite imagery for one polygon.

96. *Pseudotsuga menziesii* / *Pinus strobiformis* Forest Association (P)

Douglas fir / Southwestern white pine Forest Association (P)

Common species

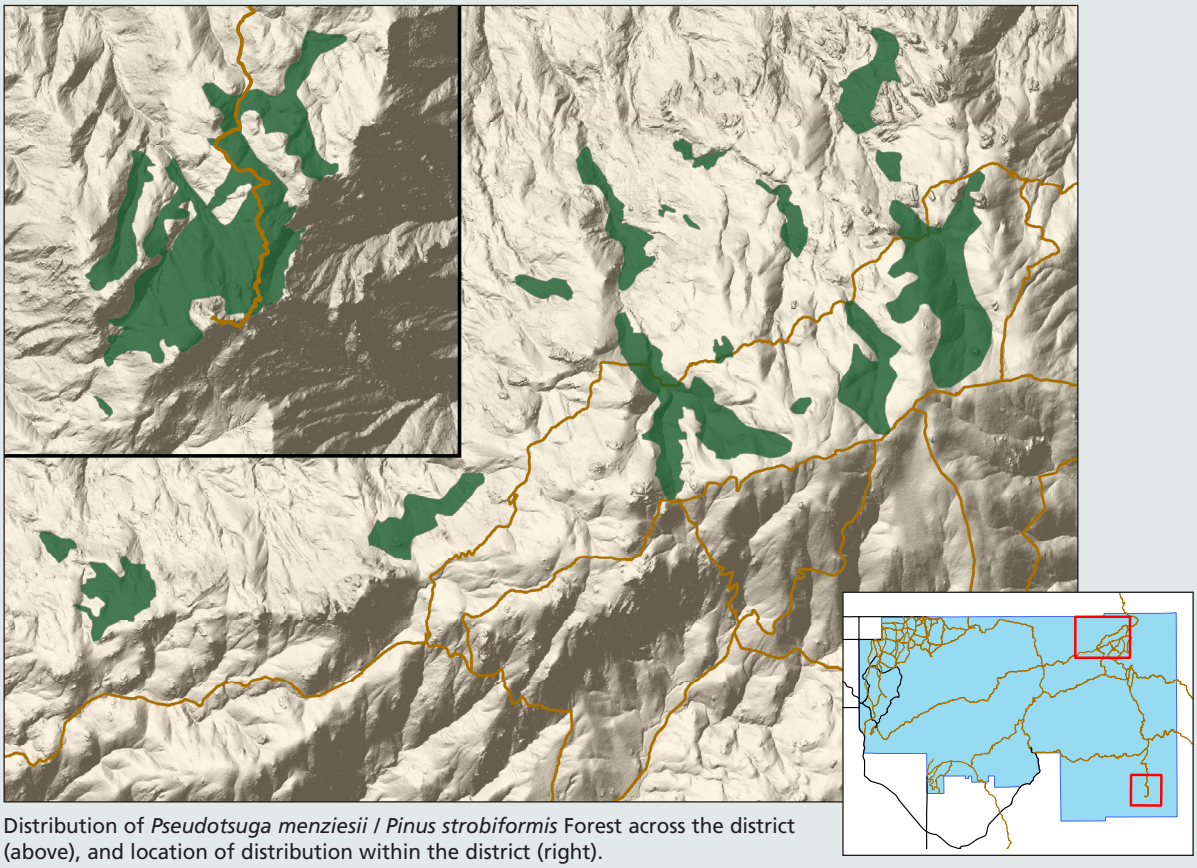
- *Pseudotsuga menziesii*
- *Pinus strobiformis*

This forest community is characterized by a dense (50–80% cover) upper canopy (>5 m) dominated by Douglas fir (*Pseudotsuga menziesii*) with subdominant southwestern white pine (*Pinus strobiformis*). Douglas fir (*P. menziesii*) is present as large (15–30 m) trees, with dense cover of 35–70%. Southwestern white pine (*P. strobiformis*) is a shorter-statured tree that provides variable cover of 10–30%. The lower-canopy (2–5 m) and subcanopy (0.5–2 m) strata are extremely sparse (<5% cover), with no clear dominants or common associates. The field stratum (<0.5 m) presents as two distinct variations. One is extremely sparse (<5% cover), with no clear dominants or associates, while the other contains a dominant layer of western brackenfern (*Pteridium aquilinum*). When present, this species provides cover of 5–20%. This variation is most common in areas of fire disturbance with a more open canopy, but was also documented in densely forested areas.

