



Vegetation Association Descriptions for Lake Mead National Recreation Area, Death Valley National Park, Mojave National Preserve, and Castle Mountains National Monument

By

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In partnership with the

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1. Forest & Woodland Class

1.B.1. Warm Temperate Forest & Woodland Formation

1.B.1.Nc. Californian Warm Temperate Forest Division

M009. Californian Forest & Woodland Macrogroup

G195. Californian Broadleaf Forest & Woodland Group

Quercus chrysolepis – *Quercus kelloggii* Forest & Woodland Alliance

Quercus chrysolepis / *Rhamnus ilicifolia* Association

NVC Association Code: CEPP006750; **Alliance Code:** A3349

Association Concept

The *Quercus chrysolepis* / *Rhamnus ilicifolia* Association forms an open to continuous tree canopy ranging from 8 to 80 percent cover. The shrub layer is open to intermittent and ranges from 5 to 39% cover, and the herbaceous understory is sparse to open and ranges from 1 to 12 percent cover.

Quercus chrysolepis is dominant or co-dominant in the overstory tree layer, and *Pinus monophylla* is characteristically present. *Rhamnus ilicifolia* is characteristically present in the understory shrub layer, along with *Artemisia ludoviciana* and *Rhus trilobata*. Other commonly associated shrubs include *Brickellia californica*, *Ericameria linearifolia*, and *Yucca baccata*. Various herbs occur in the stands including *Bromus rubens*, *Elymus elymoides*, *Achnatherum speciosum*, *Arabis* spp., and *Bromus tectorum*.

The association is localized in the Mojave National Preserve, California, at mid to upper elevations along protected rock-outcrops, canyons, and spring-fed mountain drainages. It has been sampled in the Granite, New York, and Providence Mountains, and the Mid Hills where it occurs on lowslopes to summits. Elevations range from approximately 1,400 to 1,800 meters, and elevation averages 1,576 meters. Slopes range from gentle to steep (from 5 to 32 degrees), and aspects range from north to south. Soils are derived primarily from granodiorite, limestone, and sandstone substrates, and textures are variable from clay loam to sand. It is found intermittently along slopes to summits where ambient moisture appears higher than the surrounding uplands of *Pinus monophylla* woodlands and other scrubland or rock-outcrop assemblages.

These stands of *Quercus chrysolepis* are disjunct from others across its range in California, occurring in these moist desert canyons within the Central Mojave Desert. Other similar stands occur in the Bighorn Mountains and San Bernardino Mountains at the transition between the Mojave Desert and Transverse Ranges, which is a linear distance of at least 120 kilometers (75 miles) away, and other related stands occur in the southern Sierra Nevada directly to the west of the Mojave Desert ecoregion.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (9): 322A1

Park Sampling Zones: MOJA: Granite Mtns, Mid Hills, New York Mtns, Providence Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=9

LAKE (n=0)

DEVA (n=0)

MOJA (n=9): MOJA0222, MOJA0570, MOJA0807, MOJA9443, MOJA9449, MOJAE071,
MOJAE072, MOJAE103, MOJC1156

MOJN-Johnson (n=0)

References

Evens 2000

1. Forest & Woodland Class

1.B.2 Cool Temperate Forest & Woodland Formation

1.B.2.Nb Rocky Mountain Forest & Woodland Division

M020. Rocky Mountain Subalpine-High Montane Conifer Forest Macrogroup

G224. Intermountain Basins Subalpine Limber Pine - Bristlecone Pine Woodland Group

Pinus flexilis Intermountain Basins Forest & Woodland Alliance

Pinus flexilis / *Artemisia tridentata* Association

NVC Association Code: CEPP009588; **Alliance Code:** A2035

Association Concept

The *Pinus flexilis* / *Artemisia tridentata* Association forms an open tree canopy, in which tree cover ranges from 3 to 18 percent cover. The shrub layer is variable and ranges from 8 to 43 percent cover, and the herb understory is also variable and ranges from 1 to 2 percent cover. *Pinus flexilis* is dominant in the overstory tree layer, though sometimes it co-dominates with *Pinus monophylla*. The understory shrub layer is typically dominated or co-dominated by *Artemisia tridentata*, though *Artemisia arbuscula* is sometimes present and co-dominant. Other commonly associated shrubs include *Chrysothamnus viscidiflorus*, *Eriogonum umbellatum*, and *Ribes cereum*, and commonly associated herbs include *Castilleja applegatei*, *Elymus elymoides*, *Linanthus pungens*, and *Phlox stansburyi*.

