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Vegetation Inventory, Mapping, and Characterization Report, Organ Pipe Cactus National Monument

Volume II, Type Descriptions

Mapping technician Nicole Gonzalez collecting data in the Ocotillo / Arizona spikemoss Shrubby Rock Outcrop Association at Organ Pipe Cactus National Monument in 2018.

NPS / E. SANDOVAL

Vegetation Inventory, Mapping, and Characterization Report, Organ Pipe Cactus National Monument: Volume II, Type Descriptions

Science Report NPS/SR—2025/366

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Abstract

The report contains type descriptions for 34 vegetation communities observed and described at Organ Pipe Cactus National Monument during the National Park Service Vegetation Mapping Inventory. The inventory was completed by Sonoran Desert Network staff who compiled newly collected ground observations and plot data (2017–2020) with the legacy map product from a 1981 mapping project (Warren et al. 1981) to create an updated map and updated vegetation classification. The 34 vegetation community types were described using the guidelines of the United States National Vegetation Classification System and were defined as having consistent species composition, uniform physiognomy, and similar habitat conditions.

Introduction

The Sonoran Desert Network (SODN) conducted a vegetation mapping and characterization effort at Organ Pipe Cactus National Monument (ORPI) from 2017–2020. This project was completed under the National Park Service (NPS) Inventory & Monitoring (I&M) Division Vegetation Mapping Inventory (NPS, n.d.), 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 spatial and thematic accuracy standards while placing the vegetation into a regional and national context. Organ Pipe Cactus National Monument is in southern Arizona in the southwest portion of Pima County, along the U.S.–Mexico border.

Vegetation mapping and characterization projects typically comprise four phases (1) field-based data collection, (2) development of a classification for vegetation community types at the United States National Vegetation Classification (USNVC 2019) association level, (3) development of the digital vegetation map, and (4) an accuracy assessment. Please refer to Volume I (Studd et al. 2025) of this report for details on this project's phases and its results. In brief, for Organ Pipe Cactus National Monument there was a legacy map and report from 1981 (Warren et al. 1981) that was evaluated by the project team and thought to be high-quality enough to serve as the basis for a map *update*, rather than starting from scratch. The Warren map was overall well done, but contained some line-work inadequacies, due to limitations inherent in the aerial imagery they had used at that time. Issues such as deep shadowing in the images often prevented drawing accurate boundaries on topographically complex slopes. The Warren type descriptions were developed within a vegetation classification system known as Brown, Lowe and Pase (Brown et al. 1979), and again, while good, needed to be updated into the USNVC system used by the NPS inventory program. Fieldwork took place over several multi-week periods from 2017–2020 with new data collection and observations made park-wide to enable new classification analyses and updates to the map boundaries.

Thirty-four distinct vegetation communities are described in this report. All 34 communities are described at the USNVC association level, each with detailed narratives, which include lists of species found in each association, their abundance, landscape features, and overall community structural characteristics. At the time of writing this report, only 4 of the 34 vegetation types are "accepted" fully described types within the USNVC. The other types are newly described, specific to ORPI, and will be proposed for formal incorporation into the USNVC.

This document is Volume II of a two-volume Organ Pipe Cactus National Monument Vegetation Mapping Inventory report. This volume provides unabridged versions of the type descriptions for the 34 associations identified and mapped during the project. Volume I contains a summary of each type, as well as representative photos, aerial imagery examples and maps showing where each community is found within the monument boundary.

All information in the type descriptions not identified as specific to ORPI was collected from NatureServe Explorer (NatureServe, n.d.) or from the USNVC website. This includes the USNVC codes, type concept descriptions at the association, alliance or group level, vegetation hierarchy and

ecological systems placement (if applicable). Each description also contains the corollary type name, code and description from the Warren report to facilitate comparisons.

Terminology and Naming Conventions

Alliances and associations are classified based on both the dominant (greatest canopy cover) species in the upper strata of a contiguous vegetation unit and on diagnostic species (any plant taxon or group of taxa whose relative constancy or abundance can be used to differentiate one vegetation type from another). Associations, which describe and identify the characteristic range of species composition, diagnostic species, and physiognomy of a community, are the most specific and basic classification units and are hierarchically subsumed within alliances (Jennings et al. 2009). Typically, each association is included in only one alliance, although each alliance may include many associations.

Associations define distinct plant compositions that repeat across the landscape and are generally named using both the dominant species in the uppermost stratum of the vegetation and one or more dominant species in the lower strata (or a diagnostic species in any stratum). The strata used in this project are defined as follows:

- Top canopy: greater than 5 meters in height
- Canopy: between 2 and 5 meters in height
- Subcanopy: between 0.5 and 2 meters in height
- Field: below 0.5 meters in height

Associations are defined as having consistent species composition, uniform physiognomy, and similar habitat conditions. Naming conventions and syntax for all U.S. National Vegetation Classification (USNVC) names are as follows:

- A dash with a space on either side (–) separates the names of species occurring in the same stratum.
- A slash with a space on either side (/) separates the names of species occurring in different strata.
- Species that occur in the uppermost stratum are listed first, followed successively by those in the lower strata.
- The order of species names generally reflects decreasing levels of dominance, constancy, or indicator value.
- Parentheses around a species name indicate the species is less consistently found either in all associations of an alliance or in all occurrences of an association.
- Square brackets around two species' names indicate that the species are co-dominant or trade dominance, with either or both being dominant in a given stand.
- Association names include the dominant species of the significant strata, followed by the structural class in which they are classified (e.g., forest, woodland, or herbaceous).

- (P) at the end of an association name implies that the type is proposed (i.e., it was identified and described based on the results of this or another recent SODN project) and is not yet a formally accepted vegetation type within the USNVC. These proposed types are reviewed on an ongoing basis and may be added to the USNVC when sufficient data have been collected and funding is available to support their addition.
- (PS) at the end of an association name implies that the type is a "park special", meaning it has been described as a unique community that is expected to be found only in that park unit. This typically occurs when an area has a unique disturbance or management history.

Vascular and nonvascular plant species nomenclature for association names follows the nationally standardized list maintained by the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) PLANTS database with very few exceptions (NRCS, n.d.). Examples of association names from ORPI include:

Vauquelinia californica / Simmondsia chinensis – Rhamnus crocea Wooded Shrubland Association (P)

Parkinsonia microphylla (*Stenocereus thurberi*) / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association (P)

How to Read an Association Type Description

The type descriptions in this report provide detailed insights into various ecological associations found within Organ Pipe Cactus National Monument. These descriptions encompass a comprehensive overview of floristic and structural characteristics, species abundances and frequency values, environmental and landscape attributes, and the characterization of the variability within each community. Following the introductory sections on the specific distribution within Organ Pipe Cactus National Monument and local environmental conditions, the main association vegetation description follows. This section primarily focuses on detailing the dominant species in the uppermost height strata, followed by descriptions of lower canopy levels and their floristic compositions. Less dominant but still common species are typically listed to note their presence.

For important diagnostic species, we provide constancy values, ranges and/or averages of percent cover, and—for trees and shrubs—height class ranges in meters. Within the descriptions, constancy values for key species are given in parentheses after their introduction to indicate their defining species presence. Constancy values can range from zero (0.0) indicating absence in all examples, to one (1.0) indicating present in all plots. A value of (0.6) would indicate the species was present in 60% of the plots used to classify that vegetation type.

If a type has been formally accepted and integrated into the USNVC, the type description contains more detailed information about the type in a *regional* context compared to those that have not been accepted and are only described based on observations at Organ Pipe Cactus National Monument. An accepted type will be identified by the USNVC Community Element Global (CEGL) code beginning

with CEGL, whereas a proposed type's code will begin with NPSSODN, indicating it as a National Park Service Sonoran Desert Network type.

Occasionally, the authors of this report felt confident that a proposed Association would fall under an accepted Alliance level in the USNVC and reported data from the Alliance description for context. Such instances are clearly noted in the descriptions. Accepted types will have a description of the accepted association under the *USNVC Type Concept Description* heading, whereas proposed associations will show a description at the Alliance or Group level in this section. All text was taken from the U.S. National Vegetation Classification Database, V2.03 (2019) accessed during 2021.

USNVC Upper-Level Hierarchical Order

The type descriptions are presented in this report grouped by their USNVC upper-level hierarchical ordering in the same way they are presented in Volume I.

Madrean Juniper Open Woodland

(Juniperus arizonica – Vauquelinia californica) / Mixed Shrub Wooded Shrubland (P)

Vauquelinia californica / Simmondsia chinensis – Rhamnus crocea Wooded Shrubland (P)

Quercus – Vauquelinia californica / Simmondsia chinensis Intermittently Flooded Woodland (P)

Warm Desert Riparian Low Bosque & Shrubland

Prosopis velutina / *Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland (P)

Desert Alkaline-Saline Wet Scrub

Isocoma acradenia – Distichlis spicata Open Shrubland (P)

Yellow Paloverde – Triangle Bur Ragweed Mixed Cacti Desert Scrub

(Parkinsonia microphylla) / Larrea tridentata / Ambrosia deltoidea Shrubland (P)

Fouquieria splendens / Larrea tridentata / Ambrosia deltoidea Shrubland (P)

Parkinsonia microphylla / Larrea tridentata / Ambrosia deltoidea Shrubland (P)

Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea Wooded Shrubland (P)

Parkinsonia microphylla (Stenocereus thurberi) / Larrea tridentata / Ambrosia deltoidea Shrubland (P)

Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea Wooded Shrubland (P)

Fouquieria splendens / Selaginella arizonica Shrubby Rock Outcrop (P)

Parkinsonia microphylla / Jatropha cuneata / Encelia farinosa Shrubland (P)

Parkinsonia microphylla (Stenocereus thurberi) / Jatropha cuneata / Encelia farinosa Shrubland (P)

Parkinsonia microphylla / Jatropha cuneata (Bursera microphylla) / Encelia farinosa Shrubland (P)

Parkinsonia microphylla / Simmondsia chinensis / Ambrosia deltoidea Shrubland (P)

Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum) Shrubland (P)

Simmondsia chinensis – Atriplex polycarpa (Encelia farinosa) Shrubland (P)

Parkinsonia microphylla (Stenocereus thurberi) / Simmondsia chinensis / Encelia farinosa Shrubland (P)

(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa Shrubland (P)

(Parkinsonia microphylla) / Simmondsia chinensis / Encelia farinosa Shrubland (P)

Mojave-Sonoran Bajada & Valley Desert Scrub

Larrea tridentata / Ambrosia deltoidea Shrubland (P)

Larrea tridentata / Ambrosia dumosa Shrubland

Larrea tridentata Shrubland

Fouquieria splendens / Larrea tridentata / Ambrosia dumosa Shrubland

Larrea tridentata – Atriplex polycarpa Shrubland

Atriplex polycarpa – Suaeda nigra Shrubland (P)

Prosopis velutina / Larrea tridentata – Atriplex polycarpa Floodplain (P)

Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope

(Prosopis velutina) / Larrea tridentata / Hilaria rigida Shrubland (P)

(Prosopis velutina) / Larrea tridentata Shrubland (P)

Prosopis velutina / Senegalia greggii – Larrea tridentata Intermittently Flooded Shrubland (P)

Prosopis velutina – Parkinsonia florida Intermittently Flooded Woodland (P)

Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana / Ambrosia ambrosioides Intermittently Flooded Shrubland (P)

Arid West Interior Freshwater Marsh

Schoenoplectus americanus Herbaceous Aquatic (P)

Type Descriptions: Organ Pipe Cactus National Monument

1. *(Juniperus arizonica – Vauquelinia californica)* / Mixed Shrub Wooded Shrubland Association (P)

Common Name: (Redberry juniper – Arizona rosewood) / Mixed Shrub Wooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN200

Warren Code: 122.4151

Warren Name: *Juniperus monosperma – Vauquelinia californica* Mixed Shrub Association

USNVC Classification

See Table 1 for USNVC hierarchy.

Table 1. USNVC hierarchy for (*Juniperus arizonica – Vauquelinia californica*) / Mixed Shrub Wooded Shrubland Association.

Classification Level	Name and Code
Division	Madrean-Balconian Forest & Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Juniper Open Woodland [G487]
Alliance	Undescribed
Association	(*Juniperus arizonica – Vauquelinia californica*) / Mixed Shrub Wooded Shrubland

Type Concept Descriptions

Distribution

This community is found at the upper elevation limits of the Ajo Mountain Range with the largest examples occurring on the high backslopes and ridges above Alamo Canyon, Arch Canyon, Grass Canyon, and Bull Pasture, especially near Mount Ajo.

Environmental Description

This open woodland community spans a mix of steep (35–50+%) backslopes and lower-angle (<20%) ridges and summits from 900 to 1,400 meters (2,952–4,593 ft). While this community can be found on any aspect, most examples tend to have north-trending slopes. This surface cover is characterized by shallow and well-drained soils mixed with dominant amounts of exposed bedrock and detached surface rock.

Vegetation Description

This community is characterized by an open (10 [30]%) canopy (>2 m) of *Juniperus arizonica* (redberry juniper) and *Vauquelinia californica* (Arizona rosewood) with a variable and diverse (n = 40) understory of shrubs, subshrubs, and perennial bunch grasses. *J. arizonica* is a consistent (1.0) and diagnostic component of this community, which provides an average of 5% cover, with some areas reaching up to 10%. *V. californica* is a less consistent (0.86) component that when present provides slightly higher average cover (6–7%) than *J. arizonica*.

Juniperus arizonica grows primarily as shorter-statured trees 3–4 [7] meters tall, while *V. californica* presents as a robust shrub or short tree occupying the 2–3-meter canopy stratum. *Fouquieria splendens* (ocotillo) is a consistent (1.0) associate with average cover around 2%, with some inclusions reaching up to 10%. Due to the prevalence of exposed bedrock and shallow soils, the distribution of canopy species can be patchy with *J. arizonica* and *V. californica* preferring areas of increased soil presence and depth while *F. splendens* (ocotillo) tends to occupy areas of low-angle bedrock and/or extremely shallow soil.

The subcanopy stratum (0.5–2 m) contains two distinct variations defined by the understory species composition. At the lower elevational range of this community and/or on steeper slopes a *Simmondsia chinensis* (jojoba) dominant variation of this community may appear. In this variation, *S. chinensis* contributes average cover around 8%, typically providing similar or more cover than the overstory trees. At the higher elevational range of this community, on lower angle ridges and summits, a variation may appear where *S. chinensis* (jojoba) is sparse (1%) to absent. Within both variations, a diverse and typically low-cover suite of associate shrubs are present, including *Rhamnus crocea* (redberry buckthorn), *Aloysia wrightii* (Wright's beebrush), *Dodonaea viscosa* (Florida hopbush), *Celtis reticulata* (netleaf hackberry), and *Hyptis emoryi* (desert lavender). At the higher elevational end of this community, *Nolina microcarpa* (beargrass) and *Yucca baccata* (banana yucca) begin to appear and are indicative of a transition into a semi-desert grassland community.

The variable (5–25%) field layer is characterized by a mix of perennial grasses and subshrubs, commonly dominated by *Bouteloua curtipendula* (sideoats grama)*, Muhlenbergia porteri* (bush muhly)*,* and/or *Bahiopsis parishii* (Parish's goldeneye). Across the community, perennial grasses tend to increase in diversity and density as elevation increases, becoming most prevalent on the low-angle shoulders and summits. Cover typically ranges from <1% to 10+% across this gradient. Beyond those already listed, documented perennial grasses include *Bouteloua repens* (slender grama), *Aristida ternipes* (spidergrass), *Muhlenbergia dumosa* (bamboo muhly), *Leptochloa dubia* (green sprangletop), *Eragrostis intermedia* (plains lovegrass), and *Digitaria californica* (Arizona cottontop). *B. parishii* (Parish's goldeneye) is a consistent (1.0) component in all variations of this type with cover typically ranging from 2–5 [8]%. Other noteworthy field components include *Agave deserti* (lechuguilla), *Gutierrezia sarothrae* (broom snakeweed), *Artemisia ludoviciana* (white sagebrush), *Ericameria fasciculata* (Eastwood's goldenbush), *Selaginella arizonica* (Arizona spikemoss), and *Eriogonum fasciculatum* (Eastern Mojave buckwheat).

This community tends to intergrade with adjacent drainages and shrublands. In the upper reaches of steep drainages, this community becomes a denser woodland, with *J. arizonica* reaching heights from 5 to 7 meters tall. Additional cover is provided by *C. reticulata* (netleaf hackberry)*, Senegalia greggii* (catclaw acacia), *R. crocea* (redberry buckthorn), and *Coursetia glandulosa* (rosary babybonnets). As this community moves down the steep backslopes, it transitions to a shrubland with only scattered trees, typically *V. californica,* eventually becoming a *Simmondsia chinensis*–mixed-shrub association (154.1232). In this association, species composition is similar but *J. arizonica* is absent (or accidental), and *V. californica* is rare.

Warren Type Concept Description

Found at the highest elevations in the monument, 3,500 to 4,600 feet (rarely down to 2,700 ft), at the top of the Ajo Mountains. The type generally occupies rocky slopes, especially those with northerly exposure. The best development of the type is found in the higher portions of south Alamo Canyon. The type is a mixture of species of varied origin. Although it is named for the most prominent component, the understory shrubs are mostly upper desert, chaparral or desert grassland species which often exceed the junipers in number. The name may thus be misleading with respect to the floristic affiliations of the type as a whole.

An irregularly spaced mixture of evergreen shrubs and small trees which occur in soil pockets or cracks in rock outcrops and are frequently found on fairly steep slopes. The trees are generally 10 to 15 feet tall and the shrubs 1 to 3 feet tall. Cover is variable from 25 to 45%. Local diversity and relative abundance of many component species is quite variable, depending on slope and aspect, with herbaceous species, especially grasses, abundant on deeper soil.

USNVC Type Concept Description (Group Level)

This Madrean juniper savanna and woodland group occurs in northern Mexico, southeastern Arizona and southern New Mexico, extending into western Texas. These savannas and woodlands have juniper tree canopies (5–60% cover). The lack of pinyon trees and the presence of Madrean junipers *Juniperus coahuilensis* or *Juniperus deppeana* are diagnostic of this group. *Juniperus monosperma* may be present as sole dominant when diagnostic Madrean species are present. The understory may be dominated by shrubs or grasses. If present, the shrub layer may be open to dense with desert scrub, chaparral or mountain shrub species. Characteristic species include *Agave lechuguilla, Arctostaphylos pungens, Canotia holacantha, Ceanothus greggii, Cercocarpus montanus, Larrea tridentata, Nolina microcarpa, Prosopis glandulosa, Quercus grisea, Quercus turbinella,* or *Rhus trilobata*. The herbaceous layer is diverse and resembles Chihuahuan Desert Foothill-Piedmont & Lower Montane Grassland Group (G490). Characteristic graminoid species include *Bouteloua eriopoda, Muhlenbergia emersleyi, Muhlenbergia pauciflora, Muhlenbergia setifolia, Piptochaetium fimbriatum*, or *Schizachyrium cirratum*. Some of the widespread graminoid species are similar to those found in Great Plains Shortgrass Prairie Group (G144) and may be present to dominant, with *Aristida purpurea, Bouteloua gracilis*, and *Eragrostis intermedia* being most common. This group is found in lower foothills and plains. Savanna stands occur primarily on flat ridge summits and upper slopes of foothills, canyons and alluvial fans usually at about 1,800 m elevation. Woodland sites are typically found on cool aspects of steep scarp slopes at elevations of 1,700 to 2,200 m. Substrates are

generally shallow rocky soils, but include deeper loamy soils, especially on sites where junipers have recently colonized.

Species Summary

See Tables 2 and 3 for species summary details.

Table 2. Most abundant species: (*Juniperus arizonica – Vauquelinia californica*) / Mixed Shrub Wooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Juniperus arizonica* (1.0), *Vauquelinia californica* (0.86)
Subcanopy (0.5–2 m)	*Simmondsia chinensis*
Field (0–0.5 m)	*Bouteloua curtipendula, Muhlenbergia porteri, Bahiopsis parishii* (1.0)

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

Table 3. Other noteworthy associate species: (*Juniperus arizonica – Vauquelinia californica*) / Mixed Shrub Wooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0)
Subcanopy (0.5–2 m)	*Aloysia wrightii, Dodonaea viscosa, Rhamnus crocea, Celtis reticulata, Hyptis emoryi, Nolina microcarpa, Yucca baccata*
Field (0–0.5 m)	*Aristida ternipes, Artemisia ludoviciana, Bouteloua repens*, *Digitaria californica, Eragrostis intermedia, Leptochloa dubia*, *Muhlenbergia dumosa, Gutierrezia sarothrae, Agave deserti, Ericameria fasciculata, Eriogonum fasciculatum, and Selaginella arizonica*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 18 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS038, IPS054, IPS056, IPS057, IPS060, IPS061, IPS062, IPS065, IPS067, IPS247, IPS249, IPS298, IPS313, IPS314, IPS316, IPS318, IPS323, IPS324

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

2. *Vauquelinia californica / Simmondsia chinensis – Rhamnus crocea* Wooded Shrubland Association (P)

Common Name: Arizona Rosewood / Jojoba – Redberry Buckthorn Wooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN201

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None.

USNVC Classification

See Table 4 for USNVC hierarchy.

Table 4. USNVC hierarchy for *Vauquelinia californica* / *Simmondsia chinensis – Rhamnus crocea* Wooded Shrubland Association.

Classification Level	Name and Code
Division	Madrean-Balconian Forest & Woodland [1.B.1.Nd]
Macrogroup	Madrean Lowland Evergreen Woodland [M010]
Group	Madrean Juniper Open Woodland Group [G487]
Alliance	Undescribed
Association	*Vauquelinia californica* / *Simmondsia chinensis – Rhamnus crocea* Wooded Shrubland

Type Concept Descriptions

Distribution

This community is found exclusively in the Ajo Mountain Range.

Environmental Description

This wooded shrubland community occupies north-trending, sheltered corridors between large outcrops of exposed bedrock from 990–1,300 m (2,952–4,271 ft). These corridors typically occur on the upper backslopes and shoulders of mountain slopes throughout the range. Slope varies greatly, ranging from low-angle (<10%) to extremely steep (50 +%) areas covered in loose rocks. The surface cover is dominated by exposed bedrock, loose rocks, and boulders often covered with a dense litter layer.

Vegetation Description

This community is characterized by a moderately open (15–20%) canopy (>2 m) of *Vauquelinia californica* (Arizona rosewood) with a denser (20–40%) subcanopy (0.5–2 m) of mixed shrubs, most commonly dominated by *Simmondsia chinensis* (jojoba) and *Rhamnus crocea* (redberry buckthorn).

V. californica is a consistent (1.0), small (3–4 [5] m) canopy tree that provides cover from 10–20%. Cover of this species can be distributed throughout the community but will often form dense stands in the most sheltered locations along the base of the outcrops. *Celtis reticulata* (netleaf hackberry) is a common (0.75) associate with cover rarely surpassing 5%. *Forestiera shrevei* (desert olive) is an occasional (0.50) canopy associate that, when present provides cover from 2–4%. *Quercus ajoensis* (Ajo Mountain scrub oak) is an occasional (0.50) associate that may appear in the transition with the similar *Quercus ajoensis – Vauquelinia californica* / *Simmondsia chinensis* Intermittently Flooded Woodland Association.

S. chinensis and *R. crocea* are consistent (1.0) subcanopy dominates that, on average, contribute around 6% cover each. At times, larger examples of these species may occur that reach into the canopy strata. Several additional subcanopy species occur here that are restricted to this community, including *Salvia pinguifolia* (rock sage), *Ribes quercetorum* (rock gooseberry), *Ptelea trifoliata* (hoptree), *Berberis harrisoniana* (Harrison's barberry), and *Keckiella antirrhinoides* (snapdragon penstemon). Distribution of these species can be patchy but, when present, they can become co-dominants with *S. chinensis* (jojoba) and *R. crocea* (redberry buckthorn). In order from most to least frequent, other noteworthy shrubs include *Acalypha californica* (California copperleaf), *Dodonaea viscosa* (Florida hopbush), *Aloysia wrightii* (Wright's beebrush), *Lycium berlandieri* (Berlandier's wolfberry), *Rhus aromatica* (fragrant sumac), and *Justicia candicans* (Arizona water-willow).

The sparse (<10%) field layer is characterized by a mix of perennial grasses and subshrubs without any consistent dominant or common associates. *Plumbago zeylanica* (wild leadwort) is restricted to this community within the monument. Other documented low-cover associates include *Muhlenbergia dumosa* (bamboo muhly), *Bahiopsis parishii* (Parish's goldeneye), *Ambrosia cordifolia* (Tucson bur ragweed), *Crossosoma bigelovii* (ragged rockflower), *Koanophyllon solidaginifolium* (shrubby thoroughwort), *Elymus elymoides* (squirreltail), and *Ericameria cuneata* (cliff goldenbush).

Warren Type Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Group Level)

This Madrean juniper savanna and woodland group occurs in northern Mexico, southeastern Arizona and southern New Mexico, extending into western Texas. These savannas and woodlands have juniper tree canopies (5–60% cover). The lack of pinyon trees and the presence of Madrean junipers *Juniperus coahuilensis* or *Juniperus deppeana* are diagnostic of this group. *Juniperus monosperma* may be present to sole dominant when diagnostic Madrean species are present. The understory may be dominated by shrubs or grasses. If present, the shrub layer may be open to dense with desert scrub, chaparral or mountain shrub species. Characteristic species include *Agave lechuguilla, Arctostaphylos pungens, Canotia holacantha, Ceanothus greggii, Cercocarpus montanus, Larrea tridentata, Nolina microcarpa, Prosopis glandulosa, Quercus grisea, Quercus turbinella,* or *Rhus trilobata*. The herbaceous layer is diverse and resembles Chihuahuan Desert Foothill-Piedmont & Lower Montane Grassland Group (G490). Characteristic graminoid species include *Bouteloua eriopoda, Muhlenbergia emersleyi, Muhlenbergia pauciflora, Muhlenbergia setifolia, Piptochaetium*

fimbriatum, or *Schizachyrium cirratum*. Some of the widespread graminoid species are similar to those found in Great Plains Shortgrass Prairie Group (G144) and may be present to dominant, with *Aristida purpurea, Bouteloua gracilis*, and *Eragrostis intermedia* being most common. This group is found in lower foothills and plains. Savanna stands occur primarily on flat ridge summits and upper slopes of foothills, canyons and alluvial fans usually at about 1,800 m elevation. Woodland sites are typically found on cool aspects of steep scarp slopes at elevations of 1,700 to 2,200 m. Substrates are generally shallow rocky soils, but include deeper loamy soils, especially on sites where junipers have recently colonized.

Species Summary

See Tables 5 and 6 for species summary details.