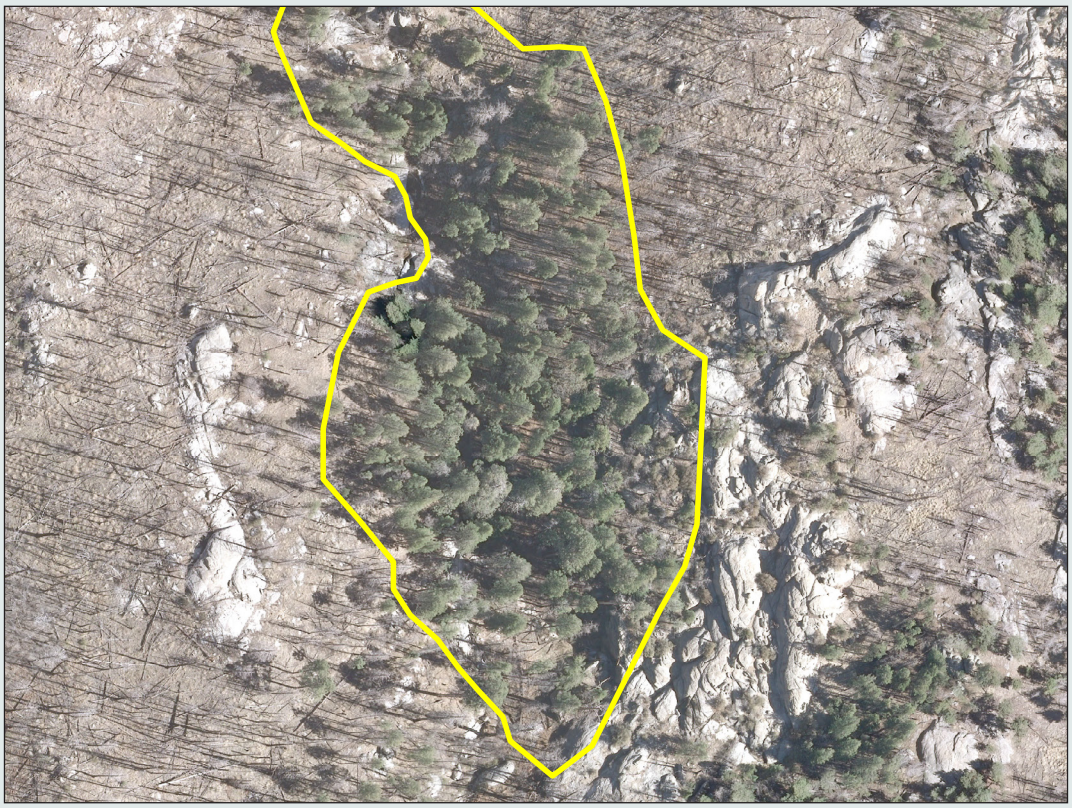
This community covers 0.5% (124 ha/306 ac) in the Rincon Mountain District and is present near the summits of Mica Mountain and Rincon Peak. It is typically found on steep (30–50+%), exclusively north-facing backslopes above 2,200 meters (7,217 ft) and deep, sheltered drainages that can reach down to 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.



Example of *Pseudotsuga menziesii* / *Pinus strobiformis* Forest.



Distribution of *Pseudotsuga menziesii* / *Pinus strobiformis* Forest across the district (above), and location of distribution within the district (right).



Example of satellite imagery for one polygon.

97. *Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos oreophilus* Woodland Association (P)

Gambel oak / New Mexico locust / Mountain snowberry Woodland Association (P)

Common species

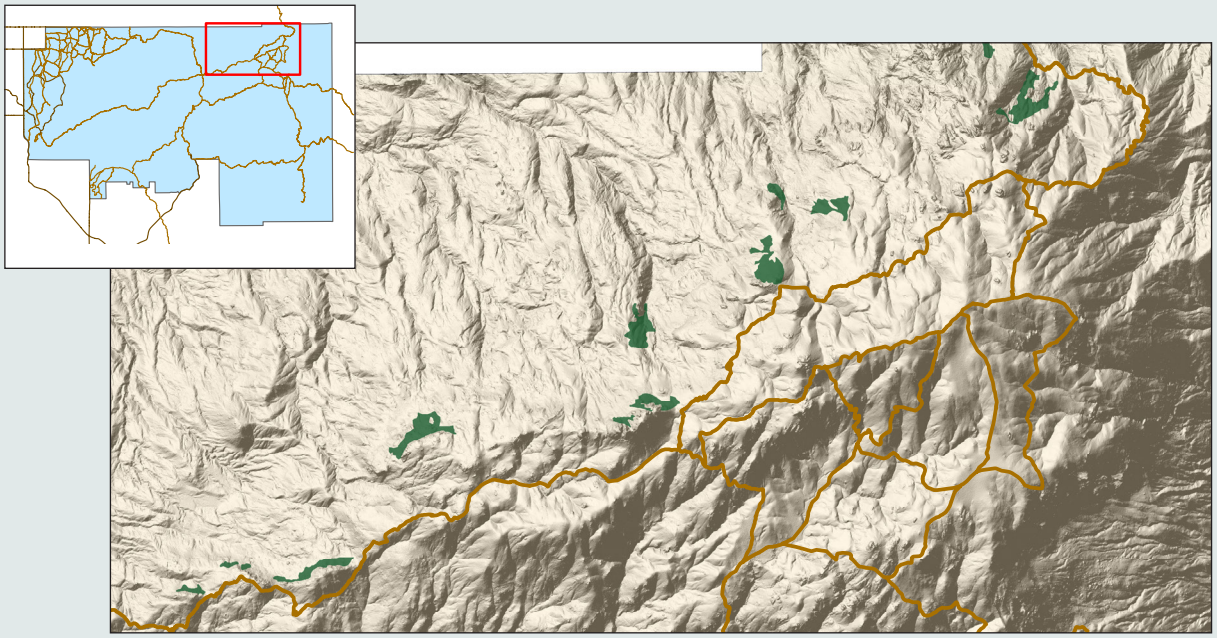
- *Quercus gambelii*
- *Robinia neomexicana*
- *Symphoricarpos oreophilus*