The association is found uncommonly in Death Valley National Park, California, at high elevations in the Panamint Mountains. It is found primarily on high ridges to upper slopes that typically have northerly or neutral (northwesterly to easterly) aspects, while other conifer types such as *Pinus monophylla* associations are found adjacent on southerly (warmer) aspects. Elevation ranges from approximately 2,680 to 3,110 meters, and elevation averages 2,946 meters. Slopes range from somewhat steep to steep (from 15 to 29 degrees). Soils include sandy loam, and they are derived from sandstone or gneiss substrate.

Ecoregion Sections and Subsection Codes: Southeastern Great Basin (5): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=0):

DEVA (n=5): DEVA9165, DEVA9170, DEVAS046, DEVAS047, DEVAS052

MOJA (n=0): MOJN-Johnson (n=0):

References

None

***Pinus longaeva* / (*Ericameria discoidea*, *Ribes* spp.) Association**

NVC Association Code: CEG005447; **Alliance Code:** A0518

Association Concept

The *Pinus longaeva* / (*Ericameria discoidea*, *Ribes* spp.) Association forms an open to intermittent tree canopy, in which tree cover ranges from 5 to 35 percent cover. The shrub layer is sparse to open, ranging from 1 to 15 percent cover, and the herb understory is also sparse to open, ranging from 0.2 to 6 percent cover. *Pinus longaeva* is characteristic in the tree overstory and can occur in purely dominant stands, or in mixed stand co-dominant with *Pinus flexilis*. Stands are usually even-aged and open, with less than 20% cover, and they are densest on north-facing slopes. A diversity of plants occur in the shrub layer, though *Ribes cereum* is often dominant or co-dominant. Other commonly associated shrubs include *Artemisia dracunculoides*, *Artemisia tridentata*, *Chamaebatiaria millefolium*, *Chrysothamnus viscidiflorus*, and *Ribes montigenum*. Commonly associated herbs include *Linanthus pungens*, and those sometimes present include *Arenaria kingii*, *Astragalus* spp., *Cryptantha* spp., *Elymus elymoides*, *Eriogonum* spp., *Heuchera* sp., *Koeleria macrantha*, and *Pellaea* spp.

Pinus longaeva is a long-lived, slow growing tree, and occurs at high elevations where the growing season is short. The association is found uncommonly in Death Valley National Park in California, sampled at high elevations with low-moisture, nutrient-deficient, rocky soils such as along Telescope Peak in the Panamint Mountains. It also occurs adjacent to the park along Mazourka Peak in the Inyo Mountains, and has been observed in the Last Chance Range. Elevation ranges from approximately 3,000 to 3,350 meters, and averages 3,235 meters. Aspects are variable, and slopes range from moderately steep to very steep (from 14 to 42 degrees). Soils include loam and silt loam, and they are derived from nutrient-poor calcareous substrate, typically limestone and dolomite. Some trees appear to have experienced lightning strikes, though fire is typically not carried through the stand since the understory is open.

Ecoregion Sections and Subsection Codes: Southeastern Great Basin (6): 341Fb, 341Ff

Park Sampling Zones: DEVA: Panamint Mtns, Mazourka Peak

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=6): DEVA0168, DEVA9169, DEVAS051, DEVAS258, DEVAS260, MOJC0431

MOJA (n=0): MOJN-Johnson (n=0):