Table 5. Most abundant species: *Vauquelinia californica* / *Simmondsia chinensis – Rhamnus crocea* Wooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Vauquelinia californica* (1.0)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0), *Rhamnus crocea* (1.0)
Field (0–0.5 m)	None

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

Table 6. Other noteworthy associate species: *Vauquelinia californica* / *Simmondsia chinensis – Rhamnus crocea* Wooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Celtis reticulata* (0.75)
Canopy (2–5 m)	*Forestiera shrevei* (0.50), *Quercus ajoensis* (0.50)
Subcanopy (0.5–2 m)	*Salvia pinguifolia, Ribes quercetorum, Ptelea trifoliata, Berberis harrisoniana, Acalypha californica, Dodonaea viscosa, Aloysia wrightii, Lycium berlandieri, Rhus aromatica, Justicia candicans*
Field (0–0.5 m)	*Plumbago zeylanica, Muhlenbergia dumosa, Bahiopsis parishii, Ambrosia cordifolia, Crossosoma bigelovii, Koanophyllon solidaginifolium, Elymus elymoides, Ericameria cuneata*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 4 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS012, IPS257, IPS275, IPS322

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

3. *Quercus ajoensis – Vauquelinia californica / Simmondsia chinensis* Intermittently Flooded Woodland Association (P)

Common Name: Ajo Mountain Scrub Oak – Arizona Rosewood / Jojoba Intermittently Flooded Woodland Association

USNVC Code: None

SODN Code: NPSSODN203

Warren Code: 123.319R

Warren Name: *Quercus ajoensis* Mixed Shrub Association

USNVC Classification

See Table 7 for USNVC hierarchy.

Table 7. USNVC hierarchy for *Quercus ajoensis – Vauquelinia californica / Simmondsia chinensis* Intermittently Flooded Woodland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Madrean Lowland Evergreen Woodland Macrogroup [M010]
Group	Madrean Juniper Open Woodland Group [G487]
Alliance	Undescribed
Association	*Quercus ajoensis – Vauquelinia californica* / *Simmondsia chinensis* Intermittently Flooded Woodland

Type Concept Descriptions

Distribution

This type is restricted to drainages in two canyons in the Ajo Mountains, the south fork of Alamo Canyon and Arch Canyon.

Environmental Description

This intermittently flooded woodland community spans low-angle (<10%) drainages and the steeper (30–50%), adjacent slopes from 730–1,180 m (2,395–3,871 ft). The surface cover is dominated by a mix of coarse gravel, cobble, and large boulders with consistent areas of exposed bedrock. The surface rock is of volcanic origin, typically rhyolite and dacite.

Vegetation Description

This intermittently flooded woodland is characterized by variable ([10] 20–40%) canopy (>2 m) dominated by *Quercus ajoensis* (Ajo mountain scrub oak) and *Vauquelinia californica* (Arizona rosewood) with a variable (5–20%) subcanopy (0.5–2 m) of mixed shrubs, most commonly

dominated by *Simmondsia chinensis* (jojoba). This community typically occupies the upper reaches of mountain drainages, above the adjacent *Acacia* spp. – *Ambrosia ambrosioides* Association.

Q. ajoensis (Ajo mountain scrub oak) is present in two forms, a tall (4–5 [6] m), single-trunked tree and small ([1] 2–3 m) shrubs. Across both growth forms, this species provides cover that typically ranges from [5] 10–20%. Distribution of this cover can be variable with open areas of patchy trees to dense, impenetrable thickets. *Vauquelinia californica* (Arizona rosewood) is a consistent (0.85) associate sub-dominant to *Q. ajoensis* (Ajo mountain scrub oak) with cover typically ranging from 5–10 [15]%. Growth forms are similar to *Q. ajoensis*, with individuals present as both shrubs and trees. *Juniperus arizonica* (redberry juniper) is an occasional (0.57) associate that, when present, typically provides cover around 5% with heights reaching above 5 m.

Simmondsia chinensis is a consistent (0.86) associate that was dominant in about half of the examples of this community. When present as an associate, this species provided cover <5% and when dominant, it ranged from 10–20%. Distribution of this species is patchy, often appearing as dense thickets along the margins of the drainages. *Rhamnus crocea* (redberry buckthorn) and *Dodonaea viscosa* (Florida hopbush) are consistent (1.0, 0.86) associates with cover from 1–3%. Other noteworthy shrubs include: *Celtis ehrenbergiana* (spiny hackberry), *Senegalia greggii* (catclaw acacia), and *Berberis haematocarpa* (red barberry).

The sparse (<5%) field stratum (<0.5 m) is characterized by a mix of low-cover shrubs. In order from most to least frequent, these shrubs include: *Gymnosperma glutinosum* (gumhead), *Abutilon incanum* (pelotazo), *Brickellia* spp. (brickellbush), *Ambrosia cordifolia* (Tucson bur ragweed), and *Acalypha californica* (California copperleaf). These species are most prevalent in more exposed areas where the canopy is sparse to absent.

Warren Type Concept Description

This unit has one of the most restricted distributions of any type in the monument. It is found from 2,500 to 4,000 feet at the bottom of some of the larger drainages, on sandy soil with scattered cobbles and boulders. Dense thickets of shrubs and small trees along riparian corridors, the shrubs 2 to 6 feet tall and the trees 10 to 15 feet tall. Cover is often high, up to 60 to 80%, but patchy. Approximately half of the species are deciduous. In more open sections of the canyons cover may be reduced, but in protected stretches ground cover is almost continuous and travel on foot is very difficult.

USNVC Type Concept Description (Group Level)

This Madrean juniper savanna and woodland group occurs in northern Mexico, southeastern Arizona and southern New Mexico, extending into western Texas. These savannas and woodlands have juniper tree canopies (5–60% cover). The lack of pinyon trees and the presence of Madrean junipers *Juniperus coahuilensis* or *Juniperus deppeana* are diagnostic of this group. *Juniperus monosperma* may be present to sole dominant when diagnostic Madrean species are present. The understory may be dominated by shrubs or grasses. If present, the shrub layer may be open to dense with desert scrub, chaparral or mountain shrub species. Characteristic species include *Agave lechuguilla, Arctostaphylos pungens, Canotia holacantha, Ceanothus greggii, Cercocarpus montanus, Larrea*

tridentata, Nolina microcarpa, Prosopis glandulosa, Quercus grisea, Quercus turbinella, or *Rhus trilobata*. The herbaceous layer is diverse and resembles Chihuahuan Desert Foothill-Piedmont & Lower Montane Grassland Group (G490). Characteristic graminoid species include *Bouteloua eriopoda, Muhlenbergia emersleyi, Muhlenbergia pauciflora, Muhlenbergia setifolia, Piptochaetium fimbriatum*, or *Schizachyrium cirratum*. Some of the widespread graminoid species are similar to those found in Great Plains Shortgrass Prairie Group (G144) and may be present to dominant, with *Aristida purpurea, Bouteloua gracilis*, and *Eragrostis intermedia* being most common. This group is found in lower foothills and plains. Savanna stands occur primarily on flat ridge summits and upper slopes of foothills, canyons and alluvial fans usually at about 1,800 m elevation. Woodland sites are typically found on cool aspects of steep scarp slopes at elevations of 1,700 to 2,200 m. Substrates are generally shallow rocky soils, but include deeper loamy soils, especially on sites where junipers have recently colonized.

Species Summary

See Tables 8 and 9 for species summary details.

Table 8. Most abundant species: *Quercus ajoensis – Vauquelinia californica / Simmondsia chinensis* Intermittently Flooded Woodland Association.

Stratum	Species [A]
Canopy (>5 m)	*Quercus ajoensis* (1.0), *Vauquelinia californica* (0.86)
Canopy (2–5 m)	*Quercus ajoensis* (1.0), *Vauquelinia californica* (0.86)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (0.86), *Rhamnus crocea* (1.0)
Field (0–0.5 m)	None

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

Table 9. Other noteworthy associate species: *Quercus ajoensis – Vauquelinia californica / Simmondsia chinensis* Intermittently Flooded Woodland Association.

Stratum	Species
Canopy (>5 m)	*Juniperus arizonica*
Canopy (2–5 m)	*Juniperus arizonica*
Subcanopy (0.5–2 m)	*Dodonaea viscosa, Celtis ehrenbergiana, Senegalia greggii, Berberis haematocarpa*
Field (0–0.5 m)	*Gymnosperma glutinosum, Abutilon incanum, Brickellia* spp., *Ambrosia cordifolia, Acalypha californica*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 7 classification plots sampled during the 2017–2018 mapping and classification effort.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS032U, IPS033U, IPS034U, IPS035H, IPS036H, IPS037U, IPS055U

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

4. *Prosopis velutina / Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland Association (P)

Common Name: Velvet Mesquite / Lotebush – Desert-thorn Wooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN191

Warren Code: 124.711R

Warren Name: *Prosopis glandulosa* Riparian Woodland Association

USNVC Classification

See Table 10 for USNVC hierarchy.

Table 10. USNVC hierarchy for *Prosopis velutina / Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland Association.

Classification Level	Name and Code
Division	Southwestern North American Warm Desert Freshwater Marsh & Bosque [2.C.4.Nc]
Macrogroup	Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland [M076]
Group	North American Warm Desert Riparian Low Bosque & Shrubland [G533]
Alliance	Honey Mesquite – Velvet Mesquite – Screwbean Mesquite Wet Scrub [A3877]
Association	*Prosopis velutina / Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland

Type Concept Descriptions

Distribution

This type is only found in the immediate vicinity of Quitobaquito, William's, and Burro Springs.

Environmental Description

This community occurs on low angle (<5 [15]%) south-trending slopes from 320–350 m (1,050–1,150 ft). The surface cover is characterized by shallow and well-drained soils with a notable, but shallow layer of leaf litter.

Vegetation Description

This wooded shrubland is characterized by a variable (20–30 [40]%) canopy (>2 m) of *Prosopis velutina* (velvet mesquite) with an understory of mixed shrubs. This community is intermixed with the adjacent *Isocoma acradenia* (alkali goldenbush) – *Distichlis spicata* (saltgrass) shrubland. While there are some similar field (<0.5 m) components, the dominant species are distinctly different between the two types.

P. velutina is a consistent (1.0) canopy (>2 m) dominant that provides cover that ranges from 15–30% with one dense inclusion up to 40%. This species is present as large trees with heights from 4–5

m and occasionally up to 7 m. Taller individuals of *Ziziphus obtusifolia* (lotebush) may occur in the canopy strata but are always shorter than *P. velutina*. *Olneya tesota* (ironwood) is found in one example of this community.

The variable (10–25%) subcanopy (0.5–2 m) stratum is characterized by a mix of shrubs, often dominated by *Z. obtusifolia* (lotebush) and *Lycium* spp. (desert-thorn). *Z. obtusifolia* is a consistent (0.75) shrub species with cover that ranges from 3–6%. While this species is typically less than 2 m, it was documented in the canopy strata with heights ranging up to 4 m. *Lycium* spp. (desert-thorn) is another very common (0.88) shrub with average cover around 4% with some areas reaching up to 6%. Due to data collection occurring while *Lycium* spp. lacked key identifying features such as flowers and fruit, most occurrences of it were only documented to genus. Those that were identified to species were all *Lycium fremontii* (Fremont's desert-thorn). In order from most to least frequent, other documented subcanopy species include *Pluchea sericea* (arrowweed), *Atriplex polycarpa* (cattle saltbush), *Atriplex canescens* (fourwing saltbush), *Larrea tridentata* (creosote), and *Condalia globosa* (bitter snakewood).

The sparse (1–3%) field stratum (<0.5 m) is characterized by the low cover (1%) presence of *Isocoma acradenia* (alkali goldenbush) and *Distichlis spicata* (saltgrass). The dominance of these species defines the adjacent *I. acradenia* (alkali goldenbush) – *D. spicata* (saltgrass) shrubland community. In this association they do not outcompete the shrubs and trees but may become more prevalent in the ecotone between the two communities. Other documented field species include *Suaeda nigra* (Mojave seablite) and *Pluchea odorata* (sweetscent).

Warren Type Concept Description

This type is found in only three localities in the monument: Growler Wash near Bates Well, Kuakatch Wash near Wall's Well and near Aguajita Spring. These localities range from 1,200–2,100 feet in elevation. In general, the lowland riparian formations in the monument are not sufficiently well developed to be termed a woodland, the exception being these three large washes, all of which have shallow groundwater. The type is found on level, silty flood-plain soil.

Open stands of trees 15–20 feet tall forming continuous corridors along large intermittent drainages. Ground cover may range from 40–60%. An understory of shrubs 2 to 4 feet tall may be present. Density of shrubs is greatest immediately adjacent to the wash and decreases with distance from the drainage. When mesquite woodland reaches its best development, shading tends to reduce the abundance of shrub species, creating a very open formation compared with the shrub thickets found along smaller washes. The tree and many of the shrub species are deciduous.

USNVC Type Concept Description (Alliance Level)

Woodlands included in this alliance are characterized by a moderate to dense tall woody canopy dominated by *Prosopis glandulosa*, *Prosopis pubescens*, and/or *Prosopis velutina*. The diversity of other species can vary greatly with geography and substrate. The dominant understory shrubs are often species of *Atriplex* but may include many other species. Succulents may include several species of *Opuntia* and *Yucca*. This alliance occurs in southern California, Arizona, southwestern New

Mexico, Texas, and the Mexican states of Chihuahua and Coahuila. Sites include mesic areas such as floodplains, streambanks, intermittently flooded arroyo terraces, alkali sinks and washes and extends into the upland on dry terraces above streams and arroyos. Substrates are generally coarse-textured, gravelly alluvium. *Prosopis* spp. trees extract groundwater with extensive root systems, but grow best where water tables are shallow, such as along drainages.

Species Summary

See Tables 11 and 12 for species summary details.

Table 11. Most abundant species: *Prosopis velutina / Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Ziziphus obtusifolia* (0.75), *Lycium* spp. (0.88)
Field (0–0.5 m)	None

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

Table 12. Other noteworthy associate species: *Prosopis velutina / Ziziphus obtusifolia – Lycium* spp. Wooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota*
Subcanopy (0.5–2 m)	*Pluchea sericea*, *Larrea tridentata, Atriplex polycarpa, Condalia globosa, Atriplex canescens*
Field (0–0.5 m)	*Distichlis spicata, Isocoma acradenia, Suaeda nigra, Pluchea odorata*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 9 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS044, IPS048, IPS168, IPS170, IPS171, IPS172, IPS175, IPS176, IPS224

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

5. *Isocoma acradenia – Distichlis spicata* Open Shrubland Association (P)

Common Name: Alkali Goldenbush – Saltgrass Open Shrubland Association

USNVC Code: None

SODN Code: NPSSODN193

Warren Code: 244.751

Warren Name: *Distichlis spicata – Juncus* spp. Association

USNVC Classification

See Table 13 for USNVC hierarchy.

Table 13. USNVC hierarchy for *Isocoma acradenia – Distichlis spicata* Open Shrubland Association.

Classification Level	Name and Code
Division	North American Western Interior Brackish Marsh, Playa & Shrubland [2.C.5.Nd]
Macrogroup	Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland [M082]
Group	North American Desert Alkaline-Saline Wet Scrub [G537]
Alliance	Mojave Seablite – Red Swampfire – Alkali Goldenbush Alkaline Wet Scrub [A3880]
Association	*Isocoma acradenia – Distichlis spicata* Open Shrubland

Type Concept Descriptions

Distribution

This type is only found in the immediate vicinity of the Quitobaquito, William's, and Burro Springs.

Environmental Description

This open shrubland community spans low-angle (<5%) south-trending slopes from 320–350 m (1,050–1,150 ft). The surface cover is dominated by shallow, well-drained soils that tend to be somewhat alkaline.

Vegetation Description

This shrubland community is characterized by an open (5%) to absent overstory (>2 m) with a variable (15–20 [40]%) understory stratum (<2 m) dominated by *Isocoma acradenia* (alkali goldenbush) and *Distichlis spicata* (saltgrass). When present (0.67), cover in the canopy strata (>2 m) is typically composed of *Prosopis velutina* (velvet mesquite) with occasional *Olneya tesota* (ironwood).

The subcanopy stratum (<0.5–2 m) is characterized by a sparse (<5%) mix of shrubs with no consistent dominants or common associates. In order from most to least frequent, documented subcanopy species include *Lycium* spp. (desert-thorn), *Atriplex polycarpa* (cattle saltbush), *Pluchea sericea* (arrowweed), and *Cylindropuntia acanthocarpa* (buckhorn cholla).

I. acradenia (alkali goldenbush) and *D. spicata* (saltgrass) are consistent (1.0, 0.83) and diagnostic components in the field stratum (<0.5 m) with one or both species always providing dominance. *I. acradenia* (alkali goldenbush) is the most dominant species with average cover around 15% with some dense inclusions reaching above 30%. When dominant (0.50), *D. spicata* (saltgrass) provides cover that ranges from 5–10%. At times, this species can be quite sparse with a patchy 1–2% cover scattered throughout. In order from most to least frequent, other noteworthy species include *Suaeda nigra* (Mojave seablite), *Sporobolus airoides* (alkali sacaton), *Nitrophila occidentalis* (boraxweed), *Heliotropium curassavicum* (salt heliotrope), *Zeltnera calycosa* (Arizona centaury), and the annual forb *Wislizenia refracta* (spectacle fruit).

A very sparsely vegetated variation of this community can be found intermixed with the more representative example described above. In this variation, species composition is similar while overall perennial cover is greatly reduced to under 5%. Seasonally, the annual forb *W. refracta* (spectacle fruit) can provide dominance with cover up to 20%.

Warren Type Concept Description

Seeps and flats at 1,050 feet adjacent to Quitobaquito, William's and Burro springs on silty, somewhat saline soil. There is considerable variation within the type due to the gradient in soil moisture between sites close to seeps where *Scirpus olneyi*, *Cyperus laevigatus*, *C. aristatus*, *Eleocharis caribaea*, and *Juncus bufonius* are more abundant, and the drier sites where *Distichlis spicata*, *Juncus cooperi*, *Sporobolus airoides*, *Suaeda nigra*, and *Nitrophila occidentalis* are more abundant.

Almost continuous ground cover of perennial herbaceous species 5–15 inches tall with scattered woody species 3–10 feet tall on damp, silty, moderately saline soil.

USNVC Type Concept Description (Alliance Level)

This alliance includes stands that are characterized by an open to dense canopy of *Suaeda moquinii* (synonym for *S. nigra*) and/or *Salicornia rubra*. Other saline wetland species present may include *Anemopsis californica*, *Distichlis spicata*, *Eleocharis palustris*, *Juncus arcticus* ssp. *littoralis*, *Schoenoplectus americanus*, *Tiquilia* spp., or *Triglochin maritima*. Stands generally have low cover of vegetation and may be sparse (<10% total vegetation). Sites are moist or seasonally dry flats, and margins of intermittently flooded desert playas and may extend to coast. This highly variable saline wet herbaceous vegetation alliance occurs across the warm deserts of North America, extending into the Central Valley and San Joaquin Valley in California south into Baja California.

Species Summary

See Tables 14 and 15 for species summary details.

Table 14. Most abundant species: *Isocoma acradenia – Distichlis spicata* Open Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	None
Field (0–0.5 m)	*Isocoma acradenia* (1.0)*, Distichlis spicata* (0.83)

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

Table 15. Other noteworthy associate species: *Isocoma acradenia – Distichlis spicata* Open Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota, Prosopis velutina*
Subcanopy (0.5–2 m)	*Lycium* spp., *Atriplex polycarpa, Pluchea sericea, Cylindropuntia acanthocarpa*
Field (0–0.5 m)	*Suaeda nigra, Sporobolus airoides, Nitrophila occidentalis, Heliotropium curassavicum, Zeltnera calycosa, Wislizenia refracta*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 6 classification plots sampled during the 2017–2020 mapping and classification effort.

This association bears some similarities to CEGL005465 *Isocoma acradenia* Desert Scrub and CEGL005395 *Isocoma acradenia* Wet Shrubland which are both under the A3880 Alliance we have placed this type under.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS167, IPS169, IPS173, IPS174, IPS220, IPS228

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

6. *(Parkinsonia microphylla) / Larrea tridentata / Ambrosia deltoidea* Shrubland Association (P)

Common Name: (Yellow Paloverde) / Creosote / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN183

Warren Code: 154.1112

Warren Name: *Larrea tridentata – Ambrosia* spp.

USNVC Classification

See Table 16 for USNVC hierarchy.

Table 16. USNVC hierarchy for (*Parkinsonia microphylla*) / *Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	*Carnegiea gigantea – Parkinsonia microphylla – Prosopis velutina* Desert Scrub [A3282]
Association	(*Parkinsonia microphylla*) / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This shrubland community is widespread throughout the Growler Valley, the Sonoyta Valley, and the Valley of the Ajo.

Environmental Description

This shrubland community spans low-angle (<5%), middle-bajadas of any aspect from 300–600 m (984–1,968 ft). The dominant soil consists of very deep, somewhat excessively drained alluvium, mainly of the Growler and Antho series. The alluvium can present as fine and sandy or can be dominated by fine to coarse gravel.

Vegetation Description

This shrubland community is characterized by a very open (<5%) canopy (>2 m) of *Parkinsonia microphylla* (yellow paloverde) with a subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote) and a field stratum (<0.5 m) by *Ambrosia deltoidea* (triangle bur ragweed). This shrubland occupies the habitat between, and is very transitional with, the similar *Larrea tridentata* / *Ambrosia*

deltoidea shrubland, an adjacent lower-bajada community, and the upper bajada *Parkinsonia microphylla* / *Larrea tridentata* / *Ambrosia deltoidea* shrubland.

Species in the canopy strata (>2 m) are sparse (<5%) to locally absent with *Parkinsonia microphylla* (yellow paloverde) providing the most consistent cover. While this species may be present along minor included washes, it should also occur throughout the interfluve. Across the community, this species provides cover that typically ranges from 1–3% with some areas reaching above 5%. *Prosopis velutina* (velvet mesquite) and *Olneya tesota* (ironwood) may appear, but these species tend to occur along small washes and rills where surface water is more plentiful. If present, saguaro (*Carnegiea gigantea*) are very inconsistent and provide trivial cover (<1%). *Fouquieria splendens* (ocotillo) is an occasional canopy component.

Larrea tridentata (creosote) is the sole subcanopy dominant, providing cover that ranges from sparsely vegetated expanses with 5% or less to dense shrublands with 20+%. On average it contributes around 10%, typically as short (1 m) individuals. This species alone accounts for over 50% of the total cover recorded in this community. Typically, this species provides 2–4 times the cover provided by the other dominant, triangle bur ragweed (*A. deltoidea*). Two succulents, *Cylindropuntia fulgida* (jumping cholla) and *Cylindropuntia acanthocarpa* (buckhorn cholla), in roughly half of examples (0.48, 0.48) provide inclusions of low cover (<1–3%).

The field stratum is characterized by the low-cover (<5%), sole dominance of *Ambrosia deltoidea* (triangle bur ragweed). Providing an average of 4% cover, this species accounts for 20% of the total cover recorded in this community. *Krameria bicolor* (white ratany) is a consistent (0.78) associate that typically contributes 1–2% cover. In order from most to least frequent, other noteworthy associate species include *Ambrosia dumosa* (burrobush), *Krameria erecta* (littleleaf ratany), *Cylindropuntia leptocaulis* (Christmas cactus), and *Echinocereus engelmannii* (Engelmann's hedgehog cactus). Seasonally, annual forbs may contribute noteworthy cover ranging from a few percent to dense inclusions that exceed the cover of the perennial species.

Warren Type Concept Description

On sandy or gravelly soil on the middle bajada with slopes of 2 to 5% from 1,300 to 1,800 feet. This association is widespread in the Valley of the Ajo and in the Growler Valley. The type is transitional between the Creosotebush association on the lower bajada and the paloverde bur sage associations on the upper bajada and pediment. In some cases, on steep bajada gradients the transition from Creosotebush-white bur sage to Paloverde-bur sage is so abrupt that this type cannot be mapped at the scale in use. The transition also may be of such a gradual nature that clearly defined boundaries are not present and types adjacent to this are delineated by dotted lines, indicating indefinite boundaries. Hilaria is found in greatest abundance in this association. Its occurrence is patchy with occasional dense stands in shallow swales near Armenta Well and on the west side of the Bates Mountains.

A low density, low-cover stand of microphyll shrubs 2–3 feet tall, containing a few scattered trees and several cacti species. Cover ranges from 15–20%. This association is intermediate between

depauperate Creosote bush types of the lower bajada and the diverse paloverde-bursage types in both structure and species richness.

USNVC Type Concept Description (Alliance level)

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

Species Summary

See Tables 17 and 18 for species summary details.

Table 17. Most abundant species: (*Parkinsonia microphylla*) / *Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (0.50)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0), *Krameria bicolor* (0.77)

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

Table 18. Other noteworthy associate species: (*Parkinsonia microphylla*) / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina, Olneya tesota, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida, Cylindropuntia acanthocarpa*
Field (0–0.5 m)	*Ambrosia dumosa, Ferocactus wislizenii, Krameria erecta, Echinocereus engelmannii, Cylindropuntia leptocaulis*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 2 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS266, IPS326

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

7. *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association (P)

Common Name: Ocotillo / Creosote / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN186

Warren Code: 154.1113

Warren Name: *Larrea tridentata – Ambrosia deltoidea – Fouquieria splendens* Association

USNVC Classification

See Table 19 for USNVC data.

Table 19. USNVC hierarchy for *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub [G293]
Alliance	*Carnegiea gigantea – Parkinsonia microphylla – Prosopis velutina* Desert Scrub [A3282]
Association	*Fouquieria splendens* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This shrubland community is restricted to the upper bajada near the southern end of the Ajo Mountain scenic loop road.

Environmental Description

This shrubland community spans low-angle (<5%), upper-bajadas, typically with a southern aspect from 500–650 m (1,640–2,132 ft). The surface is characterized by shallow to very shallow, well-drained alluvium underlying a dominant layer of coarse gravel. This community typically occurs on the higher and more exposed interfluves, often on a level above the more tree dominated bajada communities.

Vegetation Description

This shrubland community is characterized by an open (<10%) canopy (>2 m) solely dominated by *Fouquieria splendens* (ocotillo) with a subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote) and a field stratum (<0.5 m) by *Ambrosia deltoidea* (triangle bur ragweed). This community differs from similar adjacent communities due to the consistent dominance of *F.*

splendens (ocotillo), the absence of consistent *Parkinsonia microphylla* (yellow paloverde), and lower overall cover and species diversity.

F. splendens (ocotillo) is the sole canopy dominant with consistent (1.0) cover averaging to 5% including dense patches up to 20%. *Parkinsonia microphylla* (yellow paloverde) and *Olneya tesota* (desert ironwood) are sparse (0.20) to absent with the majority of cover present along small, included washes and/or the margins of the community. *Carnegiea gigantea* (saguaro) are a common (0.67), low-cover (<1%) associate.

The variable (5–20%) subcanopy is solely dominated by *L. tridentata* (creosote) with a number of low-cover succulents. This consistent (1.0) species provides an average cover of 11% with dense inclusions up to 20%. In many examples, this species was rather stunted with height around 0.5 m. *Cylindropuntia fulgida* (jumping cholla) and *Cylindropuntia acanthocarpa* (buckhorn cholla) are common (0.7, 0.6), low-cover associates that, when present, provide average cover around 1–2% each. No additional subcanopy species were documented.

The sparse (5%) field stratum is solely dominated by *A. deltoidea* (triangle bur ragweed). This consistent (1.0) small shrub contributes an average of 5% cover, accounting for almost all the cover in this stratum. *Krameria bicolor* (white ratany) is the only additional species of note, providing minimal cover (<1%) in some examples (0.6).

Warren Type Concept Description

On level ridgetops and interfluves in the upper bajada from 1,400 to 2,000 feet. This type is found on gravelly soil with a silty matrix. Fragments of caliche are commonly scattered abundantly on the soil surface. This association is found at scattered localities in the upper parts of the Sonoyta Valley and Growler Valley.