This woodland community is characterized by a canopy (>5 m) solely dominated (20–30% cover) by Gambel oak (*Quercus gambelii*), a variable (15–40%) lower 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*). The Gambel oak (*Q. gambelii*) overstory can range from a sparse 5% to a dense 20–30% cover, depending on fire history. The lower-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%. The subcanopy stratum is characterized by a variable mix of shrubs and ferns, most commonly dominated by mountain snowberry (*S. oreophilus*). This species is consistently (0.86) dominant and has highly variable cover of <5–40% (average cover is 25%). The field stratum (<0.5 m) is quite sparse, usually consisting of smaller versions of the subcanopy species.

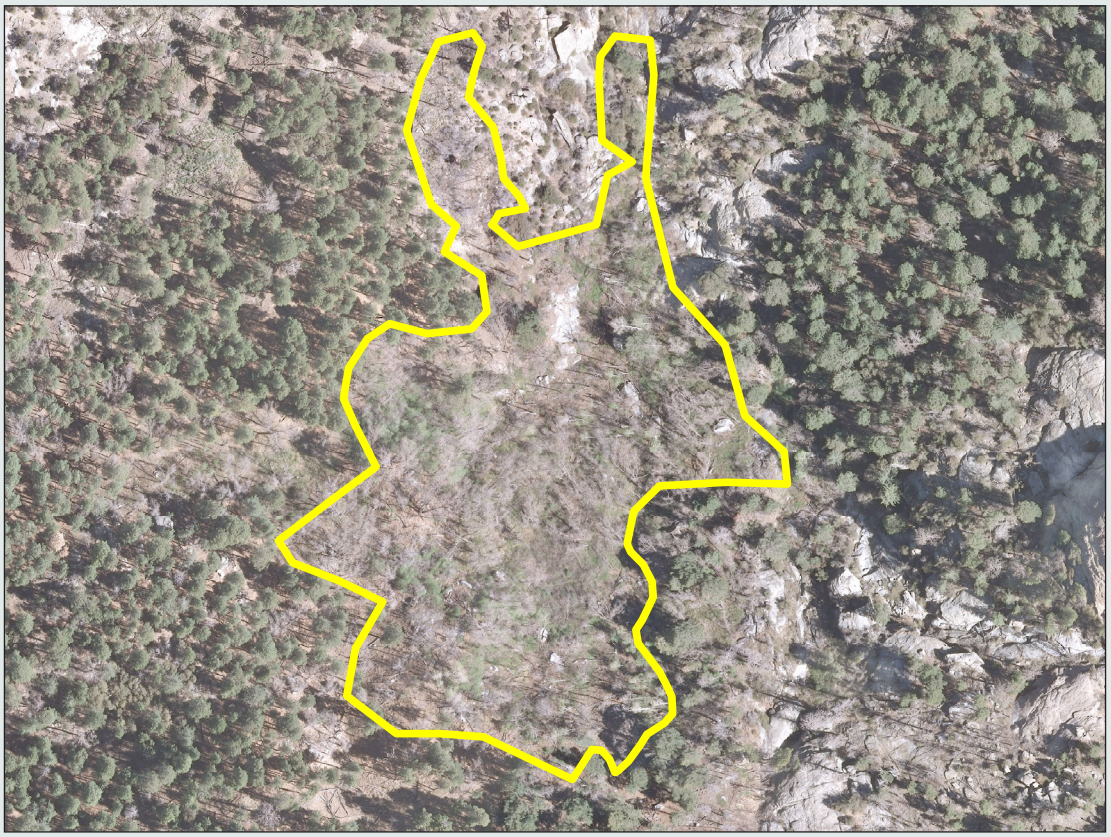
This community covers 0.08% (21 ha/54 ac) of the Rincon Mountain District, often scattered along the north slopes of Mica Mountain, from 1.5 kilometers west of Helen's Dome to Italian Springs. It is typically found on moderately steep (30%), north-facing upper backslopes from 2,100 to 2,500 meters (6,890–8,200 ft). 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. While not all examples exhibited obvious signs of fire disturbance, all examples fall within the boundaries of the 2003 Helen's 2 Fire.



Example of *Quercus gambelii* / *Robinia neomexicana* / *Symphoricarpos oreophilus* Woodland.



Distribution of *Quercus gambelii / Robinia neomexicana / Symphoricarpos oreophilus* Woodland across the district (above), and location of distribution within the district (inset).



Example of satellite imagery for one polygon.

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NPS 151/175128, March 2021

National Park Service
U.S. Department of the Interior

Natural Resource Stewardship and Science
1201 Oak Ridge Drive, Suite 150
Fort Collins, Colorado 80525

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