References

NatureServe 2012

1. Forest & Woodland Class

1.B.2 Cool Temperate Forest & Woodland Formation

1.B.2.Nc Western North American Pinyon - Juniper Woodland & Scrub Division

M026. Intermountain Singleleaf Pinyon - Juniper Woodland Macrogroup

G246. Colorado Plateau-Great Basin Juniper Open Woodland Group

Juniperus osteosperma / Shrub Understory Woodland Alliance

***Juniperus osteosperma* / *Eriogonum fasciculatum* – *Yucca baccata* Association**

NVC Association Code: CEGJ005754; **Alliance Code:** A3496

Association Concept

The *Juniperus osteosperma* / *Eriogonum fasciculatum* – *Yucca baccata* Association forms an open tree canopy, in which tree cover ranges from 1 to 15 percent cover. The shrub layer is variable and ranges from 3 to 23 percent cover, and the herb understory is also variable and ranges from 4 to 18 percent cover. *Juniperus osteosperma* is dominant in the tree overstory, while *Yucca brevifolia* is often present at lower cover. The shrub understory is characterized by *Eriogonum fasciculatum* and/or *Yucca baccata*, which are often co-dominant with a mixture of shrubs such as *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, and *Ericameria linearifolia*. Other commonly associated shrubs include *Echinocereus engelmannii*, *Gutierrezia sarothrae* and *Opuntia polyacantha* var. *erinacea*. Commonly associated herbs include *Achnatherum speciosum*, *Achnatherum hymenoides*, *Aristida purpurea*, *Bouteloua eriopoda*, *Bromus rubens*, *Cryptantha*, *Erodium cicutarium*, *Pleuraphis jamesii*, and *Sphaeralcea ambigua*.

The association is found commonly in Mojave National Preserve, California, at upper elevations including in the Cima Dome area as well as the Castle, Clark, Ivanpah, and New York Mountains. It is found primarily on rolling hill slopes to mid-slopes of mountains, though sometimes on channel walls to high slopes. Elevation ranges from approximately 1,200 to 1,800 meters, and averages 1,562 meters. Slopes range from flat to somewhat steep (0 to 24 degrees). Aspects are variable, and soils are also varied and are derived from different substrates such as alluvium, gneiss, granodiorite, limestone, rhyolite, and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (14): 322Aj, 322Al

Park Sampling Zones: MOJA: Castle Mtns, Cima Dome SE, Clark Mtn, Ivanpah Mtns, Lanfair Vly, New York Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=21

LAKE (n=0): ; DEVA (n=0):

MOJA (n=14): CAMO0101, CAMO9126, MOJA0108, MOJA9133, MOJA9245, MOJA9274, MOJA9276, MOJA9277, MOJA9286, MOJA9354, MOJA9355, MOJC1144, MOJC1151, MOJC1152

MOJN-Johnson (n=7): MOJJE003, MOJJE245, MOJJE438, MOJJE572, MOJJE605, MOJJE607, MOJJE684

References

Keeler-Wolf and Thomas 2000

Juniperus osteosperma - Yucca brevifolia / Bouteloua eriopoda Association

NVC Association Code: CEPP006716; **Alliance Code:** A3496

Association Concept

The *Juniperus osteosperma* - *Yucca brevifolia* / *Bouteloua eriopoda* Association forms an open tree canopy, in which tree cover ranges from 5 to 22 percent cover. The shrub layer is variable and ranges from 6 to 16 percent cover, and the herb understory is also variable and ranges from 5 to 30 percent cover. *Juniperus osteosperma* is dominant in the tree overstory, while *Yucca brevifolia* is characteristically present at lower cover. Commonly associated shrubs include *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, *Gutierrezia microcephala*, *Gutierrezia sarothrae*, *Salazaria mexicana*, *Salvia dorrii*, and *Yucca baccata*. The dominant or codominant herb in the understory is *Bouteloua eriopoda*. Other commonly associated herbs include *Achnatherum hymenoides*, *Achnatherum speciosum*, *Aristida purpurea*, *Bromus rubens*, *Erodium cicutarium*, *Pleuraphis jamesii*, *Pleuraphis rigida*, and *Sphaeralcea ambigua*.

The association is found uncommonly in Mojave National Preserve, California, at upper elevations including in the New York Mountains, Ivanpah Valley, and Lanfair Valley. Stands are typically found along low, rolling hillslopes with alternating drainages. Sites often occur on low to high slopes with elevation between 1,450 and 1,675 m elevation, averaging 1,552 m, and with variable aspect. Slopes range from flat to moderate (2 to 8°). Substrates are typically alluvium, often derived from granite, with soil textures that tend to gravelly and sandy loam. Some stands appear to have experienced fire in the recent past, where the woody plant species cover is lower than the herbaceous species cover.