An open, uniform stand of microphyll shrubs *2* to *3* feet tall with very few taller trees and some cacti. Diversity is low and cover is from 10 to 20%. This type is surrounded generally by more diverse Paloverde-Bursage middle bajada type on adjacent slopes.

USNVC Type Concept Description (Alliance Level)

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

Species Summary

See Tables 20 and 21 for species summary details.

Table 20. Most abundant species: *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 21. Other noteworthy associate species: *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Cylindropuntia fulgida*
Field (0–0.5 m)	*Krameria bicolor*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 15 plots, including 1 long-term I&M monitoring plot, 12 classification plots sampled during the 2017–2020 mapping and classification effort, and 2 border impact plots.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP050, IPS081, IPS113, IPS114, IPS115, IPS116, IPS124, IP125, IPS141, IPS190, IP266, IPS281

Sonoran Desert Network Monitoring Plots
V102_007

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010–141, 2011–23

Local Type Description Authors
S. Studd, J. Galvin

8. *Parkinsonia microphylla / Larrea tridentata / Ambrosia deltoidea* Shrubland Association (P)

Common Name: Yellow Paloverde / Creosote / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN184

Warren Code: 154.1211

Warren Name: Ambrosia deltoidea–Parkinsonia microphylla middle bajada (Arizona upland)

USNVC Classification

See Table 22 for USNVC hierarchy.

Table 22. USNVC hierarchy for *Parkinsonia microphylla / Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	*Carnegiea gigantea – Parkinsonia microphylla – Prosopis velutina* Desert Scrub [A3282]
Association	*Parkinsonia microphylla* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This is a widespread community throughout the Sonoyta Valley, the La Abra Plains, and the Valley of the Ajo. It is present within the Growler Valley but is restricted to the slopes at the base of the Growler Mountains.

Environmental Description

This shrubland community spans the low-angle (<15%) bajada from 350–755 m (1,148–2,577 ft). The soils consist of very deep, well drained, and gravelly alluvium.

Vegetation Description

This shrubland community is characterized by a very open (5 [10]%) canopy strata (>2 m) dominated by *Parkinsonia microphylla* (yellow paloverde), a variable (5–20%) subcanopy stratum (0.5–2 m) by *Larrea tridentata* (creosote), and a sparse (<10%) field stratum (<0.5 m) by triangle bur ragweed. This community sits between the lower bajada *Larrea tridentata* / *Ambrosia deltoidea* shrubland and the pediment *P. microphylla* / *A. deltoidea* shrubland. These communities form a broad gradient

across the bajada in which transitional areas occur where it may be difficult to separate one type from another.

The canopy (>2 m) is characterized by the consistent presence (0.95) and typical dominance of *P. microphylla* (yellow paloverde). This species is present as small (2 m), shrub-like trees to larger (3–4 m), broad-canopied trees providing average cover around 5%, including some dense inclusions approaching 10%. At times, it is evenly distributed across the alluvial fan, but can also be clustered along small washes, depressions, or anywhere that additional moisture collects. *Olneya tesota* (desert ironwood) is an uncommon (0.25) associate that, when present, can provide 2–3% cover, sometimes becoming co-dominant with *P. microphylla* (yellow paloverde). *Carnegiea gigantea* (saguaro) is an occasional (0.53), but lower cover canopy species, with cover rarely surpassing 1%. *Fouquieria splendens* (ocotillo) is also an occasional (0.40) associate that, when present, provides cover ranging from <1–3%.

The subcanopy stratum (0.5–2 m) is characterized by the sole dominance of *L. tridentata* (creosote) with a few low-cover associate succulents and shrubs. This shrub provides the most cover of any species within this community, with an average of 8%, including dense inclusions approaching 25%. *Cylindropuntia acanthocarpa* (buckhorn cholla) and *Cylindropuntia fulgida* (jumping cholla) are occasional associates (0.70, 0.47) that, when present, rarely provide more than 1–2% cover. Other documented, but low-cover (<1%) associates include: *Vachellia constricta* (whitethorn acacia), *Lycium berlandieri* (Berlandier's wolfberry), and *Simmondsia chinensis* (jojoba).

The sparse (10%) field stratum (<0.5%) is characterized by the consistent presence (1.0) and typical dominance of *Ambrosia deltoidea* (triangle bur ragweed). Across the community, cover of this species is quite variable, ranging from sparsely vegetated areas with <1% to dense inclusions with cover from 10–20%. In order from most to least frequent, other noteworthy species include: *Krameria bicolor* (white ratany), *Ambrosia dumosa* (burrobush), *Trixis californica* (American threefold), and *Cylindropuntia arbuscula* (Arizona pencil cholla).

Warren Type Concept Description

This is one of the most widespread associations in the monument occurring from 1,500 to 2,000 feet on gravelly soil of the middle bajadas in the Valley of the Ajo, Sonoyta Valley, La Abra Plain, and Growler Valley. Occasionally this type is found on lower hillsides in the Bates Mountains. At lower elevations the type is bounded by Creosotebush associations and at higher elevations by more diverse pediment and hillslope types. This middle bajada is highly dissected by numerous small drainages along which plant density is higher and floristically similar to the riparian type 154.1214. The numerous small drainages form a mosaic which is too fine to be delineated by the scale in use for this project.

The general aspect is a uniform stand of shrubs 2 to 3 feet tall with a scattering of overstory trees 10–15 feet tall. Ground cover ranges from 15–25%. The type is often uniform over extensive areas with minor variation due to soil texture. Diversity is slightly greater on the coarser textured soils. This is the "Typical" Arizona Upland Paloverde-Bursage association.

USNVC Type Concept Description (Alliance Level)

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

Species Summary

See Tables 23 and 24 for species summary details.

Table 23. Most abundant species: *Parkinsonia microphylla* / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland Association.

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

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

Table 24. Other noteworthy associate species: *Parkinsonia microphylla / Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Olneya tesota, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida, Cylindropuntia acanthocarpa, Lycium berlandieri, Vachellia constricta, Simmondsia chinensis*
Field (0–0.5 m)	*Encelia farinosa, Krameria bicolor, Ambrosia dumosa, Trixis californica, Cylindropuntia arbuscula*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 65 plots, including 7 long-term I&M monitoring plots, 20 classification plots sampled during the 2017–2020 mapping and classification effort, and 38 border impact plots.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP038, IP055, IP065, IP110, IP141, IP227, IP291, IP432, IP461, IP497, IPS030, IPS094, IPS095, IPS096, IPS097, IPS118, IPS119, IPS120, IPS139, IPS152

Sonoran Desert Network Monitoring Plots
V101_007, V101_010, V102_001W, V102_002W, V102_003, V102_005, V103_008

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-112, 2010-116, 2010-123, 2010-127, 2010-128, 2010-139, 2010-144, 2010-28, 2010-35, 2010-36, 2010-46, 2010-47, 2010-48, 2010-53, 2010-55, 2010-59, 2010-64, 2010-67, 2010-70, 2010-79, 2010-91, 2010-92, 2010-98, 2011-100, 2011-105, 2011-106, 2011-15, 2011-16, 2011-29, 2011-34, 2011-44, 2011-60, 2011-61, 2011-64, 2011-65, 2011-79, 2011-83, 2011-88

Local Type Description Authors
S. Studd, J. Galvin

9. *Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association (P)

Common Name: Yellow Paloverde – Ironwood / Creosote / Triangle Bur Ragweed Wooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN185

Warren Code: 154.1216

Warren Name: *Parkinsonia microphylla–Ambrosia deltoidea–Olneya tesota* Association

USNVC Classification

See Table 25 for USNVC hierarchy.

Table 25. USNVC hierarchy for *Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	*Carnegiea gigantea – Parkinsonia microphylla – Prosopis velutina* Desert Scrub [A3282]
Association	*Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland

Type Concept Descriptions

Distribution

This type is most common through the Abra Plain with some examples in the western portion of the Sonoyta Valley.

Environmental Description

This wooded shrubland spans low-angle (<15%), generally south trending bajadas from 375–525 m (1,230–1,722 ft). These areas have more variable topography than the adjacent bajada communities, often appearing on low, rolling hills. The soil is characterized as very deep and well-drained alluvium, typically of the gunsight series. The surface is covered with a dominant layer of coarse (>2 cm) gravel with minimal exposed soil.

Vegetation Description

This wooded shrubland community is characterized by an open (10%) canopy (>2 m) co-dominated by *Parkinsonia microphylla* (yellow paloverde) and *Olneya tesota* (ironwood) with an understory

dominated by *Larrea tridentata* (creosote) in the subcanopy (0.5–2 m) and *Ambrosia deltoidea* (triangle bur ragweed) in the field stratum (<0.5 m).

P. microphylla (yellow paloverde) is dominant in all examples of this community with average cover around 5%. *O. tesota* (ironwood) is a co-dominant in most examples (0.75) with cover ranging from 1–7%. These species range from short-statured (<2 m) shrub-like trees to larger (3–5 m) single trunk trees. Unlike in other bajada types, *O. tesota* (ironwood) is not restricted to washes and minor drainages but instead is distributed throughout the community. Other documented, low-cover (1%) associates include: *Fouquieria splendens* (ocotillo), *Carnegiea gigantea* (saguaro), *Prosopis velutina* (velvet mesquite), and *Stenocereus thurberi* (organ pipe cactus).

The open (<10%) subcanopy stratum (0.5–2 m) is characterized by the sole, low-cover dominance of *L. tridentata* (creosote). On average, this species provides around 4% cover with some inclusions reaching up to 10%. At times, inclusions of co-dominant succulents can appear, typically composed of *Cylindropuntia acanthocarpa* (buckhorn cholla) and *Cylindropuntia fulgida* (jumping cholla). Other noteworthy subcanopy species include *Jatropha cuneata* (physicnut), *Cylindropuntia bigelovii* (teddybear cholla), and *Lycium berlandieri* (Berlandier's wolfberry).

The very sparse (5%) field stratum is characterized by the dominance of *A. deltoidea* (triangle bur ragweed) with only a few low-cover associates. *A. deltoidea* (triangle bur ragweed) is dominant in most examples (0.75) of this community with an average 6% cover, including a dense inclusion around 20%. Other documented field components include: *Encelia farinosa* (brittlebush), *Fagonia laevis* (California fagonbush), *Krameria bicolor* (white ratany).

Warren Type Concept Description

On gentle, rolling slopes of the middle bajada in the Sonoyta Valley, from 1,400 to 1,600 feet. This association is found on sandy loam soil, with slightly greater drainage density than surrounding types. This association usually is bounded at lower elevations by creosotebush or saltbush associations and at higher elevations by other bursage-Paloverde associations.

This association is essentially the same as the Paloverde-Bursage middle bajada association (154.1211) except for the increased abundance of ironwood and a distribution on slightly more rolling terrain. Cover ranges from 15 to 25%. This type is a uniform stand of shrubs 2 to 3 feet tall with an overstory of small trees 10 to 15 feet tall and scattered cacti 1 to 30 feet tall.

USNVC Type Concept Description (Alliance Level)

This Sonoran Desert scrub is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic deciduous and evergreen tall shrubs *Parkinsonia microphylla* and *Larrea tridentata*, with *Prosopis velutina*, *Olneya tesota*, and *Fouquieria splendens* (less prominent). Other common shrubs and dwarf-shrubs present include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Encelia farinosa*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Psilostrophe cooperi*, *Simmondsia chinensis*, *Tetracoccus hallii*, *Zinnia grandiflora*, and many cacti, including *Echinocereus* spp., *Ferocactus* spp., *Cylindropuntia bigelovii*,

Opuntia engelmannii, and *Cylindropuntia fulgida*. The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. Stands occur on rocky slopes of hills, mesas, and alluvial fans. Elevation is typically below 1,220 m. Sites have gentle to steep slopes. Substrates are generally coarse-textured, shallow, gravelly loams.

Species Summary

See Tables 26 and 27 for species summary details.

Table 26. Most abundant species: *Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Olneya tesota* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 27. Other noteworthy associate species: *Parkinsonia microphylla – Olneya tesota / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Fouquieria splendens, Prosopis velutina, Stenocereus thurberi*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Cylindropuntia bigelovii, Cylindropuntia fulgida, Jatropha cuneata, Lycium berlandieri*
Field (0–0.5 m)	*Encelia farinosa, Fagonia laevis, Krameria bicolor*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 9 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP201, IPS031U, IPS074U, IPS136U, IPS137U, IPS138U, IPS140U, IPS142U, IPS308

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

10. *Parkinsonia microphylla (Stenocereus thurberi) / Larrea tridentata / Ambrosia deltoidea* Shrubland Association (P)

Common Name: Yellow Paloverde (Organ Pipe Cactus) / Creosote / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN194

Warren Code: 154.1212

Warren Name: *Ambrosia deltoidea – Parkinsonia microphylla* Pediment Association

USNVC Classification

See Table 28 for USNVC hierarchy.

Table 28. USNVC hierarchy for *Parkinsonia microphylla (Stenocereus thurberi) / Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Parkinsonia microphylla* (*Stenocereus thurberi*) / *Larrea tridentata* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This community occurs at the base of many hills and mountains throughout the monument. The largest cluster of examples is scattered throughout the Sonoyta and Puerto Blanco Mountains. This community is notably absent from the Ajo range.

Environmental Description

This community occupies the transition between the alluvial fan and the adjacent mountain/hill slopes from 375–675 m (1,230–2,214 ft). The surface is characterized by shallow, excessively drained alluvium underlying a dominant layer of coarse gravel and scattered cobble. Exposed bedrock is occasional, typically along erosional features.

Vegetation Description

This shrubland community is characterized by an open (5–15%) canopy (>2 m) of *Parkinsonia microphylla* (yellow paloverde) and *Stenocereus thurberi* (organ pipe cactus), a subcanopy (0.5–2 m) of *Larrea tridentata* (creosote), and a field stratum (<0.5 m) dominated by *Ambrosia deltoidea*

(triangle bur ragweed) with a diverse suite of associate shrubs and succulents. This community is highly transitional with the middle bajada *P. microphylla* / *Larrea tridentata* / *A. deltoidea* shrubland. The three most prominent species are the same in both communities with similar cover values. The main differences between these communities relate to the increased diversity, constancy, and cover of associated species, typically succulents. The most diagnostic species that increases in abundance is *S. thurberi* (organ pipe cactus).

The canopy (>2 m) is characterized by the consistent presence (0.93) and typical dominance of *P. microphylla* (yellow paloverde). This species is present as small (2 m), shrub-like trees to larger (3–4 m), broad-canopied trees providing average cover around 5%, including some dense inclusions approaching 10%. At times, it is evenly distributed across the alluvial fan, but can also be clustered along small washes, depressions, or anywhere that additional moisture collects. *Stenocereus thurberi* (organ pipe cactus) is a consistent (1.0) associate with low cover ranging from a few scattered individuals to 1–3%. This species becomes more prominent as the community transitions on to the lower mountain slopes. *Olneya tesota* (desert ironwood) is an occasional (0.58) associate that, when present, can provide 2–3% cover, sometimes becoming co-dominant with *P. microphylla* (yellow paloverde). *Fouquieria splendens* (ocotillo) is a consistent (0.85) associate that, when present, provides cover ranging from 1–5%. *Carnegiea gigantea* (saguaro) is a consistent (0.71), but lower cover canopy species, with cover rarely surpassing 1%.

The subcanopy stratum (0.5–2 m) is characterized by the dominance of *L. tridentata* (creosote) with a diverse suite of associate succulents and shrubs. On average, *L. tridentata* (creosote) provides 3–4% cover with some dense inclusions up to 10%. This is less than half of what is typically present in the adjacent middle bajada *P. microphylla* / *Larrea tridentata* / *A. deltoidea* shrubland. *Cylindropuntia acanthocarpa* (buckhorn cholla) is a consistent (0.75) associate that, when present, provides average cover around 3% with dense inclusions where it outcompetes *L. tridentata* (creosote). *Cylindropuntia fulgida* (jumping cholla) is an occasional associate (0.50) that, when present, provides cover similar to that of *L. tridentata* (creosote). Toward the upper elevational range of this community, *Jatropha cuneata* (physicnut) begins to provide dominant (5–10%) cover, but is inconsistent (0.54) across the broader community. This species is most common in the Puerto Blanco and Bates Mountains. In order from most to least frequent, other noteworthy but low-cover (<1%) associates include *Lycium berlandieri* (Berlandier's wolfberry), *Cylindropuntia bigelovii* (teddybear cholla), and *Vachellia constricta* (whitethorn acacia).

The sparse ([5] 10–15%) field stratum (<0.5 m) is characterized by the consistent presence (1.0) and typical dominance of *Ambrosia deltoidea* (triangle bur ragweed). Across the community, cover of this species is quite variable, ranging from sparsely vegetated areas with <1% to dense inclusions with cover from 20 to 40%. *Encelia farinosa* (brittlebush) is a common (0.71) species that becomes more abundant where the bajada transitions to the more exposed mountain slopes. On average, this species provides cover around 2% with dense inclusions up to 10%. In order from most to least frequent, other noteworthy species include: *Krameria bicolor* (white ratany), *Echinocereus engelmannii* (Engelmann's hedgehog cactus), *Trixis californica* (American threefold), *Muhlenbergia porteri* (bush muhly), *Fagonia laevis* (California fagonbush), and *Ferocactus emoryi* (Emory's barrel cactus).

Warren Type Concept Description

This type occurs on nearly level to rolling terrain from 1,400 to 2,000 feet elevation at the base of the Puerto Blanco, Bates, and Growler Mountains. Very coarse soil on which the type is found is commonly underlain by bedrock in bottom drainage ways. The terrain often is dissected moderately. *Neolloydia erectocentra* (name has been updated to *Sclerocactus erectocentrus* i.e., the Acuna cactus) is generally restricted to this type in the vicinity of the Puerto Blanco Mountains.

A very diverse mixture of evergreen and deciduous trees, shrubs, and cacti with cover from 25–35%. The height of shrubs ranges from 2 to 4 feet, trees from 10 to 15 feet, and cacti from 6 inches to 30 feet. This type is transitional between the Paloverde-Bursage types of the bajada and the Paloverde-Brittlebush types of the hillslopes and tends to be more diverse than either of those as a result of mixing species from both types.

USNVC Type Concept Description (Group Level)

This group occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic, summer deciduous tall shrub *Parkinsonia microphylla* and evergreen *Larrea tridentata*, with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as “Cholla Gardens” in the southern and eastern Mojave Desert in California. In this area, the group is characterized by *Cylindropuntia bigelovii*, *Fouquieria splendens*, and other succulents, but it lacks *Carnegiea gigantea* and *Parkinsonia microphylla*, which are typical farther east.

Species Summary

See Tables 29 and 30 for species summary details.

Table 29. Most abundant species: *Parkinsonia microphylla (Stenocereus thurberi) / Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	*Carnegiea gigantea* (0.71)
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Stenocereus thurberi* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (0.93)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 30. Other noteworthy associate species: *Parkinsonia microphylla (Stenocereus thurberi) / Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida, Lycium berlandieri, Jatropha cuneata, Vachellia constricta, Simmondsia chinensis, Cylindropuntia acanthocarpa, Cylindropuntia bigelovii*
Field (0–0.5 m)	*Encelia farinosa, Krameria bicolor, Echinocereus engelmannii, Trixis californica, Fagonia laevis, Muhlenbergia porteri, Ferocactus emoryi*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 41 plots, including 4 long-term I&M monitoring plots, 31 classification plots sampled during the 2017–2020 mapping and classification effort, and 6 border impact plots.

The M088 *Carnegiea gigantea – Stenocereus thurberi – Ambrosia dumosa* Mojave-Sonoran Semi-Desert Scrub Macrogroup, under which this association will fall, is very well described and detailed, however the groups, alliances and association are very much under-described and lacking. We anticipate that data from this project will be incorporated in coming years into new association descriptions.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP089, IP207, IP232, IP367, IPS047, IPS105, IPS106, IPS110, IPS112, IPS129, IPS135, IPS148, IPS149, IPS150, IPS151, IPS153, IPS161, IPS162, IPS164, IPS165, IPS189, IPS191, IPS192, IPS194, IPS208, IPS212, IPS245, IPS283, IPS287, IPS289, IPS291

Sonoran Desert Network Monitoring Plots
V101_005, V102_002, V102_003W, V103_012

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-68, 2010-75, 2010-117, 2010-130, 2011-24, 2011-87

Local Type Description Authors
S. Studd, J. Galvin

11. *Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association (P)

Common Name: Yellow Paloverde – Organ Pipe Cactus – Senita Cactus / Creosote / Triangle Bur Ragweed Wooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN195

Warren Code: 154.1272

Warren Name: *Parkinsonia microphylla – Ambrosia deltoidea – Stenocereus thurberi* with *Jatropha* spp. Association

USNVC Classification

See Table 31 for USNVC hierarchy.

Table 31. USNVC hierarchy for *Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland

Type Concept Descriptions

Distribution

This type is restricted to the Senita Basin area.

Environmental Description

This community spans low-angle (<5%), southwest-trending floodplains and alluvial fans around 500 m (1,640 ft). The surface cover is dominated by fine gravel and fine, silty soil with scattered small rocks. This community includes many narrow, braided washes.

Vegetation Description

This wooded shrubland community is characterized by a canopy co-dominated by *Parkinsonia microphylla* (yellow paloverde), *Stenocereus thurberi* (organ pipe cactus), and *Pachycereus schottii* (senita cactus) with a subcanopy (0.5–2 m) of *Larrea tridentata* (creosote) and a field (<0.5 m) of *Ambrosia deltoidea* (triangle bur ragweed). This community differs from adjacent bajada and pediment communities due to the presence of the diagnostic species, *P. schottii* (senita cactus).

P. microphylla and *Olneya tesota* (desert ironwood) are consistent (1.0) canopy dominants with average cover around 5%. These species are present as short (3–4 m), shrubby trees. *S. thurberi* and *P. schottii* are consistent (1.0) yet low-cover dominants that, on average, each provide cover around 2% with inclusions up to 5%. *Carnegiea gigantea* (saguaro) is another consistent (1.0) low-cover (1–2%) succulent species.

In the subcanopy *L. tridentata* provides consistent (1.0) dominance with average cover around 6%. In order from most to least frequent, other documented subcanopy species include *Cylindropuntia fulgida* (jumping cholla), *Lycium* spp. (wolfberry), *Sebastiania bilocularis* (arrow poison plant), *Cylindropuntia acanthocarpa* (buckhorn cholla), and *Jatropha cuneata* (Physicnut).

In the variable (5–20%) field stratum *A. deltoidea* (triangle bur ragweed) is a consistent (1.0) dominant that provides the most cover of any species in this community with an average around 15%. In order from most to least frequent, other noteworthy field species include *Encelia farinosa* (brittlebush), *Cylindropuntia leptocaulis* (Christmas cactus), *Fagonia laevis* (California fagonbush), *Trixis californica* (American threefold), and *Porophyllum gracile* (slender poreleaf).

Warren Type Concept Description

Found on level rolling hills from 1,600 to 2,000 feet on the south side of the Puerto Blanco Mountains and in the Senita Basin. The association is found on gravelly soils, derived from decomposed granite and schist, which is usually fairly deep (greater than 1 meter) but may be underlain by bedrock. This type includes many of the frost-sensitive species in the monument. To the southeast of Diaz Peak, what appears to be the highest density of organ pipe cactus in the monument occurs in a unit of this association; however, no senita were observed in that area.

A highly diverse mixture of deciduous microphyll trees, deciduous and evergreen shrubs and cacti which are regularly spaced on level to rolling terrain. Cover ranges from 25–35%. The height of trees is 10–15 feet, the shrubs 1–3 feet, and the cacti 1–30 feet. Several species are frost sensitive. Severe frost damage was visible on *Jatropha* and *Olneya* in May 1979.

USNVC Type Concept Description (Group Level)

This group occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic, summer deciduous tall shrub *Parkinsonia microphylla* and evergreen *Larrea tridentata*, with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as “Cholla Gardens” in the southern and eastern Mojave Desert in

California. In this area, the group is characterized by *Cylindropuntia bigelovii*, *Fouquieria splendens*, and other succulents, but it lacks *Carnegiea gigantea* and *Parkinsonia microphylla*, which are typical farther east.

Species Summary

See Tables 32 and 33 for species summary details.

Table 32. Most abundant species: *Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (*1.0), Stenocereus thurberi* (1.0), *Pachycereus schottii* (1.0), *Olneya tesota* (1.0)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 33. Other noteworthy associate species: *Parkinsonia microphylla – Stenocereus thurberi – Pachycereus schottii / Larrea tridentata / Ambrosia deltoidea* Wooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida, Lycium* spp.*, Sebastiania bilocularis, Cylindropuntia acanthocarpa, Jatropha cuneata*
Field (0–0.5 m)	*Encelia farinosa, Cylindropuntia leptocaulis, Fagonia laevis, Trixis californica, Porophyllum gracile*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 3 classification plots sampled during the 2017–2020 mapping and classification effort. *Pachycereus schottii* (Senita) is a diagnostic component of this community.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS103, IPS285, IPS295

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

12. *Fouquieria splendens* / *Selaginella arizonica* Shrubby Rock Outcrop Association (P)

Common Name: Ocotillo / Arizona Spikemoss Shrubby Rock Outcrop Association

USNVC Code: None

SODN Code: NPSSODN196

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None

USNVC Classification

See Table 34 for USNVC hierarchy.

Table 34. USNVC hierarchy for *Fouquieria splendens* / *Selaginella arizonica* Shrubby Rock Outcrop Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Fouquieria splendens / Selaginella arizonica* Shrubby Rock Outcrop

Type Concept Descriptions

Distribution

This type is found in the Ajo Mountains, mainly in the vicinity of Bull Pasture, and in the southeastern portion of the Diablo Mountains, within the Ajo Mountain loop road.

Environmental Description

This shrubland spans moderately steep (15–35%) mountain slopes or variable aspect from 780–1,050 m (2,559–3,444 ft). The surface cover is characterized by very shallow and rocky soils, typically of volcanic origin (rhyolite and dacite). Expanses of exposed bedrock and high surface rock cover were noted in all examples of this community.

Vegetation Description

This shrubland community is characterized by a sparse (<10%) canopy (>2 m) and subcanopy (0.5–2 m) of *Fouquieria splendens* (ocotillo) with a field stratum (<0.5 m) dominated by *Selaginella arizonica* (Arizona spikemoss). Many of the woody species and columnar cacti in this community presented with average heights well below what was documented elsewhere in the monument. This is

the only community within the monument that is defined by a non-woody species, *S. arizonica* (Arizona spikemoss).

F. splendens (ocotillo) is a consistent (1.0) dominant that provides average cover around 5% with some areas up to 10%. Individuals of this species were relatively short-statured with height around 2 m, often split between the subcanopy (0.5–2 m) and the canopy (>2 m) strata. *P. microphylla* (yellow paloverde) is a consistent (1.0) associate and occasional (0.22) dominant that provides an average of 3% cover. This species was also short-statured with height rarely surpassing 2 m. *Coursetia glandulosa* (rosary babybonnets) is a consistent (0.88) associate with average cover around 2% with inclusions up to 10%. *Stenocereus thurberi* (organ pipe cactus) was present in most examples (0.88) of this community with cover ranging from less than 1% to 4%. In order from most to least frequent, other documented species in the subcanopy and canopy strata include: *Cylindropuntia acanthocarpa* (buckhorn cholla), *Dodonaea viscosa* (Florida hopbush), *Ephedra aspera* (rough joint-fir), *Simmondsia chinensis* (jojoba), *Senegalia greggii* (catclaw acacia), *Jatropha cuneata* (physicnut), and *Lycium berlandieri* (Berlandier's wolfberry).