Ecoregion Sections and Subsection Codes: Mojave Desert (6): 322Ak, 322Al

Park Sampling Zones: MOJA: Castle Mtns, Ivanpah Vly, Lanfair Vly, New York Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=6 [+10]

LAKE (n=0): ; DEVA (n=0):

MOJA (n=6): MOJA9133, MOJA9278, MOJA9354, MOJA9580, MOJC1177, MOJC1178

MOJN-Johnson (n=0):

[MOJA-McAuliffe (n=10): MOJAA030, MOJAA033, MOJAA035, MOJAA036, MOJAA037, MOJAA038, MOJAA040, MOJAA043, MOJAA044, MOJAA079]

References

Keeler-Wolf and Thomas 2000

G247. Great Basin Pinyon - Juniper Woodland Group

Pinus monophylla - *Juniperus osteosperma* / Shrub Understory Woodland Alliance

Pinus monophylla / *Eriogonum fasciculatum* Association

NVC Association Code: CEPP006732; **Alliance Code:** A2108

Association Concept

The *Pinus monophylla* / *Eriogonum fasciculatum* Association forms an open tree canopy, in which tree cover ranges from 2 to 31 percent cover. The shrub layer is variable and ranges from 10 to 30 percent cover, and the herb understory is also variable and ranges from 3 to 12 percent cover. *Pinus monophylla* is often dominant or sometimes co-dominant in the tree overstory, while other trees often or sometimes present include *Juniperus californica* or *Juniperus osteosperma*. The shrub understory is characterized by a dominance or co-dominance of *Eriogonum fasciculatum* with other shrubs such as *Ericameria laricifolia*, *Yucca baccata*, *Cylindropuntia acanthocarpa*, *Echinocereus mojavensis*, *Ephedra viridis*, *Ericameria linearifolia* and *Thamnosma montana*. Commonly associated herbs include *Bromus rubens*, *Achnatherum speciosum* and *Sphaeralcea ambigua*. Nonvascular plants include lichen.

The association is found commonly in Mojave National Preserve, California, along mountain hills and slopes to summits including along the Clark, Granite, New York, and Providence Mountains. It occurs at upper elevations on all slope positions and aspects. Elevation ranges from approximately 1,320 to 1,850 meters, and averages 1,576 meters. Slopes range from gentle to steep (from 3 to 31 degrees). Soils range widely from clay loam to loamy sand to silt clay, and are derived usually from igneous substrates such as granodiorite and rhyolite, and rarely from quartzite/sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (9): 322Aj, 322Al

Park Sampling Zones: MOJA: Clark Mtn, Granite Mtns, Lanfair Vlly, New York Mtns, Providence Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=14

LAKE (n=):

DEVA (n=):

MOJA (n=9): MOJA0110, MOJA0148, MOJA9138, MOJA9432, MOJA9435, MOJA9445, MOJA9458, MOJA9693, MOJA9911

MOJN-Johnson (n=5): MOJJE046, MOJJE077, MOJJE179, MOJJE445, MOJJE935

References

None

Pinus monophylla / Garrya flavescens Association

NVC Association Code: CEG005771; **Alliance Code:** A2108

Association Concept

The *Pinus monophylla* / *Garrya flavescens* Association forms an open tree canopy, in which tree cover ranges from 1 to 26 percent cover. The shrub layer is variable and ranges from 14 to 36 percent cover, and the herb understory is also variable and ranges from 1 to 7 percent cover. The dominant and/or characteristic tree is *Pinus monophylla*, while other trees often or sometimes present include *Fraxinus anomala* or *Juniperus osteosperma*. Commonly associated shrubs include *Garrya flavescens*, *Prunus fasciculata*, *Rhus trilobata*, *Yucca baccata*, *Artemisia ludoviciana*, *Brickellia californica*, *Echinocereus mojavensis*, *Ephedra viridis*, *Eriogonum heermannii*, *Gutierrezia sarothrae*, *Opuntia phaeacantha*, *Purshia stansburiana*, and *Rhamnus ilicifolia*, and commonly associated herbs include *Bromus rubens*, *Bromus tectorum*, *Elymus elymoides*, *Achnatherum parishii*, *Castilleja linariifolia*, *Hymenoxys cooperi*, *Penstemon eatonii*, *Penstemon palmeri*, and *Poa fendleriana*. Nonvascular plants include lichen and moss.