The field stratum (<0.5 m) is characterized by the dominance of *S. arizonica* (Arizona spikemoss) with two common associates, *A. schottii* (Schott's century plant) and *Bouteloua repens* (slender grama), and a diverse suite of associate subshrubs, perennial grasses, and forbs. Total cover can be quite variable, ranging from 10–20% where exposed bedrock/rock is prevalent to dense areas with 50+%, mainly in places with more available surface soil. *S. arizonica* was present as a dominant in all examples of this community with areas of cover less than 10% and others with 20–40+%. This is by far the most dominant species in this community, accounting for an average of 26% of the total cover recorded across the community. *A. schottii* is a common (0.58) associate that, when present, provides cover ranging 2–5% with one example reaching 15%. *Bouteloua repens* is another common (0.83) associate that, when present, provides a 1–3% cover with one dense inclusion reaching 18%. In order from most to least frequent, other documented associates include: *Cottsia gracilis* (slender janusia), *Calliandra eriophylla* (fairyduster), *Bahiopsis parishii* (Parish's goldeneye), *Eriogonum fasciculatum* (Eastern Mojave buckwheat), *Gutierrezia sarothrae* (broom snakeweed), and *Eriogonum wrightii* (bastardsage).

Warren Type Concept Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Group Level)

This group occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy codominated by xeromorphic, summer deciduous tall shrub *Parkinsonia microphylla* and evergreen *Larrea tridentata*, with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia*

spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as "Cholla Gardens" in the southern and eastern Mojave Desert in California. In this area, the group is characterized by *Cylindropuntia bigelovii*, *Fouquieria splendens*, and other succulents, but it lacks *Carnegiea gigantea* and *Parkinsonia microphylla*, which are typical farther east.

Species Summary

See Tables 35 and 36 for species summary details.

Table 35. Most abundant species: *Fouquieria splendens* / *Selaginella arizonica* Shrubby Rock Outcrop Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Fouquieria splendens* (1.0), *Parkinsonia microphylla* (1.0)
Field (0–0.5 m)	*Selaginella arizonica* (1.0), *Agave schottii* (0.78), *Bouteloua repens* (0.89)

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

Table 36. Other noteworthy associate species: *Fouquieria splendens* / *Selaginella arizonica* Shrubby Rock Outcrop Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Coursetia glandulosa, Stenocereus thurberi, Cylindropuntia acanthocarpa, Dodonaea viscosa, Ephedra aspera, Simmondsia chinensis, Senegalia greggii, Jatropha cuneata, Lycium berlandieri*
Field (0–0.5 m)	*Cottsia gracilis, Calliandra eriophylla, Bahiopsis parishii, Eriogonum fasciculatum, Gutierrezia sarothrae, Eriogonum wrightii*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 12 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS013, IPS014, IPS016, IPS017, IPS050, IPS058, IPS059, IPS077, IPS091, IPS299, IPS312, IPS317

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

13. *Parkinsonia microphylla / Jatropha cuneata / Encelia farinosa* Shrubland Association (P)

Common Name: Yellow Paloverde / Physicnut / Brittlebush Shrubland Association

USNVC Code: None

SODN Code: NPSSODN197

Warren Code: 154.1262

Warren Name: *Parkinsonia microphylla – Encelia farinosa – Fouquieria splendens* Association

USNVC Classification

See Table 37 for USNVC hierarchy.

Table 37. USNVC hierarchy for *Parkinsonia microphylla / Jatropha cuneata / Encelia farinosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Parkinsonia microphylla / Jatropha cuneata / Encelia farinosa* Shrubland

Type Concept Descriptions

Distribution

This widely distributed type is found throughout the Bates and Puerto Blanco Mountains, as well as the Cipriano Hills.

Environmental Description

This wooded shrubland community typically spans north-trending mountain and hill slopes of variable grade (15–50+%) from 340–1,260 m (1,115–4,133 ft). The surface cover is characterized by the dominance of coarse gravel (>2 cm) and rock with minimal exposed soil.

Vegetation Description

This wooded shrubland community is characterized by an open (10–25%) low-canopy (2–5 m) dominated by *Parkinsonia microphylla* (yellow paloverde), a subcanopy (0.5–2 m) by *Jatropha cuneata* (physicnut), and a field stratum (<0.5) by *Encelia farinosa* (brittlebush). This community differs from the often-adjacent *Parkinsonia microphylla* (*Stenocereus thurberi*) / *Jatropha cuneata* / *Encelia farinosa* Shrubland due to the patchy to absent *S. thurberi* (organ pipe cactus).

P. microphylla is a consistent (1.0) component of this community that typically is the dominant species, with average cover around 6% with some inclusions up to 15%. Overall, this species was relatively short-statured, with average heights ranging from 2–3 m. *S. thurberi* (organ pipe cactus) is an uncommon component of this community and is typically only present in more exposed inclusions. *Carnegiea gigantea* (saguaro) is a common (0.7), but very sparse (<1%) associate.

The relatively sparse (5–15 [25]%) subcanopy stratum (0.5–2 m) is characterized by the consistent presence (0.80) and typical dominance of *Jatropha cuneata* (physicnut) with a mix of low-cover shrubs and succulents. When present, this species provides average cover around 4% with some dense inclusions up to 10%. *Cylindropuntia bigelovii* (teddybear cholla) is an inconsistent (0.4) associate that can occasionally become co-dominant with, or sub-dominant to, *J. cuneata* with cover approaching 10%. In order from most to least frequent, other noteworthy species include: *Larrea tridentata* (creosote), *Cylindropuntia acanthocarpa* (buckhorn cholla), *Lycium berlandieri* (Berlandier's wolfberry), *Hyptis emoryi* (desert lavender), and *Sebastiania bilocularis* (arrow poison plant).

The sparse (<10%) field stratum (<0.5 m) is characterized by the sole dominance of *Encelia farinosa* (brittlebush) with a few sparse associates. This species was recorded as dominant in all examples of the community with average cover ranging from 5–15%. Areas of low cover typically occur in the transitional zones between mountain slopes and the alluvial fan where *Ambrosia deltoidea* (triangle bur ragweed) begins to dominate. When precipitation allows, the annual forb *Perityle emoryi* (Emory's rockdaisy) may provide high cover that may outcompete all other species. In order from most to least frequent, other documented species include: *Krameria bicolor* (white ratany), *Cottsia gracilis* (slender janusia), *Fagonia laevis* (California fagonbush), and *Hibiscus denudatus* (paleface).

Warren Type Concept Description

Moderately steep north-facing slopes from 1,000 to 3,500 feet in the Ajo, Puerto Blanco and Bates mountains. Substrate generally is very gravelly soil with many cobbles, large boulders and rock outcrops of basalt or rhyolite. It generally occurs at the same elevations as 154.1261, but on the cooler north slopes. At the upper elevational limits of the type it occurs also on south-facing slopes.

An irregularly spaced, highly diverse mixture of deciduous shrubs, cacti and deciduous microphyll trees. Ground cover is variable and patchy, but generally 20 to 30%. Foliage height of shrubs is from 2 to 4 feet, trees from 10 to 15 feet, and cacti from 1 to 30 feet. This is a moderate to high diversity type. This association is similar to 154.1261 but contains fewer frost-sensitive species.

USNVC Type Concept Description (Group Level)

This group occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by xeromorphic, summer deciduous tall shrub *Parkinsonia microphylla* and evergreen *Larrea tridentata*, with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites),

Calliandra eriophylla, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as "Cholla Gardens" in the southern and eastern Mojave Desert in California. In this area, the group is characterized by *Cylindropuntia bigelovii*, *Fouquieria splendens*, and other succulents, but it lacks *Carnegiea gigantea* and *Parkinsonia microphylla*, which are typical farther east.

Species Summary

See Tables 38 and 39 for species summary details.

Table 38. Most abundant species: *Parkinsonia microphylla* / *Jatropha cuneata* / *Encelia farinosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Jatropha cuneata* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 39. Other noteworthy associate species: *Parkinsonia microphylla / Jatropha cuneata / Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Olneya tesota*, *Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Larrea tridentata, Lycium berlandieri, Sebastiania bilocularis, Hyptis emoryi*
Field (0–0.5 m)	*Ambrosia deltoidea, Fagonia laevis, Hibiscus denudatus, Krameria bicolor, Cottsia gracilis*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 10 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS179, IPS195, IPS198, IPS199, IPS204, IPS221, IPS233, IPS239, IPS277, IPS293

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

14. *Parkinsonia microphylla (Stenocereus thurberi) / Jatropha cuneata / Encelia farinosa* Shrubland Association (P)

Common Name: Yellow Paloverde (Organ Pipe Cactus) / Physicnut / Brittlebush Shrubland Association

SODN Code: NPSSODN198

Warren Code: 154.1261

Warren Name: *Parkinsonia microphylla – Encelia farinosa – Stenocereus thurberi – Jatropha cuneata* Hillside Association

USNVC Classification

See Table 40 for USNVC hierarchy.

Table 40. USNVC hierarchy for *Parkinsonia microphylla (Stenocereus thurberi) / Jatropha cuneata / Encelia farinosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Parkinsonia microphylla* (*Stenocereus thurberi*) / *Jatropha cuneata / Encelia farinosa* Shrubland

Type Concept Descriptions

Distribution

This widely distributed type is found throughout the Bates, Sonoyta, and Puerto Blanco Mountains, as well as the Quitobaquito and Cipriano Hills.

Environmental Description

This shrubland community typically spans south-trending mountain and hill slopes of variable grade (15–50+%) from 300–1219 m (984–4000). The surface cover is characterized by the dominance of coarse gravel (>2 cm) and rock with minimal exposed soil.

Vegetation Description

This shrubland community is characterized by an open (10–25%) canopy (>2 m) dominated by *Parkinsonia microphylla* (yellow paloverde) with conspicuous *Stenocereus thurberi* (organ pipe cactus), a subcanopy (0.5–2 m) by *Jatropha cuneata* (physicnut), and a field stratum (<0.5 m) by *Encelia farinosa* (brittlebush). *P. microphylla* (yellow paloverde) is a consistent (1.0) component of this community that typically presents as a dominant species with average cover around 5% with some inclusions up to 15%. Overall, this species was relatively short-statured, with average heights

ranging from 2–3 m. *S. thurberi* is a patchy (0.66) associate with heights ranging from 3–5 m. When present, this species provides average cover of 4% with rare, dense inclusions up to 15%. *Olneya tesota* (ironwood) is an uncommon (0.28), low-cover (<1%) associate. This species tends to be most prevalent where it spans a pediment or upper alluvial fan. *Carnegiea gigantea* (saguaro) is an inconsistent, but occasionally conspicuous component that provides trivial cover.

The relatively open (5–15 [25]%) subcanopy stratum (0.5–2 m) is characterized by the consistent (0.88) dominance of *Jatropha cuneata* (physicnut) with a mix of low-cover shrubs and succulents. With an average of 8% cover, this species provides the highest cover of any species documented in this community. *Cylindropuntia bigelovii* (teddybear cholla) is an inconsistent (0.38) associate that can occasionally become co-dominant with, or sub-dominant to, *J. cuneata* with cover approaching 10%. In order from most to least frequent, other noteworthy species include: *Larrea tridentata* (creosote), *Cylindropuntia acanthocarpa* (buckhorn cholla), *Lycium berlandieri* (Berlandier's wolfberry), and *Sebastiania bilocularis* (arrow poison plant).

The sparse (<10%) field stratum (<0.5 m) is characterized by the sole dominance of *Encelia farinosa* with a few sparse associates. This species was recorded as dominant in all examples of the community with average cover ranging from 5–15%. Areas of low cover typically occur in the transitional zones between mountain slopes and the alluvial fan where *Ambrosia deltoidea* (triangle bur ragweed) begins to dominate. In order from most to least frequent, other documented species include: *Krameria bicolor* (white ratany), *Fagonia laevis* (California fagonbush), and *Hibiscus denudatus* (paleface).

Warren Type Concept Description

On moderately steep south-facing hillsides in the Quitobaquito Hills and Ajo, Puerto Blanco and Bates mountains, from 1,100 to 3,000 feet. The substrate is generally very gravelly soil with many cobbles and large boulders and occasional bedrock out-crops of basalt or rhyolite. The type tends to have greater species diversity in the Ajo Mountains where some higher elevation species may be found. An irregularly spaced, highly diverse mixture of deciduous shrubs, cacti and small deciduous microphyllous trees. Cover is relatively high for desert scrub associations, ranging from 25 to 40%. The shrubs are generally from 2 to 4 feet tall, cacti from 1 to 30 feet tall and trees from 10 to 15 feet tall. This is one of the most diverse types in the monument.

USNVC Type Concept Description (Group Level)

This group occurs on hillsides, mesas and upper bajadas in southern Arizona and extreme southeastern California. The vegetation is characterized by a diagnostic sparse, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) and/or a sparse to moderately dense canopy co-dominated by xeromorphic, summer deciduous tall shrub *Parkinsonia microphylla* and evergreen *Larrea tridentata*, with *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* less prominent. Other common shrubs and dwarf-shrubs include *Acacia greggii*, *Ambrosia deltoidea*, *Ambrosia dumosa* (in drier sites), *Calliandra eriophylla*, *Jatropha cardiophylla*, *Krameria erecta*, *Lycium* spp., *Menodora scabra*, *Simmondsia chinensis*, and many cacti, including *Ferocactus* spp., *Echinocereus* spp., and *Opuntia* spp. (both cholla and prickly-pear). The sparse herbaceous layer is composed of perennial grasses

and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as "Cholla Gardens" in the southern and eastern Mojave Desert in California. In this area, the group is characterized by *Cylindropuntia bigelovii*, *Fouquieria splendens*, and other succulents, but it lacks *Carnegiea gigantea* and *Parkinsonia microphylla*, which are typical farther east.

Species Summary

See Tables 41 and 42 for species summary details.

Table 41. Most abundant species: *Parkinsonia microphylla* (*Stenocereus thurberi*) / *Jatropha cuneata* / *Encelia farinosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Stenocereus thurberi* (0.77)
Subcanopy (0.5–2 m)	*Jatropha cuneata* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 42. Other noteworthy associate species: *Parkinsonia microphylla* (*Stenocereus thurberi*) / *Jatropha cuneata* / *Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Olneya tesota*, *Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Larrea tridentata, Lycium berlandieri, Sebastiania bilocularis*
Field (0–0.5 m)	*Ambrosia deltoidea, Fagonia laevis, Hibiscus denudatus, Krameria bicolor*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 17 plots, including 4 long-term I&M monitoring plots, 5 border impact plots, and 8 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP143, IPS080, IPS102, IPS109, IPS111, IPS178, IPS184, IPS223

Sonoran Desert Network Monitoring Plots
V102_001R, V103_001W, V103_004, V103_011

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-114, 2010-12, 2011-102, 2011-18, 2011-82

Local Type Description Authors
S. Studd, J. Galvin

15. *Parkinsonia microphylla* / *Jatropha cuneata* (*Bursera microphylla*) / *Encelia farinosa* Shrubland Association (P)

Common Name: Yellow Paloverde / Physicnut (Elephant Tree) / Brittlebush Shrubland Association

USNVC Code: None

SODN Code: NPSSODN199

Warren Code: 154.1271

Warren Name: *Parkinsonia microphylla – Encelia farinosa – Stenocereus thurberi – Bursera microphylla* Association

USNVC Classification

See Table 43 for USNVC hierarchy.

Table 43. USNVC hierarchy for *Parkinsonia microphylla* / *Jatropha cuneata* (*Bursera microphylla*) / *Encelia farinosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Undescribed
Association	*Parkinsonia microphylla / Jatropha cuneata* (*Bursera microphylla*) / *Encelia farinosa* Shrubland

Type Concept Descriptions

Distribution

This shrubland community was documented on numerous mountain slopes throughout the monument, including: the Santa Rosa Mountains, the Sonoyta Mountains, and in small patches within the Bates Mountains.

Environmental Description

This shrubland association is found on moderately steep (15–50+%) south-trending mountain backslopes from 473 to 1,325 m (1,551–4,347 ft). At times this community can reach down to the toeslopes where it begins to transition to upper alluvial communities. The surface cover is characterized by a shallow layer of coarse (>2 cm) gravel and rock. The underlying parent material is varied, but typically of volcanic origin.

Vegetation Description

This shrubland association is characterized by a canopy (2–5 m) dominated by *Parkinsonia microphylla* (yellow paloverde), a subcanopy (0.5–2 m) by *Jatropha cuneata* (physicnut), and a field

stratum (<0.5 m) by *Encelia farinosa* (brittlebush). This community is further defined by the consistent (1.0) presence, but low cover of *Bursera microphylla* (elephant tree). The upper canopy (>5 m) is solely represented by patchy, low-cover (<1%) *Carnegiea gigantea* (saguaro).

The low canopy (2–5 m) is dominated by an open (10–20%) mix of small trees and succulents most commonly dominated by *P. microphylla* (yellow paloverde). This species presents as small, shrubby trees with heights ranging from 3–4 m, that provide average cover around 6%. *Stenocereus thurberi* (organ pipe cactus) is a noteworthy associate with heights ranging from 3–4 m and average cover around 3%. At times, this species can present as a sub-dominant to, or co-dominant with, *P. microphylla*. *Fouquieria splendens* (ocotillo) and ironwood (*Olneya tesota*) are sparse associates with cover rarely surpassing 1%.

The open (5–15%) subcanopy (0.5–2 m) stratum is characterized by the consistent dominance (1.0) of *J. cuneata* with one diagnostic common associate, *B. microphylla* (elephant tree). On average, *J. cuneata* provides 5% cover throughout the community with some inclusions approaching 15%. *B. microphylla* was documented in all examples of this community with cover that ranged from a few scattered individuals that contributed <1% to areas where it competed for dominance with *J. cuneata.* Other noteworthy subcanopy components, in order from most to least frequent, include: *Larrea tridentata* (creosote), *Cylindropuntia bigelovii* (teddybear cholla), *Cylindropuntia acanthocarpa* (buckhorn cholla), and *Lycium berlandieri* (Berlandier's wolfberry).

The sparse (5–10%) field stratum is characterized by the consistent dominance of *E. farinosa* (brittlebush) with a mix of low-cover associate sub-shrubs and succulents. This species is the sole dominant field component in most examples of this community with average cover around 8%. On lower-angle slopes, especially in the transition to the upper alluvial fan, *Ambrosia deltoidea* (triangle bur ragweed) and *Ambrosia dumosa* (burrobush) may begin to replace *E. farinosa* (brittlebush). In order from most to least frequent, other noteworthy species include: *Fagonia laevis* (California fagonbush), *Mammillaria* spp. (*globe cactus*), *Trixis californica* (American threefold), and *Echinocereus nicholii* (Nichol's hedgehog cactus).

Warren Type Concept Description

On south-facing slopes from 1,800 to 2,500 feet in the Santa Rosa and southern Ajo Mountains, with small additional areas on the west side of Kino Peak in the Bates Mountains and near Senita Basin. This association is found on steep (20 to 50%), rocky slopes with negligible soil accumulation. Frequently the members of this type are found growing in the cracks of rock outcrops and on the faces of near-vertical rock walls where the temperature regime is slightly better for the frost-sensitive species such as limber bush and elephant-tree. A diverse assemblage of deciduous shrubs, small deciduous microphyll trees and cacti, which tend to be spaced very unevenly, a result of growing among rocks and in cracks on steep slopes. The shrubs vary from 2 to 6 feet tall, the trees 8 to 12 feet tall and the cacti 1 to 30 feet tall. Cover is variable from 10 to 25%. This type contains the most frost-sensitive species in the monument.

USNVC Type Concept Description (Group Level)

This wooded shrubland group includes the iconic saguaro cacti "forests" of the Sonoran Desert that are characterized by a diagnostic, emergent tree layer of *Carnegiea gigantea* (3–16 m tall) with sparse to moderately dense, xeromorphic, deciduous and evergreen shrub layers dominated by *Parkinsonia microphylla* or *Larrea tridentata*. Often *Prosopis* sp., *Olneya tesota*, and *Fouquieria splendens* are present, although usually less prominently. There are typically many cacti present, including species of *Echinocereus, Escobaria, Ferocactus, Mammillaria*, and *Opuntia* (both cholla and prickly-pear). These mixed cacti are diagnostic even when saguaro is sparse or absent. Other common shrubs and dwarf-shrubs include *Acacia greggii, Ambrosia deltoidea, Ambrosia dumosa* (in drier sites), *Calliandra eriophylla, Jatropha cardiophylla, Krameria erecta, Lycium* spp., *Menodora scabra*, and *Simmondsia chinensis*. The sparse herbaceous layer is composed of perennial grasses and forbs with annuals seasonally present and occasionally abundant. On slopes, plants are often distributed in patches around rock outcrops where suitable habitat is present. Outliers of this succulent-dominated group occur as "Cholla Gardens" in the southern Mojave Desert in California. In this area, the group is characterized by *Cylindropuntia bigelovii (= Opuntia bigelovii), Fouquieria splendens*, and other succulents, but it lacks the *Carnegiea gigantea* and *Parkinsonia microphylla* which are typical farther east.

Species Summary

See Tables 44 and 45 for species summary details.

Table 44. Most abundant species: *Parkinsonia microphylla* / *Jatropha cuneata* (*Bursera microphylla*) / *Encelia farinosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Stenocereus thurberi* (0.75)
Subcanopy (0.5–2 m)	*Jatropha cuneata* (1.0), *Bursera microphylla* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 45. Other noteworthy associate species: *Parkinsonia microphylla* / *Jatropha cuneata* (*Bursera microphylla*) / *Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Fouquieria splendens, Olneya tesota*
Subcanopy (0.5–2 m)	*Larrea tridentata, Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Lycium berlandieri*
Field (0–0.5 m)	*Ambrosia deltoidea, Ambrosia dumosa, Fagonia laevis, Trixis californica, Mammillaria* spp., *Echinocereus nicholii*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 15 plots, including 2 long-term I&M monitoring plots and 13 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS093, IPS101, IPS104, IPS107, IPS108, IPS163, IPS166, IPS196, IPS201, IPS206, IPS207, IPS231, IPS320

Sonoran Desert Network Monitoring Plots
V103_002, V103_010

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

16. *Parkinsonia microphylla / Simmondsia chinensis / Ambrosia deltoidea* Shrubland Association (P)

Common Name: Yellow Paloverde / Jojoba / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN204

Warren Code: 154.1213

Warren Name: *Parkinsonia microphylla – Ambrosia deltoidea – Simmondsia chinensis pediment* Association

USNVC Classification

See Table 46 for USNVC hierarchy.

Table 46. USNVC hierarchy for *Parkinsonia microphylla / Simmondsia chinensis / Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Jojoba – Crucifixion-thorn – Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Parkinsonia microphylla* / *Simmondsia chinensis* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This type is only found along the base of the Ajo and Diablo mountain ranges.

Environmental Description

This shrubland community spans low-angle (<15%) upper bajadas and mountain pediments from 650–800 m (2,123–2,624 ft). The surface is characterized by shallow to moderately deep, well-drained alluvium underlying a dominant layer of coarse gravel and cobble. Within this community, rock tends to be of volcanic origin.

Vegetation Description

This shrubland community is characterized by an open (5–10%) canopy (>2 m) dominated by *Parkinsonia microphylla* (yellow paloverde), a subcanopy (0.5–2 m) by *Simmondsia chinensis* (jojoba), and a field stratum (<0.5 m) by *Ambrosia deltoidea* (triangle bur ragweed).

P. microphylla (yellow paloverde) is a consistent (0.88) canopy tree, that provides cover averaging around 4% but reaching as much as 10%. This species is present as relatively short-statured (2–3 m)

trees. *Fouquieria splendens* (ocotillo) is an occasional (0.63) associate that, when present, provides cover around 3% with some areas up to 7%. *Stenocereus thurberi* (organ pipe cactus) and *Olneya tesota* (ironwood) are occasional (<0.50) associates that, when present, provide cover ranging from <1% to 3%.

The open (5–15%) subcanopy stratum (0.5–2 m) is characterized by the dominance of *S. chinensis* (jojoba) with a diverse suite of associate shrubs and succulents. *S. chinensis* (jojoba) is a very consistent dominant (1.0) that provides average cover around 8% including dense inclusions up to 20%. This species is relatively short-statured, barely surpassing 0.5 m. In order from most to least frequent, other noteworthy species include: *Larrea tridentata* (creosote), *Abutilon incanum* (pelotazo), *Coursetia glandulosa* (rosary babybonnets), *Cylindropuntia fulgida* (jumping cholla), *Sebastiania bilocularis* (arrow poison plant), *Aloysia wrightii* (wright's beebrush), *Jatropha cardiophylla* (sangre de cristo), *Cylindropuntia bigelovii* (teddybear cholla), and *Cylindropuntia acanthocarpa* (buckhorn cholla).

The field stratum (<0.5) provides the highest cover of any stratum, with 20–25%, which is mainly dominated by *A. deltoidea* (triangle bur ragweed). This species provides consistent (1.0) dominance with cover around 12% including dense inclusions up to 25%. *Encelia farinosa* (brittlebush) is a transitional component of this community that is most prevalent where slopes increase and become more exposed. At times, this species can provide up to 5% cover, but should never outcompete *A. deltoidea* (triangle bur ragweed). *Cottsia gracilis* (slender janusia) is a very consistent (1.0), but low-cover (<1%) associate. The remainder of the cover is composed of a diverse suite of sub-shrubs, grasses, and forbs that includes: *Croton sonorae* (Sonoran croton), *Trixis californica* (American threefold), *Justicia longii* (longflower tube tongue), *Selaginella arizonica* (Arizona spikemoss), *Hibiscus denudatus* (paleface), and *Marina parryi* (Parry's false prairie-clover).

Warren Type Concept Description

At the base of the Ajo Mountains, from 2,000 to 2,600 feet. This type occurs on very coarse, gravelly soil which is closely underlain by bedrock. Usually, it is found on moderately dissected, gently rolling terrain. This type differs from the pediment type of the western part of the monument in that the abundance of several frost-sensitive species is considerably reduced and water availability, in the form of rainfall or runoff, seems to be greater near the Ajo Mountains.

A very diverse mixture of trees, shrubs and cacti; the trees from 10 to 15 feet tall, shrubs 2 to 4 feet, and the cacti 1 to 30 feet. Ground cover in this type is the greatest of all the upland desert scrub associations of the monument, ranging from 30 to 45%. Close proximity to the Ajo Mountains seems to provide higher moisture availability to this association, either through runoff or increased rainfall, than is generally available in other desert scrub associations, permitting the high species diversity.

USNVC Type Concept Description (Alliance Level)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and Cahuilla Mountains in southern California. This desert scrub alliance is dominated by

taller *Canotia holacantha* or *Simmondsia chinensis* with *Ambrosia deltoidea, Larrea tridentata, Ericameria linearifolia*, or *Eriogonum fasciculatum* present to codominant. In Arizona frost-sensitive species such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota, Cylindropuntia bigelovii*, and *Prosopis* spp. are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or codominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata, Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained upland slopes and alluvial fans. Elevations range from 600–1,300 m in Arizona to 580–880 m in southern California. Soils range from cobbly loams to loamy sand.

Species Summary

See Tables 47 and 48 for species summary details.

Table 47. Most abundant species: *Parkinsonia microphylla / Simmondsia chinensis / Ambrosia deltoidea* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 48. Other noteworthy associate species: *Parkinsonia microphylla / Simmondsia chinensis / Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Stenocereus thurberi*
Canopy (2–5 m)	*Fouquieria splendens, Olneya tesota*
Subcanopy (0.5–2 m)	*Larrea tridentata, Abutilon incanum, Coursetia glandulosa, Cylindropuntia fulgida, Cylindropuntia acanthocarpa, Cylindropuntia bigelovii, Sebastiania bilocularis, Aloysia wrightii, Jatropha cardiophylla*
Field (0–0.5 m)	*Encelia farinosa, Cottsia gracilis, Croton sonorae, Trixis californica, Justicia longii, Selaginella arizonica, Hibiscus denudatus, Marina parryi*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 15 plots, including 5 long-term I&M monitoring plots, 9 classification plots sampled during the 2017–2020 mapping and classification effort, and 1 border impact plot. There is a placeholder association CEGL000953 *Simmondsia chinensis – Parkinsonia*

microphylla Shrubland that will in all likelihood eventually match this type description, however it currently is blank and therefore we cannot be certain it is a match.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS086, IP342, IPS188, IPS214, IPS216, IPS242, IPS261, IPS263, IPS269

Sonoran Desert Network Monitoring Plots
V102_004, V102_010, V103_003, V203_003, V203_009

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-95

Local Type Description Authors
S. Studd, J. Galvin

17. *Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum)* Shrubland Association (P)

Common Name: Jojoba (Parish's Goldeneye – Wright's Beebrush – Eastern Mojave Buckwheat) Shrubland Association

USNVC Code: None

SODN Code: NPSSODN205

Warren Code: 154.1232

Warren Name: *Simmondsia chinensis – Bahiopsis parishii – Fouquieria splendens* Association

USNVC Classification

See Table 49 for USNVC hierarchy.

Table 49. USNVC hierarchy for *Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum)* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Jojoba – Crucifixion-thorn – Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum) Shrubland*

Type Concept Descriptions

Distribution

This type is only found growing on the slopes of the Ajo and Diablo Mountains, primarily within the canyon interiors of Alamo, Grass, Echo, Boulder and Estes Canyons. Within these canyons, especially on sheltered (north-facing) aspects, this type is very common.

Environmental Description

This shrubland association is found growing on slopes with north or northwest facing exposures, occasionally creeping around to the northeast as well, between 602 and 1,467 m (1,975–4,812 ft) elevation. Slopes are usually one face of a steep-sided canyon, with slopes ranging from 15 to >50%. This community occupies the backslope position, moving up to the shoulder slope at times. Soils are typically very rocky or gravelly, and loose (except where stabilized by high vegetative ground cover) with lots of exposed bedrock that is volcanic in origin.

Vegetation Description

This shrubland association is characterized by a variable (10–30%) subcanopy stratum (0.5–2 m) consistently (1.0) dominated by *Simmondsia chinensis* (jojoba) with a variable and patchy mix of sub-dominant shrubs, the most common of which include *Eriogonum fasciculatum* (Eastern Mojave buckwheat), *Bahiopsis parishii* (Parish's goldeneye), and *Aloysia wrightii* (Wright's beebrush). Sub-dominant species generally contribute at least 3%, though occasionally up to 20%, cover. Within this community, perennial species richness is relatively high, with an average of 20 species recorded in each classification plot.

Cover in the canopy strata (>2 m) is sparse, generally below 5% but with rare examples reaching 12%, with only *Parkinsonia microphylla* (yellow paloverde) and *Fouquieria splendens* (ocotillo) providing conspicuous cover. These species are rather patchy (0.50) and, when present, provide cover that is typically less than 5% with occasional inclusions up to 10%. Other documented canopy species include *Vauquelinia californica* (Arizona rosewood) and *Juniperus arizonica* (redberry juniper). These species appear along the bases of cliff bands or any areas of exposed bedrock, as well as in transitional zones with the adjacent (*Juniperus arizonica – Vauquelinia californica*) / mixed shrub Wooded Shrubland Association.

The subcanopy is defined by the consistent (1.0) dominance of *S. chinensis* (jojoba) with a variable mix of sub-dominants. Cover of this species averages 12% but varies between a low of 3% and a high of 50%. In order from most to least frequent, other documented subcanopy shrubs include *Lycium berlandieri* (Berlandieri wolfberry), *Dodonaea viscosa* (Florida hopbush), *Senegalia greggii* (catclaw acacia), and *Coursetia glandulosa* (rosary babybonnets).

The variable (5–20 [30]%) field layer (<0.5 m) is dominated by a suite of low shrubs and subshrubs, most commonly dominated by *E. fasciculatum* (Eastern Mojave buckwheat), *B. parishii* (Parish's goldeneye), and *A. wrightii* (Wright's beebrush). These consistent (0.79–0.83) species range from sparse associates (<1% cover) to co-dominants with *S. chinensis* contributing cover up to 15%. On average, each species contributes 2–3% cover across the community. In order from most to least frequent, other noteworthy species include *Muhlenbergia porteri* (bush muhly), *Abutilon incanum* (pelotazo), *Cottsia gracilis* (slender janusia), *Digitaria californica* (Arizona cottontop), and *Ephedra aspera* (rough jointfir). In areas of increased exposure, *Encelia farinosa* (brittlebush) may appear and occasionally become another co-dominant; however, these areas are generally small and not consistent across the community. The diminutive *Selaginella arizonica* (Arizona spikemoss) is an occasional component that, when present, forms a sparse carpet of cover (3–5%) amid the shrubs and rocks.

A distinct variation of this type, found in scattered locations in the Alamo Canyon watershed, is defined by the dominance of *Ambrosia cordifolia* (Tucson bur ragweed). In this variation, *S. chinensis* (jojoba) cover and dominance is reduced, with *A. cordifolia* providing cover ranging from 5 to 15%. Shrub cover is occasionally interrupted by dense patches of the stoloniferous perennial grass *Hilaria belangeri* (curly mesquite) which may contribute up to 10% overall cover.

Warren Type Description

In the Ajo Mountains, from 2,700 feet on north facing slopes up to 4,500 feet on south facing slopes. This association occupies mid-elevation slopes in the Ajo Mountains, which are typically very rocky and steep with very shallow, gravelly soil. The variation and diversity within the type is due largely to the tremendous variation in soil depth, slope angle and exposure and elevation within the range of the association. *Graptopetalum rusbyi* occurs on rock outcrops and ledges in this type.

Very irregularly spaced stands of small to medium-sized shrubs and suffrutescent species with a few scattered cacti. Height of the shrubs varies from 1 to 4 feet. Ground cover is quite variable, depending upon soil characteristics, ranging from 20 to 40%.

Species occurrence and relative abundance varies greatly from place to place within the type, probably more than any other type in the monument. As a result, this is one of the most heterogeneous types in the monument.

USNVC Type Concept Description (Alliance Level)

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

Species Summary

See Tables 50 and 51 for species summary details.

Table 50. Most abundant species: *Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum)* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Aloysia wrightii* (0.79), *Eriogonum fasciculatum* (0.71), *Bahiopsis parishii* (0.83)

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

Table 51. Other noteworthy associate species: *Simmondsia chinensis (Bahiopsis parishii – Aloysia wrightii – Eriogonum fasciculatum)* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla, Fouquieria splendens, Juniperus arizonica, Vauquelinia californica*
Subcanopy (0.5–2 m)	*Coursetia glandulosa, Lycium berlandieri, Senegalia greggii, Dodonaea viscosa*
Field (0–0.5 m)	*Muhlenbergia porteri, Cottsia gracilis , Ephedra aspera, Hilaria belangeri, Abutilon incanum, Digitaria californica, Encelia farinosa, Selaginella arizonica*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 24 plots, including 4 long-term I&M monitoring plots, one park study plot and 19 classification plots sampled during the 2017–2020 mapping and classification effort, and 1 border impact plot.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS002, IPS003, IPS008, IPS011, IPS015, IPS040, IPS063, IPS066, IPS069, IPS071, IPS076, IPS078, IPS087, IPS090, IPS251, IPS259, IPS265, IPS271, IPS311

Sonoran Desert Network Monitoring Plots
V203_005, V203_006, V203_010, V203_G190

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-97

Local Type Description Authors
S. Studd, J. Galvin

18. *Simmondsia chinensis – Atriplex polycarpa (Encelia farinosa)* Shrubland Association (P)

Common Name: Jojoba – Cattle Saltbush (Brittlebush) Shrubland Association

USNVC Code: None

SODN Code: NPSSODN206

Warren Code: 154.1234

Warren Name: *Simmondsia chinensis – Atriplex polycarpa* Association

USNVC Classification

See Table 52 for USNVC hierarchy.

Table 52. USNVC hierarchy for *Simmondsia chinensis – Atriplex polycarpa (Encelia farinosa)* Shrubland Association.

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

Type Concept Descriptions

Distribution

This type is spread across slopes throughout the Ajo Mountain Range. The best examples occur on the south-facing slopes of upper Boulder Canyon, Grass Canyon, and along the ridgeline south of Ajo Peak.

Environmental Description

This shrubland community spans steep (≥35%), south-trending backslopes from 750–1,250 m (2,460–4,104 ft). The surface cover is characterized by shallow soils underlying a layer of coarse gravel (>2 cm) and rock with areas of exposed bedrock. The surface rock is typically of volcanic origin (rhyolite and dacite).

Vegetation Description

This association is characterized by a moderately dense (20–30%) shrub layer (<2 m) co-dominated by *Simmondsia chinensis* (jojoba) and *Atriplex polycarpa* (cattle saltbush) with sporadic patches of dominant *Encelia farinosa* (brittlebush). This community contains a diverse mix of species, with an average of 20 perennial species recorded in each classification plot. This community is often found

adjacent to, or intermixed with, the similar *S. chinensis* (jojoba) – *Encelia farinosa* (brittlebush) shrubland association.

The canopy strata (>2 m) species are absent to very sparse (<5%) with only *Fouquieria splendens* (ocotillo) providing conspicuous, but low (1–2%) cover. *Juniperus arizonica* (redberry juniper) and/or *Vauquelinia californica* (Arizona rosewood) may appear at the margins of included bedrock outcrops.

S. chinensis (jojoba) is a consistent (1.0) short-statured (<1 m) shrub that ranges from a sub-dominant with 2–3% cover to the primary dominant with 10–15%. *A. polycarpa* is also a consistent (1.0) shrub, usually with cover around 10%. *Encelia farinosa* is a consistent (1.0) species that provides variable cover ranging from sparse (<1%) to co-dominant with cover similar to *A. polycarpa.* High cover of this species typically occurs in the transition with the similar *S. chinensis* (jojoba) – *E. farinosa* (brittlebush) shrubland association. *Coursetia glandulosa* (rosary babybonnets) and *Lycium berlandieri* (Berlandier's wolfberry) are consistent (0.75) associates that typically contribute 1–3% cover. The remainder of the community is defined by a diverse suite of low-cover (1%) and short-stature, associate shrubs, subshrubs, and grasses. In order from most to least frequent, these include: *Aloysia wrightii* (Wright's beebrush), *Mirabilis laevis* (desert wishbone-bush), *Bahiopsis parishii* (Parish's goldeneye), *Eriogonum wrightii* (Eastern Mojave buckwheat), *Acalypha californica* (California copperleaf), *Muhlenbergia porteri* (bush muhly), *Selaginella arizonica* (Arizona spikemoss), *Eriogonum fasciculatum* (Eastern Mojave buckwheat), and *Agave deserti* (desert agave).

Warren Type Concept Description

In the interior of the Ajo Mountains from 2,600 to 3,600 feet on steep (20–40%) south-facing slopes. The type is best developed in north Alamo Canyon. This association is found on shallow rocky soil on hillsides with frequent rock outcrops. It is not clear what determines the distribution of this type and the Jojoba–Brittlebush type (154.1231), but 143.1231 generally is found on hillsides with an open exposure whereas this type is found on hillsides within a canyon which have an exposure protected by the opposing canyon wall.

A stand of medium sized shrubs 2 to 3 feet tall with a few suffrutescent species and a few cacti, the latter usually 2 to 3 feet tall. Cover is variable, usually from 15–25%. Distribution tends to be patchy on areas of soil accumulation between rock outcrops.

USNVC Type Concept Description (Group Level)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis* with *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* present to codominant. In Arizona frost-sensitive species such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp. are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or codominant in the shrub canopy, with *Artemisia californica*,

Echinocereus engelmannii, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained upland slopes and alluvial fans. Elevations range from 600–1,300 m in Arizona to 580–880 m in southern California. Soils range from cobbly loams to loamy sand.

Species Summary

See Tables 53 and 54 for species summary details.

Table 53. Most abundant species: *Simmondsia chinensis – Atriplex polycarpa (Encelia farinosa)* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Atriplex polycarpa* (1.0), *Encelia farinosa* (1.0)

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

Table 54. Other noteworthy associate species: *Simmondsia chinensis – Atriplex polycarpa (Encelia farinosa)* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens, Vauquelinia californica, Juniperus arizonica*
Subcanopy (0.5–2 m)	*Coursetia glandulosa, Aloysia wrightii, Lycium berlandieri*
Field (0–0.5 m)	*Bahiopsis deltoides, Eriogonum fasciculatum, Muhlenbergia polycaulis, Mirabilis laevis, Eriogonum wrightii, Acalypha californica, Muhlenbergia porteri, Selaginella arizonica, Agave deserti*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 6 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS009U, IPS010U, IPS253, IPS273, IPS296, IPS297

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

19. *Parkinsonia microphylla (Stenocereus thurberi) / Simmondsia chinensis / Encelia farinosa* Shrubland Association (P)

Common Name: Yellow Paloverde (Organ Pipe Cactus) / Jojoba / Brittlebush Shrubland Association

USNVC Code: None

SODN Code: NPSSODN207

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None

USNVC Classification

See Table 55 for USNVC hierarchy.

Table 55. USNVC hierarchy for *Parkinsonia microphylla (Stenocereus thurberi) / Simmondsia chinensis / Encelia farinosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Jojoba – Crucifixion-thorn – Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*Parkinsonia microphylla* (*Stenocereus thurberi*) / *Simmondsia chinensis / Encelia farinosa* Shrubland

Type Concept Descriptions

Distribution

This widely distributed type is found throughout the Ajo and Diablo Mountains.

Environmental Description

This shrubland community typically spans south-trending mountain and hill slopes of variable grade (15–50+%) from 300–1,219 meters (984–4,000 ft) elevation. The surface cover is characterized by the dominance of coarse gravel (>2 cm) and rock with minimal exposed soil.

Vegetation Description

This shrubland community is characterized by an open (5–15%) canopy (<2 m) dominated by *Parkinsonia microphylla* (yellow paloverde) with conspicuous *Stenocereus thurberi* (organ pipe cactus), a subcanopy (0.5–2 m) with dominant *Simmondsia chinensis* (jojoba), and a field stratum (<0.5 m) dominated by *Encelia farinosa* (brittlebush).

In the canopy strata (<2 m), *P. microphylla* (yellow paloverde) is a consistent (1.0) component of this community that typically presents as a dominant with average cover around 5% with some inclusions

up to 15%. Overall, this species was relatively short-statured, with average heights ranging from 2–3 m. *S. thurberi* (organ pipe cactus) is a patchy (0.66) associate with heights ranging from 3–5 m. When present, this species provides average cover of 4% with rare, dense inclusions up to 15%. *Olneya tesota* (ironwood) is an uncommon (0.28), low-cover (<1%) associate. This species tends to be most prevalent where it spans a pediment or upper alluvial fan. *Carnegiea gigantea* (saguaro) is an inconsistent, but occasionally conspicuous component that provides minimal cover.

The relatively open (5–15 [25]%) subcanopy stratum (0.5–2 m) is characterized by the consistent (0.88) dominance of *S. chinensis* (jojoba) with a mix of low-cover shrubs and succulents. With an average of 10% cover, this species provides the highest cover of any species documented in this community. *Cylindropuntia bigelovii* (teddybear cholla) is a consistent (1.0) associate that can occasionally become co-dominant with, or sub-dominant to, *S. chinensis* (jojoba) with cover approaching 10%. In order from most to least frequent, other noteworthy species include: *Larrea tridentata* (creosote), *Cylindropuntia acanthocarpa* (buckhorn cholla), *Lycium berlandieri* (Berlandier's wolfberry), and *Sebastiania bilocularis* (arrow poison plant).

The sparse (<10%) field stratum (<0.5 m) is characterized by the sole dominance of *Encelia farinosa* (brittlebush) with a few sparse associates. This species is dominant in all examples of the community, with cover generally ranging from 5–15%. Areas of low cover typically occur in the transitional zones between mountain slopes and the alluvial fan where *Ambrosia deltoidea* (triangle bur ragweed) begins to dominate. In order from most to least frequent, other documented species include: *Krameria bicolor* (white ratany), *Fagonia laevis* (California fagonbush), and *Hibiscus denudatus* (paleface).

Warren Type Concept Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Alliance Level)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis* with *Ambrosia deltoidea*, *Larrea tridentata*, *Ericameria linearifolia*, or *Eriogonum fasciculatum* present to codominant. In Arizona frost-sensitive species such as *Carnegiea gigantea*, *Ferocactus* sp., *Olneya tesota*, *Cylindropuntia bigelovii*, and *Prosopis* spp. are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or codominant in the shrub canopy, with *Artemisia californica*, *Echinocereus engelmannii*, *Encelia actonii*, *Encelia farinosa*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Lotus scoparius*, *Opuntia basilaris*, *Cylindropuntia californica*, *Rhus ovata*, *Salvia mellifera*, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained upland slopes and alluvial fans. Elevations range from 600–1300 m in Arizona to 580–880 m in southern California. Soils range from cobbly loams to loamy sand.

Species Summary

See Tables 56 and 57 for species summary details.

Table 56. Most abundant species: *Parkinsonia microphylla (Stenocereus thurberi) / Simmondsia chinensis / Encelia farinosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (1.0), *Stenocereus thurberi* (0.77)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 57. Other noteworthy associate species: *Parkinsonia microphylla (Stenocereus thurberi) / Simmondsia chinensis / Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Olneya tesota*, *Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Larrea tridentata, Lycium berlandieri, Sebastiania bilocularis*
Field (0–0.5 m)	*Ambrosia deltoidea, Fagonia laevis, Hibiscus denudatus, Krameria bicolor*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 2 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS082, IPS244

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

20. *(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa* Shrubland Association (P)

Common Name: (Yellow Paloverde) Ocotillo / Jojoba (Elephant Tree) / Brittlebush Shrubland Association

USNVC Code: None

SODN Code: NPSSODN208

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None.

USNVC Classification

See Table 58 for USNVC hierarchy.

Table 58. USNVC hierarchy for *(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Sonoran Paloverde – Mixed Cacti Desert Scrub Group [G293]
Alliance	Jojoba – Crucifixion-thorn – Eastern Mojave Buckwheat Desert Scrub [A3283]
Association	*(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa* Shrubland

Type Concept Descriptions

Distribution

This shrubland community was documented on the slopes of the Ajo Mountains, mainly south of Bull Pasture.

Environmental Description

This shrubland association is found on moderately steep (15–50+%) south-trending mountain backslopes from 473 to 1,325 m (1,551–4,347 ft). At times this community can reach down to the toeslopes where it begins to transition to upper alluvial communities. The surface cover is characterized by a shallow layer of coarse (>2 cm) gravel and rock. The underlying parent material is varied, but typically of volcanic origin.

Vegetation Description

This shrubland association is characterized by an open (5–15%) canopy (>2 m) dominated by *Fouquieria splendens* (ocotillo), *Stenocereus thurberi* (organ pipe cactus) and *Parkinsonia*

microphylla (yellow paloverde). The subcanopy is dominated by *Simmondsia chinensis* (jojoba) and *Bursera microphylla* (elephant tree), and a field stratum by *Encelia farinosa* (brittlebush).

F. splendens (ocotillo) is consistent (1.0) canopy dominant with average cover around 10% including some areas that range up to 15%. *S. thurberi* (organ pipe cactus) provides consistent (1.0) cover, that typically ranges from 2–8% with an average around 7%. *Parkinsonia microphylla* is a conspicuous common canopy species with consistent (0.8) but low cover (<5%). *Carnegiea gigantea* (saguaro) is uncommon (0.33) throughout this community, with scant cover that rarely surpasses 1%.

The co-occurrence of *S. chinensis* (jojoba) and *B. microphylla* (elephant tree) is diagnostic of this community. These species are typically present as low-cover, co-dominants with each species contributing around 3–5 [7]% cover in the subcanopy stratum (0.5–2 m). In one example of this community, *Coursetia glandulosa* (rosary babybonnets) presented as the sole subcanopy dominant. Other documented associates, in order from most to least frequent, include: *Croton sonorae* (Sonoran croton), *Atriplex polycarpa* (cattle saltbush), *Larrea tridentata* (creosote), *Jatropha cardiophylla* (sangre de cristo), *Lycium berlandieri* (Berlandier's wolfberry), and *Mimosa distachya* var. *laxiflora* (Arizona mimosa).

The open (10–15%) field stratum (<0.5 m) is characterized by the consistent (1.0) dominance of *Encelia farinosa* (brittlebush) with a variable mix of low-cover associates. On average, *E. farinosa* (brittlebush) provides cover around 10%. In one example of this community, *E. farinosa* (brittlebush) was co-dominant with *Ambrosia deltoidea* (triangle-leaf bur ragweed), providing cover approaching 10%. In order from most to least frequent, other noteworthy field species include *Muhlenbergia porteri* (bush muhly), *Cottsia gracilis* (slender janusia), *Argythamnia lanceolata* (narrowleaf silverbush), *Hibiscus denudatus* (paleface), *Digitaria californica* (Arizona cottontop), and *Eriogonum fasciculatum* (Eastern Mojave buckwheat).

Warren Type Concept Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Alliance Level)

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

occur on well-drained upland slopes and alluvial fans. Elevations range from 600–1,300 m in Arizona to 580–880 m in southern California. Soils range from cobbly loams to loamy sand.

Species Summary

See Tables 59 and 60 for species summary details.

Table 59. Most abundant species: *(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0), *Stenocereus thurberi* (1.0), *Parkinsonia microphylla* (0.8)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (1.0), *Bursera microphylla* (1.0)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 60. Other noteworthy associate species: *(Parkinsonia microphylla) / Fouquieria splendens / Simmondsia chinensis (Bursera microphylla) / Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Carnegiea gigantea*
Subcanopy (0.5–2 m)	*Coursetia glandulosa, Croton sonorae, Atriplex polycarpa, Larrea tridentata, Jatropha cardiophylla, Lycium berlandieri, Mimosa distachya* var. *laxiflora*
Field (0–0.5 m)	*Ambrosia deltoidea, Muhlenbergia porteri, Cottsia gracilis, Argythamnia lanceolata, Hibiscus denudatus, Digitaria californica, Eriogonum fasciculatum*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 6 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Data not available

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS070, IPS072, IPS073, IPS083, IPS084, IPS085

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

21. (*Parkinsonia microphylla*) / *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association (P)

Common Name: (Yellow Paloverde) / Jojoba / Brittlebush Shrubland Association

USNVC Code: None

SODN Code: NPSSODN209

Warren Code: 154.1231

Warren Name: *Simmondsia chinensis – Encelia farinosa – Fouquieria splendens* Association

USNVC Classification

See Table 61 for USNVC hierarchy.

Table 61. USNVC hierarchy for (*Parkinsonia microphylla*) / *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association.

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

Type Concept Descriptions

Distribution

This shrubland community is widespread throughout the Ajo Mountain range and some of the adjacent hills.

Environmental Description

This shrubland community typically spans south-trending mountain backslopes of variable grade (15–50%) from 600 to 1,150 m (1,968–3,772 ft). At times, this community may appear on lower angle (5–15%) north to northwest-trending slopes. The surface cover is characterized by the dominance of coarse gravel (>2 cm) and rock with minimal exposed soil. The surficial geology is typically of volcanic origin (rhyolite and latite).

Vegetation Description

This shrubland association is characterized by a sparse (<10%) canopy (>2 m) of *Parkinsonia microphylla* (yellow paloverde), a variable (10–30 [40]%) subcanopy (0.5–2 m) dominated by *Simmondsia chinensis* (jojoba), and a variable ([<5] 10–30%) field (<0.5 m) dominated by *Encelia farinosa* (brittlebush). *P. microphylla* is a common (0.69) associate that, when present, provides average cover around 5%. Individuals of this species were relatively short-statured with heights

ranging from 1–3 m. *Fouquieria splendens* (ocotillo) and *Stenocereus thurberi* (organ pipe cactus) are inconsistent (0.66, 0.30) associates that rarely provide more than 1–2% cover. While conspicuous in some locations, *Carnegiea gigantea* (saguaro) is inconsistent (0.33) and, when present, provides low aerial cover (<1%).

The subcanopy (0.5–2 m) is characterized by the consistent presence (1.0) and typical dominance (0.67) of *S. chinensis* (jojoba). Cover of this species is quite variable, ranging from less than 5% to roughly 20%, with an average around 9%. *Coursetia glandulosa* (rosary babybonnets) is a consistent (0.73), low-cover (1–2%) associate that occasionally becomes co-dominant with *S. chinensis* (jojoba). *Larrea tridentata* (creosote) is an inconsistent (0.57) associate that, when present, provides cover similar to that of *S. chinensis* (jojoba). This species is most common on lower-angle slopes (<15%) where the mountain slopes transition into the alluvial fan. In order from most to least frequent, other noteworthy species include: *Lycium berlandieri* (Berlandier's wolfberry), *Sebastiania bilocularis* (arrow poison plant), *Larrea tridentata* (creosote), *Ephedra aspera* (rough jointfir), *Cylindropuntia acanthocarpa* (buckhorn cholla), and *Atriplex polycarpa* (cattle saltbush).

The field stratum (<0.5 m) is characterized by the sole dominance of *Encelia farinosa* (brittlebush) with a mix of associate sub-shrubs. On average, *E. farinosa* (brittlebush) provides cover around 13% with some inclusions approaching 30%. Areas of low cover typically coincide with a shift to a more sheltered, northern aspect. On lower angle slopes, where the mountain slopes transition to the alluvial fan, *Ambrosia deltoidea* (triangle bur ragweed) may begin to appear and compete for dominance with *E. farinosa* (brittlebush). In order from most to least frequent, other noteworthy species include: *Cottsia gracilis* (slender janusia), *Eriogonum fasciculatum* (eastern Mojave buckwheat), *Krameria* spp. (ratany), and *Abutilon incanum* (pelotazo).

Warren Type Concept Description

On south-facing slope in the Ajo Mountains, from 2,500 to 3,500 feet. This type occurs on steep rocky slopes, 20 to 40% at mid-elevations where soil accumulation is low, and soils are very gravelly. Many of the desert scrub species reach the upper elevational limit of their distribution in this type. Open stands of evergreen sclerophyll and deciduous shrubs and cacti, spaced irregularly with 15 to 25% cover. The shrubs usually stand 2 to 3 feet tall, and the cacti generally 2 to 4 feet, but occasionally up to 30 feet. Occasionally, deciduous trees may be 8 to 12 feet tall.