The association is often found in Mojave National Preserve, California, in upper elevation, rocky canyons and ravines at predominately northerly aspects including within the Clark, Granite, and Providence Mountains. Elevation ranges from approximately 1,330 to 1,830 meters, and averages 1,614 meters. Slopes range from gentle to steep (from 5 to 30 degrees). Soils vary from sand and loam textures, being derived from substrates such as granodiorite, limestone, rhyolite, and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (12): 322Ai, 322Aj, 322Al

Park Sampling Zones: MOJA: Clark Mtn, (Granite Mtns), Providence Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=0):

DEVA (n=0):

MOJA (n=12): MOJA0141, MOJA0263, MOJA9434, MOJAE038, MOJAE039, MOJAE040, MOJAE041, MOJAE104, MOJAE105, MOJAE106, MOJAE233, MOJAE234

MOJN-Johnson (n=0):

References

Evens 2000

Pinus monophylla / Prunus fasciculata – Rhus trilobata Association

NVC Association Code: CEG005772; **Alliance Code:** A2108

Association Concept

The *Pinus monophylla* / *Prunus fasciculata* – *Rhus trilobata* Association forms an open tree canopy, in which tree cover ranges from 2 to 22 percent cover. The shrub layer is variable and ranges from 7 to 36 percent cover, and the herb understory is also variable and ranges from 1 to 18 percent cover.

Pinus monophylla is dominant or co-dominant in the tree layer, while other trees often or sometimes present include *Juniperus osteosperma*. The shrub understory is characterized by a dominance or co-dominance of tall shrubs such as *Prunus fasciculata*, *Rhus trilobata*, and *Fallugia paradoxa*. Other commonly associated shrubs include *Yucca baccata*, *Artemisia ludoviciana*, *Cylindropuntia acanthocarpa*, *Ephedra viridis*, *Gutierrezia microcephala*, *Salvia mohavensis*, and *Thamnosma montana*. Commonly associated herbs include *Achnatherum speciosum*, *Aristida purpurea*, *Bromus rubens*, *Bromus tectorum*, *Erodium cicutarium*, *Penstemon palmeri*, and *Sphaeralcea ambigua*. Nonvascular plants include cryptogamic crust, lichen, and moss.

The association is often found in Mojave National Preserve, California, along bedrock slopes that experience colluvial disturbances and dry canyon drainages that are intermittently flooded. It is sampled within the Clark, Granite, New York, Providence, and Van Winkle Mountains, and the Mid Hills, at upper elevations on all slope positions and aspects, but primarily favoring mid-slopes and northerly aspects. Elevation ranges from approximately 1,150 to 1,750 meters, and elevation averages 1,524 meters. Slopes range from gentle to steep (from 2 to 45 degrees). Soils range from clay loam or silt loam to coarse sand, and are derived from a variety of substrates such as alluvium, gneiss, granodiorite, limestone, plutonic rock, rhyolite, and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (27): 322Aj, 322Al

Park Sampling Zones: MOJA: Clark Mtn, Granite Mtns, Mid Hills, New York Mtns, Providence Mtns, Van Winkle Mtn, Woods Mtns

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=27

LAKE (n=0): ; DEVA (n=0):

MOJA (n=27): MOJA0223, MOJA9227, MOJA9256, MOJA9414, MOJA9423, MOJA9436, MOJA9441, MOJA9442, MOJA9456, MOJA9575, MOJA9588, MOJA9695, MOJA9907, MOJAE001, MOJAE042, MOJAE043, MOJAE045, MOJAE046, MOJAE107, MOJAE164, MOJAE165, MOJAE235, MOJAE236, MOJC0017, MOJC0212, MOJC1148, MOJC1157; MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

1. Forest & Woodland Class

1.B.3 Temperate Flooded & Swamp Forest Formation

1.B.3.Nd Western North American Interior Flooded Forest Division

M036. Interior Warm & Cool Desert Riparian Forest Macrogroup

G797. Western Interior Riparian Forest & Woodland Group

Populus fremontii - *Fraxinus velutina* - *Salix gooddingii* Flooded Forest & Woodland Alliance

***Populus fremontii* / *Baccharis sergiloides* Association**

NVC Association Code: CEPP006735; **Alliance Code:** A3803

Association Concept

The *Populus fremontii* / *Baccharis sergiloides* Association forms an open to intermittent tree canopy, in which tree cover ranges from 9 to 46 percent cover. The understory is variable with the shrub layer ranging from 30 to 75 percent cover, and the herb layer ranging from 3 to 39 percent cover. *Populus fremontii* is dominant in the overstory tree layer, and *Baccharis sergiloides* is dominant to co-dominant in the shrub layer. Other commonly associated shrubs include *Artemisia ludoviciana*, *Rhus trilobata*, and *Acacia greggii* (= *Senegalia greggii*), and commonly associated herbs include *Bromus rubens*, *Sphaeralcea ambigua*, and various wetland plants including *Carex* spp., *Juncus* spp., *Funastrum hirtellum*, *Mimulus guttatus*, *Polypogon monspeliensis* and *Typha* spp.