USNVC Type Concept Description (Alliance Level)

This Sonoran Desert scrub alliance is reported along the northern edge of the Sonoran Desert in an elevational band along the lower slopes of the Mogollon Rim/Central Highlands region and in Perris Valley and Cahuilla Mountains in southern California. This desert scrub alliance is dominated by taller *Canotia holacantha* or *Simmondsia chinensis* with *Ambrosia deltoidea, Larrea tridentata, Ericameria linearifolia*, or *Eriogonum fasciculatum* present to codominant. In Arizona frost-sensitive species such as *Carnegiea gigantea, Ferocactus* sp., *Olneya tesota, Cylindropuntia bigelovii*, and *Prosopis* spp. are absent or have low cover. In California, this alliance is generally characterized by *Simmondsia chinensis* as dominant or codominant in the shrub canopy, with *Artemisia californica, Echinocereus engelmannii, Encelia actonii, Encelia farinosa, Eriogonum fasciculatum, Gutierrezia*

sarothrae, Lotus scoparius, Opuntia basilaris, Cylindropuntia californica, Rhus ovata, Salvia mellifera, and *Yucca schidigera* as subdominants. The herbaceous layer is generally sparse. Stands occur on well-drained upland slopes and alluvial fans. Elevations range from 600–1,300 m in Arizona to 580–880 m in southern California. Soils range from cobbly loams to loamy sand.

Species Summary

See Tables 62 and 63 for species summary details.

Table 62. Most abundant species: (*Parkinsonia microphylla*) / *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia microphylla* (0.66)
Subcanopy (0.5–2 m)	*Simmondsia chinensis* (*1.0*), *Larrea tridentata* (0.57)
Field (0–0.5 m)	*Encelia farinosa* (1.0)

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

Table 63. Other noteworthy associate species: (*Parkinsonia microphylla*) / *Simmondsia chinensis* / *Encelia farinosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Fouquieria splendens, Stenocereus thurberi*
Subcanopy (0.5–2 m)	*Coursetia glandulosa, Lycium berlandieri, Sebastiania bilocularis, Larrea tridentata, Ephedra aspera, Cylindropuntia acanthocarpa, Atriplex polycarpa*
Field (0–0.5 m)	*Ambrosia deltoidea*, *Cottsia gracilis, Eriogonum fasciculatum, Krameria* spp., *Abutilon incanum*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 25 plots, including 5 long-term I&M monitoring plots, 14 classification plots sampled during the 2017–2020 mapping and classification effort, and 6 border impact plots.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP419, IPS004, IPS005, IPS039, IPS052, IPS053, IPS068, IPS075, IPS079, IPS098, IPS099, IPS100, IPS213, IPS218

Sonoran Desert Network Monitoring Plots
V101_352Graz, V103_005, V103_009, V203_007, V203_014

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-41, 2010-45, 2010-49, 2010-65, 2010-76, 2010-77

Local Type Description Authors
S. Studd, J. Galvin

22. *Larrea tridentata / Ambrosia deltoidea* Shrubland Association (P)

Common Name: Creosote / Triangle Bur Ragweed Shrubland Association

USNVC Code: None

SODN Code: NPSSODN182

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None.

USNVC Classification

See Table 64 for USNVC hierarchy.

Table 64. USNVC hierarchy for *Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub Group [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Larrea tridentata* / *Ambrosia deltoidea* Shrubland

Type Concept Descriptions

Distribution

This type is intermixed with the similar *Larrea tridentata* / *Ambrosia dumosa* shrubland throughout the Valley of the Ajo and the Growler Valley.

Environmental Description

This shrubland community spans north-trending, low-angle (<5%) alluvial fans from 325 to 550 m (1,066–1,804 ft). The surface is characterized by very deep and well-drained mixed alluvium, underlying a dominant layer of fine gravel. This community predominantly spans the Rillito and Gunsight soil series. Biological soil crust communities are widespread throughout this community.

Vegetation Description

This shrubland community is characterized by an open (5–15%) subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote) and a field stratum (<0.5 m) by *Ambrosia deltoidea* (triangle bur ragweed). This community is often intermixed with the similar *L. tridentata* (creosote) / *Ambrosia dumosa* (burrobush) shrubland association.

The sparse (<1%) canopy stratum (>2 m) contains a few low-cover associates that are usually associated with minor washes or depressions. *Prosopis velutina* (velvet mesquite) is the most common tree species, but yellow paloverde (*Parkinsonia microphylla*) may also be present.

The open (5–15%) subcanopy stratum is characterized by the consistent (1.0) and sole dominance of *L. tridentata* (creosote). This species provides the highest cover within the community with an average around 7% with some inclusions up to 20%. *Cylindropuntia fulgida* (jumping cholla) and *Cylindropuntia acanthocarpa* (buckhorn cholla) are the only other subcanopy species documented in this shrubland.

The sparse (<5%) field stratum (<0.5 m) is characterized by the dominance of *A. deltoidea* (triangle bur ragweed) with a few very low-cover (<1%) associates. *A. deltoidea* (triangle bur ragweed) is a consistent (1.0) dominant with average cover around 4%. Distribution of this species can range from scattered patches, typically along minor erosional features, to an even distribution. *A. dumosa* (burrobush) is a patchy (0.31), low cover (1%) associate that should never outcompete *A. deltoidea* (triangle bur ragweed). Other documented field associates include: *Krameria bicolor* (white ratany), *Cylindropuntia leptocaulis* (Christmas cactus), *Ferocactus wislizenii* (candy barrel cactus), and *Hilaria rigida* (big galleta). Often, there is a broad gradient between this community and the similar and typically adjacent *L. tridentata* (creosote bush) shrubland community. Within this gradient, *A. deltoidea* (triangle bur ragweed) becomes less consistent with cover rarely surpassing 1%.

Warren Type Concept Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Alliance Level)

This widespread alliance occurs in the Mojave, Sonoran and Colorado deserts and extends north into the transition zone with the Great Basin. The vegetation is characterized by an open, xeromorphic shrub layer codominated by *Larrea tridentata* and *Ambrosia dumosa*. Cover of either species does not exceed the other by more than twice, and no other species greatly exceeds the cover of both combined. Other desert shrubs and dwarf-shrubs may be present to codominant, including *Atriplex confertifolia*, *Atriplex hymenelytra*, *Ephedra funerea*, *Ephedra nevadensis*, *Hymenoclea salsola*, *Krameria bicolor*, *Krameria erecta*, *Lycium andersonii*, *Cylindropuntia ramosissima*, *Psorothamnus arborescens*, *Psorothamnus fremontii*, *Salazaria mexicana*, *Senna armata*, and many others. If *Encelia farinosa* or *Yucca schidigera* is present, cover is low (<1–2% cover). Occasional emergent *Fouquieria splendens* or *Yucca brevifolia* and herbaceous species such as *Croton californicus*, *Eriogonum inflatum*, *Echinocactus polycephalus*, *Galium angustifolium*, or *Hilaria rigida* may also be present. Abundant annuals may be seasonally present. Stands occur on alluvial fans, bajadas, upland slopes, piedmonts and minor washes. Sites are gentle to moderately sloping. Substrates are typically well-drained, sandy soils derived from colluvium or alluvium. A pebbly pavement may form on the soil surface. Substrates are rarely calcareous with a caliche hardpan because caliche tends to restrict rooting of the shallow-rooted *Ambrosia dumosa*. This vegetation is very common and dominates much of the desert landscape in the southwestern U.S.

Species Summary

See Tables 65 and 66 for species summary details.

Table 65. Most abundant species: *Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia deltoidea* (1.0)

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

Table 66. Other noteworthy associate species: *Larrea tridentata / Ambrosia deltoidea* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida*
Field (0–0.5 m)	*Ambrosia dumosa, Ferocactus wislizenii, Krameria bicolor, Hilaria rigida, Cylindropuntia leptocaulis*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 59 plots, including 8 long-term monitoring plots, 5 classification plots sampled during the 2017–2020 mapping and classification effort, and 46 border impact plots.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS045, IPS117, IPS256, IPS302, IPS319

Sonoran Desert Network Monitoring Plots
101_001, 101_002, 101_003, 101_003W, 101_008, 101_012, 101_014, 101_100GRAZ

Organ Pipe Cactus National Monument Border Impacts Study Plots
2009-01, 2009-03, 2009-10, 2009-21, 2010-10, 2010-111, 2010-113, 2010-118, 2010-122, 2010-136, 2010-147, 2010-22, 2010-23, 2010-24, 2010-38, 2010-40, 2010-52, 2010-58, 2010-62, 2010-69, 2010-80, 2010-84, 2010-87, 2010-96, 2011-01, 2011-02, 2011-103, 2011-104, 2011-11, 2011-20, 2011-27, 2011-31, 2011-37, 2011-42, 2011-43, 2011-49, 2011-56, 2011-57, 2011-59, 2011-62, 2011-63, 2011-68, 2011-84, 2011-91, 2011-93, 2011-99

Local Type Description Author
J. Galvin

23. *Larrea tridentata / Ambrosia dumosa* Shrubland Association

Common Name: Creosote / Burrobush Shrubland Association

USNVC Code: CEGL002954

SODN Code: None

Warren Code: 154.1111

Warren Name: *Larrea tridentata – Ambrosia dumosa* Association

USNVC Classification

See Table 67 for USNVC hierarchy.

Table 67. USNVC hierarchy for *Larrea tridentata / Ambrosia dumosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub Group [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Larrea tridentata* / *Ambrosia dumosa* Shrubland [CEGL002954]

Type Concept Descriptions

Distribution

This type is intermixed with the similar *Larrea tridentata* / *Ambrosia deltoidea* shrubland throughout the Valley of the Ajo and the Growler Valley.

Environmental Description

This shrubland community spans north-trending, low-angle (<5%) alluvial fans 325 to 550 m (1,066–1,804 ft). The surface is characterized by very deep and well-drained mixed alluvium, underlying a dominant layer of fine gravel. This community predominantly spans the Rillito and Gunsight soil series. Biological soil crust communities are widespread throughout this community.

Vegetation Description

This shrubland community is characterized by an open (5–15%) subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote) and a field stratum (<0.5 m) by *Ambrosia dumosa* (burrobush). This community is often intermixed with the similar *L. tridentata* (creosote) / *Ambrosia deltoidea* (triangle bur ragweed) shrubland association.

The sparse (<1%) canopy stratum (>2 m) contains a few low-cover associates that are usually associated with minor washes or depressions. *Prosopis velutina* (velvet mesquite) is the most

common tree species, but yellow paloverde (*Parkinsonia microphylla*), *Fouquieria splendens* (ocotillo), and *Olneya tesota* (ironwood) may also be present.

The open (5–15%) subcanopy stratum is characterized by the consistent (1.0) and sole dominance of *L. tridentata* (creosote). This species provides the highest cover within the community with an average around 8%. *Cylindropuntia fulgida* (jumping cholla) was the only other species documented in this shrubland.

The sparse (<5%) field stratum (<0.5 m) is characterized by the dominance of *A. dumosa* (burrobush) with a few very low-cover (<1%) associates. *A. dumosa* is a consistent (1.0) dominant with average cover around 4%. *A. deltoidea* (triangle bur ragweed) is a patchy (0.33), low cover (<1%) associate that should never outcompete *A. dumosa*. Other documented field associates include: *Krameria bicolor* (white ratany), *Cylindropuntia leptocaulis* (Christmas cactus), *Ferocactus wislizenii* (candy barrel cactus), and *Hilaria rigida* (big galleta).

Warren Type Concept Description

On flat silty or sandy soils from 1,100 to 1,500 feet in lower portions of the monument, particularly in the Growler Valley and the Valley of the Ajo. In the Growler Valley this type occurs in a mosaic with the Creosote-Mesquite floodplain type (154.1115R). Creosotebush-white bursage occupies desert pavement on the interfluvial rises, and Creosote-Mesquite occupies the silty drainage areas in between. Although white bursage is generally the dominant bursage, triangle bursage occurs in variable abundance throughout the type with no apparent pattern, sometimes exceeding White Bursage in abundance.

A very open, low diversity stand of regularly spaced microphyllus shrubs. Cover is commonly 10–15%. Shrub height is generally 2 to 3 feet, with a few small trees about 10 feet tall scattered along the drainages. This is one of the most species-poor types in the monument.

USNVC Type Concept Description (Alliance Level)

This creosotebush shrubland association occurs in Arizona, California and Nevada. It is currently described from Grand Canyon National Park and Grand Canyon-Parashant National Monument in Arizona. More survey and classification work are needed to fully characterize this type. It typically occurs on sideslopes, but also occurs on mesas, alluvial fans, and drainage channels at 375 to 500 m (1,250–1,625 ft) elevation but can be found as high as 650 m (2,100 ft). It is typically found on low gradients (0–10°), across all aspects, but occasionally occurs on steeper slopes (10–20°). Soils are well- to rapidly drained silty or sandy clays or loams, and the underlying geology is usually limestone or less frequently basalt. Vegetation is characterized by the codominance of the tall shrub *Larrea tridentata* and the dwarf-shrub *Ambrosia dumosa*. *Ferocactus cylindraceus* and *Cylindropuntia acanthocarpa* occur most frequently in the sparse short-shrub layer. The dwarf-shrub layer also occasionally includes the cactus *Opuntia basilaris*. *Dasyochloa pulchella* and *Vulpia octoflora* are relatively common in a very sparse graminoid layer. *Cryptantha* spp., *Plantago* sp., *Eriogonum inflatum*, and *Erodium cicutarium* are regularly present in the forb understory.

Species Summary

See Tables 68 and 69 for species summary details.

Table 68. Most abundant species: *Larrea tridentata / Ambrosia dumosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia dumosa* (1.0)

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

Table 69. Other noteworthy associate species: *Larrea tridentata / Ambrosia dumosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla, Olneya tesota, Fouquieria splendens*
Subcanopy (0.5–2 m)	*Cylindropuntia fulgida*
Field (0–0.5 m)	*Ambrosia deltoidea, Ferocactus wislizenii, Krameria bicolor, Hilaria rigida, Cylindropuntia leptocaulis*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 8 plots, including 7 classification plots sampled during the 2017–2020 mapping and classification effort and 1 border impact plot.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: G3G4

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots

IPS122, IPS123, IPS160, IPS232, IPS241, IPS305, IPS325

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
2009-05

Local Type Description Author
J. Galvin

24. *Larrea tridentata* Shrubland Association

Common Name: Creosote Shrubland Association

USNVC Code: CEGL001261

SODN Code: None

Warren Code: 154.1114

Warren Name: *Larrea tridentata* with annuals Association

USNVC Classification

See Table 70 for USNVC hierarchy.

Table 70. USNVC hierarchy for *Larrea tridentata Shrubland* Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub Group [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Larrea tridentata Shrubland*

Type Concept Descriptions

Distribution

This type is present throughout the Growler Valley; the Valley of the Ajo; and the Sonoyta Valley, in small patches near the international border.

Environmental Description

This shrubland community spans low-angle (<5%) bajadas from 620 to 1,140 m (2,034–3,740 ft). The soil is characterized by very deep, well-drained stream alluvium underlying a layer of dominant fine gravel (<0.5 cm) and bare soil. Biological soil crusts are widespread throughout this community.

Vegetation Description

This shrubland community is characterized by the sole dominance of *Larrea tridentata* (creosote) with seasonal contributions from a suite of annual forbs. The canopy strata (>2 m) are generally absent with only a few instances with documented species, such as *Olneya tesota* (ironwood) and *Prosopis velutina* (velvet mesquite). These species typically appear along minor included washes and/or floodplains. *L. tridentata* (creosote) consistently (1.0) dominates the subcanopy stratum (0.5–2 m) with average cover around 11% including some dense inclusion up to 30%. A couple of very inconsistent and low-cover (<1%) associate shrubs and succulents may be present including *Lycium andersonii* (water jacket), *Senegalia greggii* (catclaw acacia), and *Cylindropuntia fulgida* (jumping cholla).

The field stratum (<0.5 m) is characterized by the seasonal dominance of annual forbs with a mix of very low-cover subshrubs. As most data were collected outside of the peak seasons for annual species and/or in years without significant precipitation to support a flush of annuals, we don't have a dataset to accurately describe this component of the community. Warren's type description states that in good conditions, annual species could account for up to 70–90% of ground cover. Species noted by Warren that contribute to this cover include: *Plantago ovata* (desert Indianwheat), *Lepidium lasiocarpum* (shaggyfruit pepperweed), *Chaenactis stevioides* (Steve's pincushion), *Malacothrix californica* (California desertdandelion), *Sphaeralcea coulteri* (Coulter's globemallow), *Chorizanthe rigida* (devil's spineflower), *Cryptantha barbigera* (bearded cryptantha), *Erodium cicutarium* (redstem stork's bill), and *Amsinckia tessellata* (bristly fiddleneck). Documented subshrubs include: *Ambrosia deltoidea* (triangle bur ragweed), *Ambrosia dumosa* (burrobush), and *Krameria* spp. (ratany). These species are very inconsistent (<0.25) with average cover under 1%.

Warren Type Concept Description

On nearly level silty soil, 1,100 to 1,600 feet. This type occurs in the bottom of the Growler Valley and the Valley of the Ajo and is often adjacent to washes of Creosotebush-Mesquite floodplains. A monospecific stand of evergreen microphyll shrubs 2–3 feet tall which are very evenly spaced with about 10–15% cover. Structurally and floristically this is the simplest type in the monument. There is commonly slight pedestalling around the bases of the shrubs. Annual species comprise an important component of the type on a seasonal basis, occasionally accounting for 70–90% ground cover during the spring in good years. Annuals are also important in all of the other Creosotebush associations but tend to be less abundant in associations with coarser soil.

USNVC Type Concept Description (Alliance Level)

This widespread alliance occurs in the Mojave, Sonoran and Colorado deserts and extends north into the transition zone with the Great Basin. The vegetation is characterized by an open, xeromorphic shrub layer codominated by *Larrea tridentata* and *Ambrosia dumosa*. Cover of either species does not exceed the other by more than twice, and no other species greatly exceeds the cover of both combined. Other desert shrubs and dwarf-shrubs may be present to codominant, including *Atriplex confertifolia*, *Atriplex hymenelytra*, *Ephedra funerea*, *Ephedra nevadensis*, *Hymenoclea salsola*, *Krameria bicolor*, *Krameria erecta*, *Lycium andersonii*, *Cylindropuntia ramosissima*, *Psorothamnus arborescens*, *Psorothamnus fremontii*, *Salazaria mexicana*, *Senna armata*, and many others. If *Encelia farinosa* or *Yucca schidigera* is present, cover is low (<1–2% cover). Occasional emergent *Fouquieria splendens* or *Yucca brevifolia* and herbaceous species such as *Croton californicus*, *Eriogonum inflatum*, *Echinocactus polycephalus*, *Galium angustifolium*, or *Hilaria rigida* may also be present. Abundant annuals may be seasonally present. Stands occur on alluvial fans, bajadas, upland slopes, piedmonts and minor washes. Sites are gentle to moderately sloping. Substrates are typically well-drained, sandy soils derived from colluvium or alluvium. A pebbly pavement may form on the soil surface. Substrates are rarely calcareous with a caliche hardpan because caliche tends to restrict rooting of the shallow-rooted *Ambrosia dumosa*. This vegetation is very common and dominates much of the desert landscape in the southwestern U.S.

Species Summary

See Tables 71 and 72 for species summary details.

Table 71. Most abundant species: *Larrea tridentata* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	Annual Forbs

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

Table 72. Other noteworthy associate species: *Larrea tridentata* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina, Olneya tesota*
Subcanopy (0.5–2 m)	*Lycium andersonii, Senegalia greggii, Cylindropuntia fulgida*
Field (0–0.5 m)	*Plantago ovata, Lepidium lasiocarpum, Chaenactis stevioides, Malacothrix californica, Sphaeralcea coulteri, Chorizanthe rigida, Cryptantha barbigera, Erodium cicutarium, Amsinckia tessellata, Ambrosia deltoidea, Ambrosia dumosa, Krameria* spp.

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 63 plots, including 2 long-term I&M monitoring plots, 3 classification plots sampled during the 2017–2020 mapping and classification effort, and 58 plots sampled for the border impact protocol.

USNVC Classification Confidence

Low – Poorly Documented

Distribution and Conservation Status

Global Status: G5

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS042U, IPS121U, IPS145U

Sonoran Desert Network Monitoring Plots
V101_002W, V101_013

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-100, 2010-102, 2010-105, 2010-107, 2010-108, 2010-119, 2010-120, 2010-124, 2010-125, 2010-129, 2010-134, 2010-135, 2010-137, 2010-138, 2010-142, 2010-146, 2010-149, 2010-151, 2010-43, 2010-61, 2010-63, 2010-82, 2010-85, 2010-86, 2010-90, 2010-93, 2011-07, 2011-08, 2011-0, 2011-107, 2011-12, 2011-14, 2011-19, 2011-30, 2011-32, 2011-33, 2011-36, 2011-39, 2011-40, 2011-45, 2011-46, 2011-47, 2011-48, 2011-50, 2011-51, 2011-52, 2011-53, 2011-54, 2011-67, 2011-69, 2011-70, 2011-74, 2011-75, 2011-77, 2011-78, 2011-94, 2011-95, 2011-97

Local Type Description Author
J. Galvin

25. *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia dumosa* Shrubland Association

Common Name: Ocotillo / Creosote / Burrobush Shrubland Association

USNVC Code: CEGL005136

SODN Code: N/A

Warren Code: 154.1263

Warren Name: *Parkinsonia microphylla – Encelia farinosa – Ambrosia dumosa* Association

USNVC Classification

See Table 73 for USNVC hierarchy.

Table 73. USNVC hierarchy for *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia dumosa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub Group [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Fouquieria splendens* / *Larrea tridentata* / *Ambrosia dumosa* Shrubland [CEGL005136]

Type Concept Descriptions

Distribution

This community is widespread throughout the Cipriano Hills and the Bates Mountains.

Environmental Description

This shrubland community spans low-angle (<10%) slopes of variable aspect from 350 to 850 m (1,150–2,788 ft). Often, this community can be found around the summits of small hills, spanning all aspects. The surface cover is defined by very rocky soil, typically of volcanic origin, that presents as a dense layer of coarse gravel (>2 m) with scattered cobbles.

Vegetation Description

This shrubland community is characterized by an open (10–15%) canopy (>2 m) dominated by *Fouquieria splendens* (ocotillo), a subcanopy (0.5–2 m) by *Larrea tridentata* (creosote), and a field stratum (<0.5 m) by *Ambrosia dumosa* (burrobush) and/or *Ambrosia deltoidea* (triangle bur ragweed). This community is intermixed with the similar and adjacent *Parkinsonia microphylla* (yellow paloverde) / *L. tridentata* (creosote) / *Encelia farinosa* (brittlebush) shrubland association.

F. splendens is a consistent (1.0) canopy dominant with cover that typically ranges from 5–10%. This species tends to present with a relatively short stature (2–3 m). *Parkinsonia microphylla* (yellow paloverde) is a common (0.80) associate that, when present, provides cover similar to *F. splendens.* *Stenocereus thurberi* (organ pipe cactus), *Carnegiea gigantea* (saguaro), and *Olneya tesota* (ironwood) are sparse associates that rarely surpass 1% cover.

The open (5–15%) subcanopy stratum (0.5–2 m) is characterized by the consistent (1.0) dominance of *L. tridentata* (creosote) with a few occasional sub-dominants. Across the community *L. tridentata* (creosote) provides cover ranging from [1] 5–10%. Both *Cylindropuntia fulgida* (jumping cholla) and *Jatropha cuneata* (physicnut) were present as co/sub-dominants in one example of this community. In order from most to least frequent, other documented subcanopy species include: *Cylindropuntia acanthocarpa* (buckhorn cholla), *Cylindropuntia bigelovii* (teddybear cholla), and *Lycium berlandieri* (Berlandier's wolfberry).

The open (5–15%) field stratum (<0.5 m) is characterized by the dominance of *A. dumosa* (burrobush) and/or *A. deltoidea* (triangle bur ragweed). These species provided average cover around 5% with some inclusions up to 10%. *Encelia farinosa* (brittlebush) is a consistent (1.0), but low-cover (1%) associate that rarely outcompeted *Ambrosia* spp. (ragweed). In order from most to least frequent, other documented field components include: *Krameria bicolor* (white ratany), *Marina parryi* (Parry's false prairie-clover), *Mammillaria* spp. (globe cactus), and *Echinocereus* spp. (hedgehog cactus).

Warren Type Concept Description

On southerly slopes (20 to 45%) and nearly level mesa tops from 1,200 to 2,200 feet in the Bates Mountains, Cipriano and Quitobaquito hills. This association is found on rocky soil, usually associated with numerous basaltic boulders. On the tops of level mesas, such as the Cipriano Hills and northern Bates Mountains, the type is associated with extensive caliche accumulation on the ground surface.

Irregularly spaced deciduous shrubs and small deciduous microphyll trees with some cacti, usually with low cover (10–20%) and moderate diversity. The height of shrubs is generally 1 to 3 feet, the trees 8 to 12 feet and the cacti range from 1 to 30 feet.

USNVC Type Concept Description (Association Level)

This creosotebush shrubland association occurs in Arizona and Nevada. It is currently described from Grand Canyon National Park in Arizona. More survey and classification work are needed to fully characterize this type. It typically occurs on sideslopes, terraces, and plateaus at 500 to 600 meters (1,650–1,950 ft) elevation, but can be found as low as 425 meters (1,400 ft). It is primarily found on fairly gentle gradients (2–10°), but also occasionally occurs on steeper slopes (20°). Soils are rapidly-drained silty loams that typically lie above limestone bedrock. Vegetation is characterized by the codominance of the tall shrubs *Larrea tridentata* and *Fouquieria splendens*, and the dwarf-shrub *Ambrosia dumosa*. *Ephedra aspera* frequently occurs in a relatively weak short-shrub layer, while *Psorothamnus* sp., *Cylindropuntia acanthocarpa*, and *Encelia farinosa* also occur occasionally. The

dwarf-shrub layer invariably includes the cactus *Opuntia basilaris*. Few graminoids occur, but *Dasyochloa pulchella* does appear fairly consistently. *Cryptantha* spp., *Dichelostemma capitatum*, and *Phacelia* sp. are the most frequent forbs. *Eriogonum inflatum* and *Gilia* sp. also sporadically occur in this layer.

Species Summary

See Tables 74 and 75 for species summary details.

Table 74. Most abundant species: *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia dumosa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Fouquieria splendens* (1.0), *Parkinsonia microphylla* (0.66)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Ambrosia dumosa* (0.8), *Ambrosia deltoidea* (0.8)

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

Table 75. Other noteworthy associate species: *Fouquieria splendens* / *Larrea tridentata* / *Ambrosia dumosa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Stenocereus thurberi, Carnegiea gigantea, Olneya tesota*
Subcanopy (0.5–2 m)	*Cylindropuntia bigelovii, Cylindropuntia acanthocarpa, Cylindropuntia fulgida, Lycium berlandieri*
Field (0–0.5 m)	*Encelia farinosa, Krameria bicolor, Echinocereus* spp., *Mammillaria* spp., *Marina parryi*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 10 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Low – Poorly Documented

Distribution and Conservation Status

Global Status: Unranked; global rank not yet assessed (GNR)

Global Range: This shrubland association is currently known from Lake Mead National Recreation Area and Grand Canyon National Park in northern Arizona and southern Nevada. More survey work is needed to fully document its global range.

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS125, IPS126, IPS128, IPS185, IPS197, IPS203, IPS205, IPS237, IPS279, IPS321

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

26. *Larrea tridentata – Atriplex polycarpa* Shrubland Association

Common Name: Creosote – Cattle Saltbush Shrubland Association

USNVC Code: CEGL005765

SODN Code: None

Warren Code: 154.1761

Warren Type Name: *Atriplex polycarpa – A. linearis – Larrea tridentata* Association

USNVC Classification

See Table 76 for USNVC hierarchy.

Table 76. USNVC hierarchy for *Larrea tridentata – Atriplex polycarpa* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland Division [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub Group [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Larrea tridentata – Atriplex polycarpa* Shrubland

Type Concept Descriptions

Distribution

This type is only found along the southern border of the monument, from the Cerro Blanco east to the Sonoyta Valley.

Environmental Description

This shrubland community spans very low-angle (1%) south-trending lower-bajadas from 300–500 m (984–1,640 ft). The soil is characterized by very deep, well-drained alluvium, often underlying a dense layer of sorted gravel. The surface often presents as desert pavement.

Vegetation Description

This shrubland community is characterized by an open (10%) subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote) with a field (<0.5 m) dominated by *Atriplex* spp. (saltbush), mainly *Atriplex polycarpa* (cattle saltbush). The canopy layer (>2 m) is very sparse (1%) with only *Prosopis velutina* (velvet mesquite) and *Parkinsonia microphylla* (yellow paloverde) documented in this community. These species are most common along the many small washes that bisect the bajada.

The subcanopy is defined by the consistent (0.89) dominance of *L. tridentata* (creosote). When present, this species typically provides cover ranging from 5–10%; however, dense (25%) and sparse (1%) examples may occur throughout. Individuals of this species are relatively short often at heights

around 1 m. *Cylindropuntia acanthocarpa* (buckhorn cholla) and *Cylindropuntia fulgida* (jumping cholla) are very sparse (<1%) and inconsistent associates. Occasional patches of desert-thorn, mainly *Lycium andersonii* (water jacket) and *Lycium fremontii* (Fremont's desert thorn), may appear along minor washes.

Cover in the field stratum is quite variable ranging from sparse inclusions down to 3% and dense patches reaching up to 30% with an average around 10%. *A. polycarpa* (cattle saltbush) accounts for the majority of this cover with an average around 8%, including dense inclusion up to 30%. In most examples (0.80) of the community, this species provides sole dominance in the field; however, in a few instances *A. linearis* (thinleaf fourwing saltbush) became a co-dominant. This species provides patchy (0.75) cover that, when present, ranges from 1–3%. A broad gradient exists between this association and the similar and often adjacent *L. tridentata* (creosote bush) shrubland association. In this gradient, *Atriplex* spp. (saltbush) gradually decreases in cover and consistency until *L. tridentata* (creosote bush) is the sole dominant. Other documented associates include *Ambrosia dumosa* (burrobush), *Ambrosia deltoidea* (triangle bur ragweed), *Krameria bicolor* (white ratany), and *Grusonia* spp. (club cholla).

Warren Type Concept Description

Found on deep, level alluvial soils, with fine silty or sandy texture and almost no included cobbles in low-lying portions of the monument from 1,000 to 1,500 feet near the international boundary. The type is well developed in the vicinity of Dos Lomitas and along Puerto Blanco Drive between Pozo Salado and Aguajita Spring. *Opuntia stanleyi* [i.e., *Grusonia emoryi*] is restricted to this type in the monument.

Regularly spaced stands of evergreen microphyll shrubs 2 to 3 feet tall with scattered cacti 1 to 4 feet tall (occasionally up to 30 ft) and small deciduous microphyll trees 10 to 15 feet tall occurring along drainages. Cover ranges from 20 to 30%. At higher elevations the type grades into the Paloverde-Bursage type (154.1211) of the middle bajada.

USNVC Type Concept Description (Association Level)

This association is found at low to mid elevations in the northern Colorado/Sonoran Desert, Mojave Desert and southern Great Basin in California and southern Nevada. Vegetation is characterized by a sparse to open shrub canopy (2–15% cover) codominated by *Atriplex polycarpa* and *Larrea tridentata*. *Ambrosia dumosa* may be present in some stands. If present, the herbaceous layer is sparse. Stands occur primarily in low areas such as terraces adjacent to washes and drainages on sandy flats, sandsheets, and toeslopes ranging from 0–850 m elevation. Sites occur on flat to moderate slopes on variable aspects. Soils are sand and loams, often alkaline with moderate to high cover of gravel and are derived from a variety of substrates such as alluvium, sand deposits, conglomerate, limestone, and rhyolite.

Species Summary

See Tables 77 and 78 for species summary details.

Table 77. Most abundant species: *Larrea tridentata – Atriplex polycarpa* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Larrea tridentata*
Field (0–0.5 m)	*Atriplex polycarpa*

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

Table 78. Other noteworthy associate species: *Larrea tridentata – Atriplex polycarpa* Shrubland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Cylindropuntia fulgida, Lycium* spp.
Field (0–0.5 m)	*Ambrosia dumosa, Ambrosia deltoidea, Krameria bicolor, Grusonia* spp.

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 18 plots, including 1 long-term I&M monitoring plot, 16 classification plots sampled during the 2017–2020 mapping and classification effort, and 1 border impact plot.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: GNR

Global Range: This association is found in the northern Colorado Desert, Mojave Desert and southern Great Basin. It was sampled in Mojave National Preserve and Death Valley National Park in California and southern Nevada.

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS041U, IPS043U, IPS046U, IPS143U, IPS144U, IPS146U, IPS147U, IPS177U, IPS225, IPS227, IPS238, IPS250, IPS270, IPS307, IPS309, IPS310

Sonoran Desert Network Monitoring Plots
V101_004W

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-115

Local Type Description Author
J. Galvin

27. *Atriplex polycarpa – Suaeda nigra* Shrubland Association (P)

Common Name: Cattle Saltbush – Mojave Seablite Shrubland Association

USNVC Code: None

SODN Code: NPSSODN180

Warren Code: 154.1762

Warren Name: *Atriplex polycarpa – A. linearis – Suaeda nigra* Association

USNVC Classification

See Table 79 for USNVC hierarchy.

Table 79. USNVC hierarchy for *Atriplex polycarpa – Suaeda nigra* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Atriplex polycarpa – Suaeda nigra* Shrubland

Type Concept Descriptions

Distribution

This type is only found along the southern border of the monument, exclusively in the vicinity of Quitobaquito.

Environmental Description

This shrubland community spans low-angle (1%) floodplains around 330 m (1,066 ft). The soil is characterized as deep and well-drained, fine silty loam often supporting a robust community of biological soil crusts. Surface rock and gravel are very uncommon.

Vegetation Description

This shrubland community is characterized by an open (10–15%) subcanopy (0.5–2 m) dominated by *Suaeda nigra* (Mojave seablite) and *Atriplex polycarpa* (cattle saltbush). The canopy strata (>2 m) is very sparse (1%) with only *Prosopis velutina* (velvet mesquite) documented in this community.

The subcanopy is defined by the consistent (1.0) co-dominance of *S. nigra* (Mojave seablite) and *A. polycarpa* (cattle saltbush). These species account for the vast majority of cover documented in this community. On average, each of these species contributes from 5–10% cover throughout. Other documented subcanopy species include *Larrea tridentata* (creosote), *Lycium* spp. (desert-thorn), *Atriplex linearis* (narrowleaf four wing saltbush), and *Cylindropuntia fulgida* (jumping cholla). This

community is very similar to the often-adjacent *Atriplex polycarpa – Larrea tridentata* shrubland community. The sole difference is the codominance of *S. nigra* (Mojave seablite) and lower *L. tridentata* (creosote) cover.

Warren Type Concept Description

Restricted to a small area of fine silty floodplain soil from 1,000 to 1,200 feet in the vicinity of Aguajita Spring near the international boundary. This type has shown a fast recovery since termination of grazing in 1977.

Uniform stands of evergreen microphyll shrubs 2 to 3 feet tall with 10 to 20% cover. Diversity and cover are low due largely to severe livestock grazing damage. Small trees, 10 to 15 feet tall, are scattered along the drainages.

USNVC Type Concept Description (Alliance Level)

This widespread alliance occurs in the Mojave, Sonoran and Colorado deserts and extends north into the transition zone with the Great Basin. The vegetation is characterized by an open, xeromorphic shrub layer co-dominated by *Larrea tridentata* and *Ambrosia dumosa*. Cover of either species does not exceed the other by more than twice, and no other species greatly exceeds the cover of both combined. Other desert shrubs and dwarf-shrubs may be present to codominant, including *Atriplex confertifolia*, *Atriplex hymenelytra*, *Ephedra funerea*, *Ephedra nevadensis*, *Hymenoclea salsola*, *Krameria bicolor* (now *K. bicolor*), *Krameria erecta*, *Lycium andersonii*, *Cylindropuntia ramosissima*, *Psorothamnus arborescens*, *Psorothamnus fremontii*, *Salazaria mexicana*, *Senna armata*, and many others. If *Encelia farinosa* or *Yucca schidigera* is present, cover is low (<1–2% cover). Occasional emergent *Fouquieria splendens* or *Yucca brevifolia* and herbaceous species such as *Croton californicus*, *Eriogonum inflatum*, *Echinocactus polycephalus*, *Galium angustifolium*, or *Pleuraphis rigida* may also be present. Abundant annuals may be seasonally present. Stands occur on alluvial fans, bajadas, upland slopes, piedmonts and minor washes. Sites are gentle to moderately sloping. Substrates are typically well-drained, sandy soils derived from colluvium or alluvium. A pebbly pavement may form on the soil surface. Substrates are rarely calcareous with a caliche hardpan because caliche tends to restrict rooting of the shallow-rooted *Ambrosia dumosa*. This vegetation is very common and dominates much of the desert landscape in the southwestern U.S.

Species Summary

See Tables 80 and 81 for species summary details.

Table 80. Most abundant species: *Atriplex polycarpa – Suaeda nigra* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Atriplex polycarpa* (1.0)*, Suaeda nigra* (1.0)
Field (0–0.5 m)	None

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

Table 81. Other noteworthy associate species: *Atriplex polycarpa* – *Suaeda nigra* Shrubland Association.

Stratum	*Species*
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina*
Subcanopy (0.5–2 m)	*Larrea tridentata, Cylindropuntia fulgida, Atriplex linearis*
Field (0–0.5 m)	None

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 1 classification plot sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS236

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

28. *Prosopis velutina / Larrea tridentata – Atriplex polycarpa* Floodplain Association (P)

Common Name: Velvet Mesquite / Cattle Saltbush – Creosote Floodplain Association

USNVC Code: None

SODN Code: NPSSODN181

Warren Code: 154.1763

Warren Name: *Atriplex polycarpa – A. linearis – Prosopis glandulosa* Association

USNVC Classification

See Table 82 for USNVC hierarchy.

Table 82. USNVC hierarchy for *Prosopis velutina / Larrea tridentata – Atriplex polycarpa* Floodplain Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	Mojave-Sonoran Semi-Desert Scrub [M088]
Group	Mojave-Sonoran Bajada & Valley Desert Scrub [G295]
Alliance	Creosotebush – Burrobush Bajada & Valley Desert Scrub [A3277]
Association	*Prosopis velutina* / *Larrea tridentata – Atriplex polycarpa* Floodplain

Type Concept Descriptions

Distribution

This type is only found along the southern border of the monument, from the Cerro Blanco east to the Sonoyta Valley.

Environmental Description

This community spans low-angle (<5%) floodplains and alluvial terraces from 320–450 m (1,049–1,476 ft). The soil is characterized as very deep and excessively drained, fine sandy loam often with a robust assemblage of biological soil crusts. Surface gravel and rock tend to be absent to sparse.

Vegetation Description

This shrubland community is characterized by a very open (5%) canopy (>2 m) of *Prosopis velutina* (velvet mesquite) and an open (15%) subcanopy (0.5–2 m) dominated by *Atriplex polycarpa* (cattle saltbush) and *Larrea tridentata* (creosote).

In the canopy strata, *P. velutina* (velvet mesquite) is a consistent (1.0) tree species that provides variable cover that ranges from 2–10%. Individuals present as short (2–3 m) trees, typically on the

floodplain, to tall (4–5 m) wide-canopied trees when present on alluvial terraces. *Olneya tesota* (ironwood) was the only additional tree species documented within this community.

The subcanopy stratum is characterized by the consistent presence (1.0) and typical dominance of both *A. polycarpa* (cattle saltbush) and *L. tridentata* (creosote). *A. polycarpa* (cattle saltbush) is a diagnostic species of this community and provides the highest cover with an average around 8%. At times, this species can become intermixed with the closely associated *Atriplex linearis* (thinleaf fourwing saltbush), occasionally becoming a co-dominant. *L. tridentata* (creosote) typically presents as a co-dominant with, or a sub-dominant to *A. polycarpa* (cattle saltbush), providing average cover around 5%. Other documented subcanopy species include *Lycium* spp. (desert-thorn), *Ziziphus obtusifolia* (lotebush), *Senegalia greggii* (catclaw acacia), *Ambrosia salsola* (burrobush), and *Cylindropuntia fulgida* (jumping cholla).

The field stratum (<0.5 m) is variable depending upon the season and associated precipitation. When conditions are conducive to a flush of annual species, cover can easily surpass 20%. In drier times of the year, or when seasonal precipitation is low, cover will be sparse (1%) and typically consists of species associated with adjacent uplands habitats. These species include *Ambrosia deltoidea* (triangle bur ragweed) and *Ambrosia dumosa* (burrobush).

Warren Type Concept Description

Found on silty floodplain soils from 1,300 to 1,500 feet along the international boundary in the vicinity of Dos Lomitas. Erosion is causing gully cutting in this type. The type differs from 154.1761 in that this type has much lower diversity and the abundance is not approached by any other species.

Uniform stands of shrubs 2 to 3 feet tall with scattered cacti 1 to 3 feet tall and short trees along the drainages. Cover is 10 to 20%. This type has fairly low species diversity and suffers from severe grazing damage.

USNVC Type Concept Description (Alliance Level)

This widespread alliance occurs in the Mojave, Sonoran and Colorado deserts and extends north into the transition zone with the Great Basin. The vegetation is characterized by an open, xeromorphic shrub layer codominated by *Larrea tridentata* and *Ambrosia dumosa*. Cover of either species does not exceed the other by more than twice, and no other species greatly exceeds the cover of both combined. Other desert shrubs and dwarf-shrubs may be present to codominant, including *Atriplex confertifolia*, *Atriplex hymenelytra*, *Ephedra funerea*, *Ephedra nevadensis*, *Hymenoclea salsola*, *Krameria bicolor*, *Krameria erecta*, *Lycium andersonii*, *Cylindropuntia ramosissima*, *Psorothamnus arborescens*, *Psorothamnus fremontii*, *Salazaria mexicana*, *Senna armata*, and many others. If *Encelia farinosa* or *Yucca schidigera* is present, cover is low (<1–2% cover). Occasional emergent *Fouquieria splendens* or *Yucca brevifolia* and herbaceous species such as *Croton californicus*, *Eriogonum inflatum*, *Echinocactus polycephalus*, *Galium angustifolium*, or *Pleuraphis rigida* may also be present. Abundant annuals may be seasonally present. Stands occur on alluvial fans, bajadas, upland slopes, piedmonts and minor washes. Sites are gentle to moderately sloping. Substrates are typically well-drained, sandy soils derived from colluvium or alluvium. A pebbly pavement may

form on the soil surface. Substrates are rarely calcareous with a caliche hardpan because caliche tends to restrict rooting of the shallow-rooted *Ambrosia dumosa*. This vegetation is very common and dominates much of the desert landscape in the southwestern U.S.

Species Summary

See Tables 83 and 84 for species summary details.

Table 83. Most abundant species: *Prosopis velutina / Larrea tridentata – Atriplex polycarpa* Floodplain Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (1.0)
Subcanopy (0.5–2 m)	*Atriplex polycarpa* (1.0), *Larrea tridentata* (1.0)
Field (0–0.5 m)	None

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

Table 84. Other noteworthy associate species: *Prosopis velutina / Larrea tridentata – Atriplex polycarpa* Floodplain Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Olneya tesota*
Subcanopy (0.5–2 m)	*Ambrosia salsola, Ziziphus obtusifolia, Lycium* spp., *Senegalia greggii, Cylindropuntia fulgida*
Field (0–0.5 m)	Annual forbs, *Ambrosia deltoidea, Ambrosia dumosa*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 4 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS202, IPS230, IPS248, IPS268

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

29. *(Prosopis velutina) / Larrea tridentata / Hilaria rigida* Shrubland Association (P)

Common Name: (Velvet Mesquite) / Creosote / Big Galleta Shrubland Association

USNVC Code: None

SODN Code: NPSSODN187

Warren Code: None. This was not a recognized type within the Warren map.

Warren Name: None.

USNVC Classification

See Table 85 for USNVC hierarchy.

Table 85. USNVC hierarchy for *(Prosopis velutina) / Larrea tridentata / Hilaria rigida* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope [G541]
Alliance	Undescribed
Association	(*Prosopis velutina*) / *Larrea tridentata* / *Hilaria rigida* Shrubland

Type Concept Descriptions

Distribution

This type is found throughout the Valley of the Ajo, the Growler Valley, and the Sonoyta Valley. It is most widespread within the Growler Valley.

Environmental Description

This shrubland community spans very low-angle (<5%) floodplains included within the low-bajada from 320–640 m (1,049–2,099 ft). The soil is characterized by deep, well-drained alluvium often with patches of biological and physical crusts. This community spans the floodplains between the more upland *Larrea tridentata* (creosote) shrubland and the wash associated *Prosopis velutina* (velvet mesquite) – *Parkinsonia florida* (blue paloverde) intermittently flooded woodland.

Vegetation Description

This floodplain community is characterized by a sparse (<10%) canopy (>2 m) of *Prosopis velutina* (velvet mesquite), a subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote), and a field stratum (<0.5 m) of patchy *Hilaria rigida* (big galleta). This community has considerable species overlap with adjacent ones and is mainly defined by the presence of *H. rigida* (big galleta) and its location on a floodplain.

P. velutina (velvet mesquite) is a consistent (0.81), low-cover common associate. Cover of this species is quite variable, ranging from scattered individuals contributing <5% to dense patches with cover above 10%. Areas of high cover tend to coincide with small, braided washes or with depressions that collect surface flow. On the broader floodplain, individuals tend to be smaller (~2 m) and have a shrubbier growth form, while those along washes are taller (4–5 m), single-trunk trees. *Castela emoryi* (crucifixion thorn) is a rare associate documented in only one example of this community, in the lower reach of the Valley of the Ajo, near Growler Canyon.

L. tridentata (creosote) is the most consistent (1.0) dominant in the community with cover that typically ranges from 5–15% with some areas reaching above 20%. *Lycium* spp. (wolfberry), typically *Lycium andersonii* (water jacket) and *Lycium fremontii* (Fremont's desert thorn), are occasional (0.68) associates that, when present, provide cover around 1 [3]%. Other documented species include: *Atriplex canescens* (fourwing saltbush), *Ziziphus obtusifolia* (lotebush), and *Senegalia greggii* (*Catclaw acacia*).

The field stratum (<0.5 m) is characterized by a low-cover (<5%) mix of shrubs and grasses, most commonly dominated by *H. rigida* (big galleta). This species provides consistent (1.0), low cover that rarely surpasses 5%. This species tends to cluster in dense, irregularly distributed patches. Other noteworthy species include *Ambrosia deltoidea* (triangle bur ragweed), *Ambrosia dumosa* (burrobush), and a suite of annual forbs.

Warren Type Concept Description

This community was not described during Warren's classification and mapping effort.

USNVC Type Concept Description (Group Level)

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

Species Summary

See Tables 86 and 87 for species summary details.

Table 86. Most abundant species: *(Prosopis velutina) / Larrea tridentata / Hilaria rigida* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (0.81)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	*Hilaria rigida* (1.0)

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

Table 87. Other noteworthy associate species: *(Prosopis velutina) / Larrea tridentata / Hilaria rigida* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Castela emoryi*
Subcanopy (0.5–2 m)	*Lycium fremontii, Ziziphus obtusifolia, Lycium andersonii, Senegalia greggii, Atriplex canescens*
Field (0–0.5 m)	*Ambrosia deltoidea, Ambrosia dumosa,* Annual forbs

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 16 plots, including 3 long-term I&M monitoring plots, 13 classification plots sampled during the 2017–2020 mapping and classification effort, and 7 border impact plots.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS154U, IPS155U, IPS156U, IPS157U, IPS158U, IPS159U, IPS252, IPS254, IPS258, IPS260, IPS262, IPS264, IPS301

Sonoran Desert Network Monitoring Plots
V101_001R, V101_004, V101_006

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-101, 2010-106, 2010-126, 2010-132, 2010-133, 2010-66, 2010-78

Local Type Description Authors
S. Studd, J. Galvin

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

Common Name: (Velvet Mesquite) / Creosote Shrubland Association

USNVC Code: None

SODN Code: NPSSODN188

Warren Code: 154.1115R

Warren Name: *Larrea tridentata – Prosopis glandulosa* Floodplain Association

USNVC Classification

See Table 88 for USNVC hierarchy.

Table 88. USNVC hierarchy for *(Prosopis velutina) / Larrea tridentata* Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope [G541]
Alliance	Undescribed
Association	(*Prosopis velutina*) / *Larrea tridentata* Shrubland

Type Concept Descriptions

Distribution

This type is found throughout the Valley of the Ajo, the Growler Valley, and the Sonoyta Valley. It is most widespread within the Growler Valley.

Environmental Description

This shrubland community spans very low-angle (<5%) floodplains included within the low-bajada from 320–640 m (1,049–2,099 ft). The soil is characterized by deep, well-drained alluvium often with patches of biological and physical crusts. This community spans the floodplains between the more upland *Larrea tridentata* (creosote) shrubland and the wash associated *Prosopis velutina* (velvet mesquite) – *Parkinsonia florida* (blue paloverde) intermittently flooded woodland.

Vegetation Description

This floodplain community is characterized by a sparse (<10 [20]%) canopy (>2 m) of *Prosopis velutina* (velvet mesquite) and a subcanopy (0.5–2 m) dominated by *Larrea tridentata* (creosote). This community has considerable species overlap with adjacent ones and is mainly defined by its location on a floodplain, dominance of *P. velutina* (velvet mesquite), and lack of *Hilaria rigida* (big galleta).

P. velutina (velvet mesquite) is a consistent (0.90) tree species that provides variable cover that ranges from scattered individuals contributing <5% to dense patches with cover above 10%. Areas of high cover (>10%) tend to coincide with small, braided washes or with depressions that collect surface flow. On the broader floodplain, individuals tend to be smaller (2 m) and have a shrubbier growth form, while those along washes are taller (4–5 m), single-trunk trees. *Castela emoryi* (crucifixion thorn) was documented in two examples of this community, in the lower reach of the Valley of the Ajo, near Growler Canyon.

L. tridentata (creosote) is the most consistent (1.0) dominant in the community with cover that typically ranges from 5–15% with some areas reaching above 20%. *Lycium* spp. (wolfberry), typically *Lycium andersonii* (water jacket) and *Lycium fremontii* (Fremont's desert thorn), are uncommon (0.40) associates that, when present, provide cover around 1% (rarely up to 3%). Other documented species include: *Atriplex canescens* (fourwing saltbush) and *Senegalia greggii* (*Catclaw acacia*).

The composition of the field stratum (<0.5 m) varies based on season and recent precipitation. In drier years, this stratum is very sparse (<5%) with only *Ambrosia deltoidea* (triangle bur ragweed) providing noteworthy cover. When present (0.5), this species contributes 1–2%, often in the transition with the adjacent *A. deltoidea* (triangle bur ragweed) communities. In wetter years, the field stratum can be dominated by a suite of native and non-native annual forbs and grasses which can contribute up to 40%.

Warren Type Concept Description

This type occupies the fine, silty soils of the extreme lower bajada from 1,100 to 2,000 feet. The type is best represented in the vicinity of Growler Wash in the Growler Valley and in the Valley of the Ajo, but it occurs in small patches throughout the lower portions of the monument adjacent to larger drainages. *Holocantha* [*Castela*] *emoryi* is found in this type in the vicinity of Armenta Well and Cuerda de Lena Wash. Standing dead trunks or mesquite often are scattered throughout the type, suggesting a fairly recent decrease in subsurface water availability. Erosion is cutting gullies in this type in several areas, particularly northeast and northwest of Pozo Nuevo.

A sparse stand of microphyll shrubs and small deciduous trees with low diversity, the trees 10 to 15 feet tall and the shrubs 2 to 8 feet tall. Creosotebush reaches its maximum stature in this type, occasionally reaching 10 feet in height. The dominants occur in uniform, low density, with ground cover usually 10–20%, but associated species are scattered and irregular in occurrence.

USNVC Type Concept Description (Group Level)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present and is typically scattered clumps to very open and may be dominated by shrubs and small trees such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum*

squamatum, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes with woody vegetation absent or only with scattered individuals present. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although often dry, the intermittent fluvial processes are characteristic of this group, which are often associated with rapid sheet and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense, and typically occurs along the banks, but may occur within the channel.

Species Summary

See Tables 89 and 90 for species summary details.

Table 89. Most abundant species: *(Prosopis velutina) / Larrea tridentata* Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (0.81)
Subcanopy (0.5–2 m)	*Larrea tridentata* (1.0)
Field (0–0.5 m)	None

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

Table 90. Other noteworthy associate species: *(Prosopis velutina) / Larrea tridentata* Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Castela emoryi*
Subcanopy (0.5–2 m)	*Lycium fremontii, Ziziphus obtusifolia, Lycium andersonii, Senegalia greggii, Atriplex canescens*
Field (0–0.5 m)	*Ambrosia deltoidea, Ambrosia dumosa,* Annual forbs

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 10 plots, including 2 long-term I&M monitoring plots, 7 classification plots sampled during the 2017–2020 mapping and classification effort, and 1 border impact plot.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IP037, IPS181, IPS182, IPS183, IPS186, IPS209, IPS211

Sonoran Desert Network Monitoring Plots
V101_009, V101_011

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-148

Local Type Description Authors
S. Studd, J. Galvin

31. *Prosopis velutina* / *Senegalia greggii* – *Larrea tridentata* Intermittently Flooded Shrubland Association (P)

Common Name: Velvet Mesquite / Catclaw Acacia – Creosote Intermittently Flooded Shrubland Association

USNVC Code: None

SODN Code: NPSSODN189

Warren Code: 154.1214R

Warren Name: *Acacia* spp. – *Ambrosia ambrosioides* Association

USNVC Classification

See Table 91 for USNVC hierarchy.

Table 91. USNVC hierarchy for *Prosopis velutina* / *Senegalia greggii* – *Larrea tridentata* Intermittently Flooded Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope [G541]
Alliance	Catclaw Acacia – Desert-lavender – Beloperone Desert Wash Scrub [A4187]
Association	*Prosopis velutina / Senegalia greggii – Larrea tridentata* Intermittently Flooded Shrubland

Type Concept Descriptions

Distribution

This type occurs in many of the wash systems throughout the monument with the most prominent examples occurring in the Alamo and Kuakatch washes.

Environmental Description

This intermittently flooded shrubland community spans low-angle (<5%) washes from 300–900 m (984–2,952 ft). The soil is composed of deep and well-drained alluvium.