The association is found uncommonly in Lake Mead National Recreation Area, Nevada such as in Grapevine Canyon of the Newberry Mountains, and also in the Mojave National Preserve, California, including a few canyons of the Granite and New York Mountains. Its habitat is primarily drainage channels within canyons or bases of slopes that are springfed and often have running water. Sites are mid to upper elevations (ranging from approximately 750 to 1,650 meters), and averages 1,137 meters. Slopes are gentle to moderate (ranging from 1 to 12 degrees), and aspects are variable. Soils range from loamy sand to sand, and are derived from alkali-granite (alaskite) and granodiorite substrate.

Ecoregion Sections and Subsection Codes: Mojave Desert (5): 322A1, 322Am

Park Sampling Zones: LAKE: Katherine; MOJA: Granite Mtns, Mid Hills

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=3): LAKE9431, LAKE9440, LMJOS002; DEVA (n=0):

MOJA (n=2): MOJA9271, MOJAE194; MOJN-Johnson (n=0):

References

None

1. Forest & Woodland Class

1.B.3 Temperate Flooded & Swamp Forest Formation

1.B.3.Nd Western North American Interior Flooded Forest Division

M298. Interior West Ruderal Flooded & Swamp Forest & Woodland Macrogroup

G510. Interior West Ruderal Riparian Forest & Scrub Group

Rubus armeniacus - *Sesbania punicea* - *Ficus carica* Ruderal Riparian Scrub Alliance

Ficus carica Ruderal Riparian Association

NVC Association Code: CEPP006709; **Alliance Code:** A4160

Association Concept

The *Ficus carica* Ruderal Riparian Association forms an intermittent to continuous shrub canopy, in which the shrub cover ranges from 60 to 100 percent cover. The emergent tree layer is sparse, if present, and the herb understory is variable. *Ficus carica* is the dominant and characteristic shrub. *Nerium oleander* is sometimes present as an associated non-native, and other shrubs may include *Ambrosia dumosa*, *Atriplex canescens*, *Ericameria cuneata* and *Larrea tridentata*.

The association has been found uncommonly in Death Valley National Park in California, at mid to upper elevations of the Panamint Mountains. It was mapped at two mountain springs (Mint Spring and Warm Spring), and patches are small in size (<0.1 hectare). Elevation ranges from approximately 700 to 1,400 meters, and elevation averages 1,133 meters. Stands are found at/near springs where they appear to be an artifact of cultural plantings, and shrubs are slowly naturalizing. Soils are derived from a variety of substrates such as granodiorite and sandstone. Other culturally planted stands in the area where this type was mapped include *Fraxinus velutina*, *Nerium oleander*, and *Tamarix aphylla*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2), 322Af; Southeastern Great Basin (3): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns

Classification Confidence: Low; **Rarity Rank (Global, State-CA):** GNR, SNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=0):

DEVA (n=5): DEVA8005, DEVA8006, DEVA8007, DEVA8008, DEVA8009

MOJA (n=0) ; MOJN-Johnson (n=0):

References

None

Phoenix dactylifera Ruderal Association

NVC Association Code: CEPP006859; **Alliance Code:** A4161

Association Concept

The *Phoenix dactylifera* Ruderal Association forms an intermittent to continuous tree canopy ranging from 49 to 95 percent cover. *Phoenix dactylifera* is dominant in the tree overstory, and *Prosopis* spp. and/or *Washingtonia filifera* are sometimes present. Understory shrub and herb cover/composition information was not documented in the areas sampled.