Vegetation Description

This intermittently flooded shrubland is characterized by an open (10%) canopy (>2 m) of *Prosopis velutina* (velvet mesquite) and a dense (30–60%) understory (<2 m) of mixed shrubs and forbs, most commonly dominated by *Senegalia greggii* (catclaw acacia) and *Larrea tridentata* (creosote). This community bisects most of the upland communities present throughout the monument and can be interspersed with many other riparian communities. As a result, the margins of this community can contain a diverse suite of associate species, many of which are strictly upland components.

A mix of several tree species, most often dominated by *Prosopis velutina* (velvet mesquite), characterizes the open canopy (>2 m). This species provides consistent (0.91) cover that ranges up to 20%, with an average around 6%. In order from most to least frequent, other noteworthy trees include blue paloverde (*Parkinsonia florida*), yellow paloverde (*Parkinsonia microphylla*), and *Olneya tesota* (ironwood). On average, these species provide cover that rarely surpasses 5%. Along minor washes heavily influenced by the adjacent upland habitats, *P. microphylla* (yellow paloverde) may present as a dominant.

A mix of shrubs, primarily dominated by *Senegalia greggii* (catclaw acacia), characterizes the variably dense (20–40%) subcanopy stratum. *S. greggii* (catclaw acacia) is a consistent (0.91) dominant, providing average cover around 12% with inclusions up to 25%. This species may present as short (<2 m) shrubby individuals or taller (2–4 m), tree-like ones. *Larrea tridentata* (creosote) is the next most dominant shrub, with consistent (0.91) cover with an average around 4%, including some examples up to 15%. In order from most to least frequent, other noteworthy shrubs include *Lycium* spp. (desert-thorn), *Simmondsia chinensis* (jojoba), *Vachellia constricta* (whitethorn acacia), *Sebastiania bilocularis* (arrow poison plant), *Condalia globosa* (bitter snakewood), *Celtis ehrenbergiana* (spiny hackberry), and *Ziziphus obtusifolia* (lotebush).

A mix of sub-shrubs and forbs, dominated by *Ambrosia ambrosioides* (ambrosia leaf bur ragweed) and/or *Bebbia juncea* (sweetbush), characterizes the patchy field stratum. Cover within this stratum is highly variable and depends on the overstory shrub and tree density, the width of the wash, and number of channels. Wide washes (10 m +) containing multiple channels that create vegetated "islands" typically support a robust sub-shrub community dominated by *B. juncea* (sweetbush). When present (0.36) this species provides dominant cover that ranges from 10–20%. The most conspicuous example of this variable occurs in Alamo Wash, near the highway 85 bridge. In narrower washes (<5 m) with an open shrub and tree layer, *A. ambrosioides* (ambrosia leaf bur ragweed) is typically the field stratum dominant. Present in most examples (0.81), this species provides average cover around 2% with inclusions up to 10%. In narrow washes with a dense shrub and tree layer, the field stratum is generally sparse without any dominant components. In order from most to least frequent, other noteworthy field species include *Ambrosia deltoidea* (triangle bur ragweed), *Encelia farinosa* (brittlebush), *Funastrum cynanchoides* (fringed twinevine), *Atriplex polycarpa* (cattle saltbush), and *Acourtia wrightii* (brownfoot). Depending upon the season and associated precipitation, this community may support a robust community of annual forbs. The most common annuals include *Sphaeralcea coulteri* (Coulter's globemallow), *Phacelia pedicellata* (pedicellate phacelia), and *Erodium cicutarium* (redstem stork's bill).

Warren Type Concept Description

Along small and medium sized drainages from 1,200–2,500 feet. This type may be found in association with almost any other type in adjacent upland areas, and members of adjacent types frequently are found along washes. As a result, this type has nearly the greatest local variation in species composition of any type in the monument. This type is found along small washes where soil tends to be coarser, with more gravel and cobble, than soil of the lower elevation riparian types that are associated with larger washes. Wash channels on the bajada occasionally show large scale

braiding, with major channels separating and rejoining, resulting in easily mapped stretches which may appear isolated.

Corridors of trees and shrubs of larger stature, 15–20 feet, and greater cover, 50–70%, than that of the surrounding desert scrub. The scrub species also are large, often 6 to 8 feet tall. Many of the dominant species are deciduous. The association usually occurs as two strips of vegetation along the banks of the broad, sandy wash bed.

USNVC Type Concept Description (Alliance Level)
This alliance is found in the Colorado and Sonoran deserts of Arizona, California, Nevada, and possibly Baja California, Mexico. It occurs in arroyos, channels, rocky alluvial washes, bajadas, valleys, canyon walls, seeps, and springs and steep, very rocky colluvium on lower canyon slopes. Soils are coarse, well-drained, and moderately acidic to slightly saline or gravelly sands and loams surrounding boulders and bedrock. *Acacia greggii*, *Hyptis emoryi*, or *Justicia californica* is dominant or codominant in the shrub canopy with *Adenophyllum porophylloides*, *Ambrosia eriocentra*, *Bebbia juncea*, *Encelia farinosa*, *Encelia virginensis*, *Ephedra californica*, *Ephedra nevadensis*, *Ericameria teretifolia*, *Eriogonum fasciculatum*, *Hymenoclea salsola*, *Larrea tridentata*, *Cylindropuntia acanthocarpa*, *Opuntia basilaris*, *Prunus fasciculata*, *Psorothamnus schottii*, *Rhus ovata*, *Salazaria mexicana*, *Salvia dorrii*, *Senna armata*, *Trixis californica*, *Bahiopsis parishii*, and *Yucca schidigera*. Emergent trees may be present at low cover, including *Chilopsis linearis*, *Fouquieria splendens*, *Juniperus californica*, *Juniperus osteosperma*, *Olneya tesota*, *Parkinsonia florida*, and/or *Psorothamnus spinosus*.

Species Summary
See Tables 92 and 93 for species summary details.

Table 92. Most abundant species: *Prosopis velutina* / *Senegalia greggii* – *Larrea tridentata* Intermittently Flooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*Prosopis velutina* (0.91)
Subcanopy (0.5–2 m)	*Senegalia greggii* (0.91), *Larrea tridentata* (0.91)
Field (0–0.5 m)	*Ambrosia ambrosioides* (0.81)

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

Table 93. Other noteworthy associate species: *Prosopis velutina* / *Senegalia greggii* – *Larrea tridentata* Intermittently Flooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Parkinsonia florida, Parkinsonia microphylla, Olneya tesota*
Subcanopy (0.5–2 m)	*Lycium* spp.*, Ziziphus obtusifolia, Simmondsia chinensis, Vachellia constricta, Condalia globosa, Sebastiania bilocularis, Celtis ehrenbergiana*
Field (0–0.5 m)	*Ambrosia deltoidea, Encelia farinosa, Acourtia wrightii, Funastrum cynanchoides, Atriplex polycarpa, Sphaeralcea coulteri, Phacelia pedicellata, Erodium cicutarium*

Classification Comments

Organ Pipe Cactus National Monument
This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 10 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence
Low

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS180, IPS187, IPS193, IPS200, IPS217, IPS234, IPS240, IPS243, IPS246, IPS267

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

32. *Prosopis velutina – Parkinsonia florida* Intermittently Flooded Woodland Association (P)

Common Name: Velvet Mesquite – Blue Paloverde Intermittently Flooded Woodland Association

USNVC Code: None

SODN Code: NPSSODN190

Warren Code: 154.1215R

Warren Name: *Prosopis glandulosa – Parkinsonia florida* Association

USNVC Classification

See Table 94 for USNVC hierarchy.

Table 94. USNVC hierarchy for *Prosopis velutina – Parkinsonia florida* Intermittently Flooded Woodland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope [G541]
Alliance	Blue Paloverde – Desert-ironwood Desert Wash Scrub [A0588]
Association	*Prosopis velutina – Parkinsonia florida* Intermittently Flooded Woodland

Type Concept Descriptions

Distribution

This association is widespread along the large washes that bisect the bajada in the Growler Valley, the Valley of the Ajo, the Sonoyta Valley, and La Abra Plain. The most prominent wash where this type occurs includes Cherioni Wash, Growler Wash, Kuakatch Wash, and Aguajita Wash.

Environmental Description

This intermittently flooded association spans low-angle (<5%) washes and adjacent floodplains from 320–520 m (1,049–1,706 ft). The soils are deep and excessively well-drained torrifluvents. Within wash channels, surface cover ranges from sand to fine gravel with occasional surface rock. Along the margins of washes, the surface tends to be fine and silty with minimal surface rock or gravel.

Vegetation Description

This intermittently flooded woodland association is characterized by a dense (30–50+%) canopy (>2 m) dominated by a mix of *Prosopis velutina* (velvet mesquite) and *Parkinsonia florida* (blue paloverde) with an understory of mixed shrubs most often dominated by *Senegalia greggii* (catclaw acacia) and *Larrea tridentata* (creosote). This community contains two distinct zones, a dense and linear woodland that lines the margins of washes and an open, often un-vegetated wash channel.

In the dense (40+%), linear woodlands *P. velutina* (velvet mesquite) is a consistent (1.0) canopy dominant, providing cover that ranges from 20 to 40%. *P. florida* (blue paloverde) is present as a co-dominant with *P. velutina*, providing cover that ranges from 10–20%. Both species present as large trees with heights ranging from 4–6 m. *Olneya tesota* (ironwood) is the only additional tree species documented within this community.

The sparse (<10%) subcanopy (<2 m) of these woodlands is characterized by a variable mix of shrubs, most commonly dominated by *Senegalia greggii* (catclaw acacia). In order from most to least frequent, other documented subcanopy associates include *Larrea tridentata* (creosote), *Ambrosia ambrosioides* (ambrosia leaf bur ragweed), *Ziziphus obtusifolia* (lotebush), *Condalia globosa* (bitter snakewood), and *Lycium* spp. (desert-thorn).

Cover and composition of the field stratum is dependent on the season and its associated precipitation. In years of high precipitation and moderate temperature, this community can support a robust population of forbs and grasses. The most abundant of these species include *Sphaeralcea coulteri* (Coulter's globemallow), *Phacelia ramosissima* (branching phacelia), *Ambrosia cordifolia* (Tucson bur ragweed), *Amsinckia* spp. (fiddleneck), *Amaranthus* spp. (pigweed), and *Erodium cicutarium* (redstem stork's bill).

Scattered along the wash corridor are occasional shrubby inclusions dominated by *Ambrosia monogyra* (singlewhorl burrobrush) with cover ranging from 10–30+%. These areas are most common where a wash becomes wider (30–50+ m) and more channelized, allowing for slightly elevated areas less prone to scouring flows. *Baccharis sarothroides* (desert broom) is a low-cover (<1–1%) associate in these areas.

Warren Type Concept Description

Corridors of trees and shrubs of larger stature, 15 to 20 feet, and greater cover, 50 to 70%, than that of the surrounding desert scrub. The shrub species also are large, often 6–8 feet tall. Many of the dominant species are deciduous. The association usually occurs as two strips of vegetation along the banks of a broad, sandy wash bed.

USNVC Type Concept Description (Alliance Level)

Olneya tesota and/or *Parkinsonia florida* are codominant, or either species is dominant, in the tree or tall-shrub canopy with *Chilopsis linearis*, *Fouquieria splendens*, *Prosopis glandulosa*, *Prosopis pubescens*, and *Psorothamnus spinosus*. Shrubs may include *Acacia greggii*, *Ambrosia dumosa*, *Bebbia juncea*, *Calliandra eriophylla*, *Colubrina californica*, *Encelia farinosa*, *Ferocactus cylindraceus*, *Hymenoclea salsola*, *Hyptis emoryi*, *Justicia californica*, *Larrea tridentata*, *Lycium andersonii*, *Lycium brevipes*, *Cylindropuntia echinocarpa*, and/or *Simmondsia chinensis*. This alliance is found in the Mojave and Sonoran deserts of California, Arizona and Baja California, Mexico. It occurs along desert arroyo margins, seasonal watercourses and washes, bottomlands, middle and upper bajadas and alluvial fans, and lower slopes. Soils are sandy, well-drained, and derived from alluvium or colluvium.

Species Summary

See Tables 95 and 96 for species summary details.

Table 95. Most abundant species: *Prosopis velutina – Parkinsonia florida* Intermittently Flooded Woodland Association.

Stratum	Species [A]
Canopy (>5 m)	*Prosopis velutina* (1.0), *Parkinsonia florida* (0.80)
Canopy (2–5 m)	*Prosopis velutina* (1.0), *Parkinsonia florida* (0.80), *Senegalia greggii* (0.67)
Subcanopy (0.5–2 m)	*Senegalia greggii* (0.67)
Field (0–0.5 m)	None

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

Table 96. Other noteworthy associate species: *Prosopis velutina – Parkinsonia florida* Intermittently Flooded Woodland Association.

Stratum	Species
Canopy (>5 m)	*Carnegiea gigantea*
Canopy (2–5 m)	*Prosopis velutina, Parkinsonia microphylla*
Subcanopy (0.5–2 m)	*Cylindropuntia acanthocarpa, Cylindropuntia fulgida, Lycium* spp.
Field (0–0.5 m)	*Ambrosia dumosa, Ambrosia deltoidea, Krameria bicolor, Grusonia* spp.

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 6 plots, including 5 classification plots sampled during the 2017–2020 mapping and 1 border impact plot.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS130, IPS131, IPS132, IPS133, IPS134

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
2010-15

Local Type Description Authors
S. Studd, J. Galvin

33. *Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana* / *Ambrosia ambrosioides* Intermittently Flooded Shrubland Association (P)

Common Name: Jojoba – Catclaw Acacia – Spiny Hackberry / Ambrosia Leaf Bur Ragweed Intermittently Flooded Shrubland

USNVC Code: None

SODN Code: NPSSODN202

Warren Code: 154.1233R

Warren Name: *Simmondsia chinensis – Celtis ehrenbergiana – Senegalia greggii* Association

USNVC Classification

See Table 97 for USNVC hierarchy.

Table 97. USNVC hierarchy for *Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana* / *Ambrosia ambrosioides* Intermittently Flooded Shrubland Association.

Classification Level	Name and Code
Division	North American Warm Desert Scrub & Grassland [3.A.2.Na]
Macrogroup	North American Warm-Desert Xeric-Riparian Scrub [M092]
Group	Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope [G541]
Alliance	Undescribed
Association	*Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana* / *Ambrosia ambrosioides* Intermittently Flooded Shrubland

Type Concept Descriptions

Distribution

This type occupies drainages from the Ajo and Diablo mountain ranges, although it is likely to occur elsewhere outside of the monument.

Environmental Description

This community spans deep and narrow, intermittent mountain drainages from 762–1,066 m (2,500–3,500 ft). These drainages are characterized by dominant exposed bedrock and boulders with sandy soils filling in the depressions. In general, the rock is of volcanic origin. At times, this community can occur in the shelter of cliffs and overhangs.

Vegetation Description

This intermittently flooded shrubland association is characterized by an open (10%) canopy of *Prosopis velutina* (velvet mesquite) and a relatively dense (20–50%), mixed shrubby understory dominated by *Simmondsia chinensis* (jojoba), *Senegalia greggii* (catclaw acacia), and *Celtis ehrenbergiana* (spiny hackberry) with scattered *Ambrosia ambrosioides* (ambrosia leaf bur ragweed).

The open canopy stratum contains a mix of patchy trees and large shrubs that predominantly occur in the understory strata. *Celtis reticulata* and *Prosopis velutina* are patchy (0.5, 0.4) associate trees that, when present, contribute average cover of 10 and 5%, respectively. *Parkinsonia florida* (blue paloverde) is a very uncommon (0.20) component of this community. *Parkinsonia microphylla* (yellow paloverde) may occur in the ecotone with the adjacent upland habitats.

S. chinensis (jojoba) provides the most cover of any species in this community, with an average cover of 11% but some dense patches having up to 20%. *C. ehrenbergiana* (netleaf hackberry) and *Senegalia greggii* (catclaw acacia) are consistent (1.0) sub-dominant species that each contribute an average around 5%. All three dominant shrubs can range from small (1 m) to larger (3 m), occasionally tree-like individuals that reach into the canopy strata. *Justicia californica* (beloperone) is a consistent (1.0) associate, occurring as a sprawling shrub that provides cover around 2–3%. In order from most to least frequent, other documented shrub species include: *Dodonaea viscosa* (Florida hopbush), *Coursetia glandulosa* (rosary babybonnets), *Sebastiania bilocularis* (arrow poison plant), and *Rhamnus crocea* (redberry buckthorn).

The sparse (<5%) field stratum (<0.5 m) is characterized by the patchy (0.60) presence and occasional dominance of *Ambrosia ambrosioides* (ambrosia leaf bur ragweed) with a suite of low-cover associates. When present, this species provides 5% cover with some dense inclusions up to 10%. Cover of this species is dependent on the density of shrub cover and the availability of usable habitat along the water course. In order from most to least frequent, other noteworthy field species include: *Brickellia californica* (California brickellbush), *Abutilon incanum* (pelotazo), *Acalypha californica* (California copperleaf), *Ambrosia cordifolia* (Tucson bur ragweed), and *Bebbia juncea* (sweetbush).

Warren Type Concept Description

In the bottom of narrow, steep-walled canyons with westerly exposure, from 2,800 to 3,600 feet in the Ajo Mountains. This association has a restricted distribution, occurring in only a few canyons in the Ajo Mountains. It is especially well developed in Boulder Canyon. The type is found on sandy soil among boulders and on lower slopes near drainage ways.

Moderately dense stands of medium to large shrubs 4 to 6 feet tall with a few scattered trees 10 to 15 feet tall. Cover ranges from 30 to 50%, but is patchy where plants are spaced around bare rock. Several species such as Mulberry, Soapberry and Netleaf Hackberry, which are rare in the monument are found in this mesic association.

USNVC Type Concept Description (Group Level)

This group is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains and basin floors throughout the warm deserts of the western U.S. and northwestern Mexico. A woody layer is usually present and is typically scattered clumps to very open and may be dominated by shrubs and small trees such as *Acacia greggii*, *Brickellia laciniata*, *Baccharis sarothroides*, *Chilopsis linearis*, *Ephedra californica*, *Ericameria paniculata*, *Fallugia paradoxa*, *Forestiera pubescens*, *Hymenoclea salsola*, *Hymenoclea monogyra*, *Hyptis emoryi*, *Juglans microcarpa*, *Lepidospartum*

squamatum, *Olneya tesota*, *Parkinsonia florida*, *Prosopis* spp., *Psorothamnus spinosus*, *Prunus fasciculata*, *Rhus microphylla*, *Salazaria mexicana*, *Sarcobatus vermiculatus*, or *Viguiera reticulata*. A few known herbaceous communities dominate intermittent drainages and washes with woody vegetation absent or only with scattered individuals present. Dominant species include *Panicum bulbosum*, *Alopecurus aequalis*, or *Lycurus phleoides*. Although often dry, the intermittent fluvial processes are characteristic of this group, which are often associated with rapid sheet and gully flow. This group is restricted to drainages in upland areas or ramaderos that are intermittently flooded and occur as linear or sometimes broader braided strips within desert scrub- or desert grassland-dominated landscapes. The vegetation of desert washes is quite variable in species composition and structure, ranging from sparse and patchy to moderately dense, and typically occurs along the banks, but may occur within the channel.

Species Summary

See Tables 98 and 99 for species summary details.

Table 98. Most abundant species: *Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana* / *Ambrosia ambrosioides* Intermittently Flooded Shrubland Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	None
Subcanopy (0.5–2 m)	*Celtis ehrenbergiana* (1.0), *Simmondsia chinensis* (1.0), *Senegalia greggii* (1.0)
Field (0–0.5 m)	*Ambrosia ambrosioides* (1.0)

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

Table 99. Other noteworthy associate species: *Simmondsia chinensis – Senegalia greggii – Celtis ehrenbergiana* / *Ambrosia ambrosioides* Intermittently Flooded Shrubland Association.

Stratum	Species
Canopy (>5 m)	None
Canopy (2–5 m)	*Celtis reticulata, Prosopis velutina, Parkinsonia microphylla, Parkinsonia florida*
Subcanopy (0.5–2 m)	*Justicia californica, Coursetia glandulosa, Dodonaea viscosa, Sebastiania bilocularis, Rhamnus crocea*
Field (0–0.5 m)	*Brickellia californica, Ambrosia cordifolia, Bebbia juncea, Abutilon incanum, Acalypha californica*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 8 classification plots sampled during the 2017–2020 mapping and classification effort.

USNVC Classification Confidence
Data not available

Distribution and Conservation Status
Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS006, IPS007, IPS049, IPS051, IPS064, IPS088, IPS089, IPS092

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Authors
S. Studd, J. Galvin

34. *Schoenoplectus americanus* Herbaceous Aquatic Association (P)

Common Name: Chairmaker's Bulrush Herbaceous Aquatic Association

USNVC Code: None

SODN Code: NPSSODN192

Warren Code: 244.711

Warren Name: *Typha domingensis – Scirpus olneyi* Association

USNVC Classification

See Table 100 for USNVC hierarchy.

Table 100. USNVC hierarchy for *Schoenoplectus americanus* Herbaceous Aquatic Association.

Classification Level	Name and Code
Division	Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland [2.C.4.Nb]
Macrogroup	Arid West Interior Freshwater Marsh [M888]
Group	Arid West Interior Freshwater Marsh [G531]
Alliance	Chairmaker's Bulrush – Hardstem Bulrush – California Bulrush Marsh [A3895]
Association	*Schoenoplectus americanus* Herbaceous Aquatic

Type Concept Descriptions

Distribution

This type is exclusively found in, and immediately adjacent to, the Quitobaquito pond.

Environmental Description

This community spans aquatic habitat, either emergent from standing water or on seasonally saturated soils.

Vegetation Description

This herbaceous community is characterized by a mix of aquatic macrophytes, typically dominated by *Stuckenia* spp. (pondweed), surrounded by a dense band of *Schoenoplectus americanus* (chairmaker's bulrush) along the margins of the pond. The pond was heavily disturbed in 2022 when a large *Populus fremontii* (Fremont's cottonwood) was removed and the liner was replaced.

At the margins of the pond and in the transition with the adjacent *Prosopis velutina* (velvet mesquite) Bosque, several riparian tree species may appear in the canopy strata (>2 m). Along the north end of the pond a few scattered individuals of *Salix gooddingii* (Gooding's willow) and *Populus fremontii* (Fremont's cottonwood) are present.

The subcanopy stratum (0.5–2 m) is characterized by the sole dominance of the wetland obligate *Schoenoplectus americanus* (chairmaker's bulrush) with a few low-cover associate shrubs. This species forms a dense, almost unbroken, band around the pond ranging from a width of 1 to 3 m. Where this species occurs, it provides close to 100% cover. The facultative wetland shrub *Pluchea sericea* (arrowweed) forms one dense patch along the northern shore of the pond. *Baccharis salicifolia* (mule-fat) and *Baccharis sarothroides* (desert broom) provide low cover (<1%) throughout. Along the narrow channel which feeds the pond, patches of *Typha domingensis* (southern cattail) are occasional. This is mainly in areas where the channel was intentionally widened to create a small pool of water.

The field stratum (0–0.5 m) is characterized by a very sparse (<5%) mix of native and non-native grasses and forbs. These species include *Cynodon dactylon* (Bermuda grass), *Polypogon monspeliensis* (annual rabbitsfoot grass), *Melilotus indicus* (annual yellow sweetclover), *Sonchus asper* (spiny sowthistle), *Polypogon viridis* (beardless rabbitsfoot grass), and *Distichlis spicata* (saltgrass).

The community of aquatic plants growing in the pond is characterized by the dominance of a mix of *Potamogeton pectinatus* (sago pondweed) and *Potamogeton pusillus* (small pondweed). *Najas marina* (spiny naiad) and *Zannichellia palustris* (horned pondweed) have also been documented within the pond but were not documented during surveys for this project. These 4 species tend to grow intertwined in large masses that cover from ¼ to ¾ of the pond depending upon the season. In addition, a number of emergent macrophytes can be found along the margins of the pond and the associated spring channel, including *Juncus balticus* (mountain rush), *Juncus cooperi* (Cooper's rush), and *Anemopsis californica* (yerba mansa).

Warren Type Concept Description

Only at Quitobaquito pond and immediate vicinity, 1,050 feet. Emergent from permanent water and on damp soil adjacent to pond.

Nearly continuous cover of perennial herbaceous species 3 to 6 feet in height emergent from shallow water. As a result of the small area mapped the unit also includes adjacent terrestrial woody species occurring on the pond margins which grade into the cattail association. Tree may reach 40 feet and shrubs 3–10 feet.

USNVC Type Concept Description (Alliance Level)

This alliance contains freshwater marshes dominated by one or two species of *Schoenoplectus*, *Scirpus*, and/or *Bolboschoenus*, such as *Schoenoplectus acutus*, *Schoenoplectus americanus*, *Bolboschoenus fluviatilis*, *Bolboschoenus maritimus*, *Schoenoplectus pungens*, *Schoenoplectus tabernaemontani*, and/or *Scirpus microcarpus*. *Phragmites australis* may be present. This alliance occurs throughout the central midwestern and western U.S. and Canada. Stands are flooded for most of the growing season up to 1.5 m deep and often drain completely in the winter, exposing bare ground.

Species Summary

See Tables 101 and 102 for species summary details.

Table 101. Most abundant species: *Schoenoplectus americanus* Herbaceous Aquatic Association.

Stratum	Species [A]
Canopy (>5 m)	None
Canopy (2–5 m)	*None*
Subcanopy (0.5–2 m)	*Schoenoplectus americanus* (1.0)
Field (0–0.5 m)	*Potamogeton pectinatus* (1.0), *Potamogeton pusillus* (1.0)

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

Table 102. Other noteworthy associate species: *Schoenoplectus americanus* Herbaceous Aquatic Association.

Stratum	Species
Canopy (>5 m)	*Populus fremontii*
Canopy (2–5 m)	*Salix gooddingii*
Subcanopy (0.5–2 m)	*Pluchea sericea, Baccharis salicifolia, Baccharis sarothroides*
Field (0–0.5 m)	*Najas marina, Zannichellia palustris, Juncus balticus, Juncus cooperi, Anemopsis californica, Cynodon dactylon, Polypogon monspeliensis, Melilotus indicus, Sonchus asper, Polypogon viridis*

Classification Comments

Organ Pipe Cactus National Monument

This association has been described based solely on data collected during this inventory project and other recent studies and is based on data from 1 classification plot sampled during the 2017–2020 mapping and classification effort. Similarities exist between this type as described at Organ Pipe Cactus National Monument and the Chairmaker's Bulrush Western Marsh association CEGL001841 which was described based solely on data from Great Sand Dunes in Colorado. It also bears similarity to the Southern Cattail Western Marsh type, CEGL001845, but does not share the same dominant species or associates. More classification work is needed to better define differences and similarities across all these examples, especially in Western states.

USNVC Classification Confidence

Low

Distribution and Conservation Status

Global Status: Data not available

Global Range: Data not available

NatureServe Conservation Status: Data not available

Conservation Status Reasons: Data not available

Element Sources

Sonoran Desert Network Classification Plots
IPS229

Sonoran Desert Network Monitoring Plots
None

Organ Pipe Cactus National Monument Border Impacts Study Plots
None

Local Type Description Author
J. Galvin

Literature Cited

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