The ruderal association occurs in localized patches along low-elevation alkali springs in Death Valley National Park, California, such as in the Black Mountains and Funeral Mountains area at Ratat and Travertine East springs. Elevations range from approximately 100 to 250 meters, and elevation averages 154 m. Stands have included cultural plantings with *Phoenix dactylifera* escaping into natural settings as scattered trees and as small stands in Death Valley National Park. Sites with *Phoenix dactylifera* along with *Washingtonia filifera* were also mapped as “Palm” points in the Travertine Springs complex (Thomas 2006); these exotic palm species dominated the riparian vegetation at these springs until early 2011 when the palms were mechanically removed following an autumn 2010 fire (Sada and Cooper 2012).

Other individuals and stands of *Phoenix dactylifera* have been observed in the Rogers Spring/Wash complex in Lake Mead National Recreation Area in Nevada, where Park Service staff have previously cut down the trees to try restoring the area to more natural conditions, though the palms have re-invaded this site.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322Ab, (322Az)

Park Sampling Zones: **DEVA:** Death Valley; **(LAKE:** Echo Bay)

Classification Confidence: Low

Surveys (with Sample Sizes) Used in Description

MOJN: N=8

LAKE (n=0):

DEVA (n=8): DEVA8011, DEVA8012, DEVA8013, DEVA8014, DEVA8015, DEVA8019, DEVA8022, DEVA8027

MOJA (n=0):

MOJN-Johnson (n=0):

References

Thomas 2006

Washingtonia filifera / spring Ruderal Association

NVC Association Code: CEPP006845; **Alliance Code:** A4161

Association Concept

The *Washingtonia filifera* / spring Ruderal Association forms an open to continuous tree canopy ranging from 3 to 95 percent cover. *Washingtonia filifera* is either dominant or co-dominant in the tree canopy, and other trees such as the non-native *Phoenix dactylifera* sometimes occur in these stands. *Pluchea sericea* is sometimes present in the shrub layer within a sparse to intermittent shrub understory, while the herb understory is variable with sparse to open cover.

Stands occurring in the study area in the central to northern Mojave Desert and Great Basin are non-native, where the fan palm has naturalized in spring and stream areas from cultural plantings. It has been specifically sampled at low elevations in Death Valley, including at the southern end of the Black Mountains, in Saline Valley at Lower Warm Springs, and along and near Cow Creek including Nevares, Ratat, and Shoot-me-up Springs. It has been mapped as “Palm” stands and individuals at the Travertine Springs complex in Death Valley (Thomas 2006), where exotic palms dominated the riparian vegetation at these springs until early 2011 when the palms were mechanically removed following an autumn 2010 fire (Sada and Cooper 2012). It also is found in Lake Mead National Recreation Area at Rogers Spring near Echo Bay and in Overton, where most of the palms and some other trees were cut down by Park Service staff in an effort to restore the area to a more natural condition, but the palms are growing back. It also has been observed along Soda Springs in Zzyzx at MOJA. The association is found primarily along low-elevation stream bottoms and low-slopes springs where water is perennially available. Elevations range from approximately 0 to 500 meters, and elevation averages 251 meters. Aspects are variable, and soils are clay derived from a variety of substrates including alluvium, limestone, and sandstone.

In the natural stands of *Washingtonia filifera*, fire is essential in regeneration and maintenance. Fire removes dead leaves and shag from the trunk and base of the trees and creates favorable germination sites. In natural stands, non-native *Tamarix* as well as agricultural and urban development, cutting and vandalism can pose as threats. In the non-natural stands such as in Death Valley and Rogers Spring areas, the non-native *Washingtonia filifera* poses a threat by drawing upon limited water resources and competing with native wetland plants.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (11): 322Ab, 322Ad, 322Az; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Death Valley, Saline Valley; **LAKE:** Echo Bay, Overton; [**MOJA:** Soda Lake]

Classification Confidence: Low

Surveys (with Sample Sizes) Used in Description

MOJN: N=12

LAKE (n=2): LAKE9298, LAKE9414

DEVA (n=10): DEVA8016, DEVA8017, DEVA8018, DEVA8021, DEVA8023, DEVA8024, DEVA8025, DEVA8026, DEVA8028, DEVA8029

MOJA (n=0):

MOJN-Johnson (n=0):

References

Evens et al. 2012, Keeler-Wolf et al. 1998, Thomas 2006

2. Shrub & Herb Vegetation Class

2.B.1 Mediterranean Scrub & Grassland Formation

2.B.1.Nb Californian Grassland & Meadow Division

M045. Californian Annual & Perennial Grassland Macrogroup

G766. Californian Annual Grassland & Forb Meadow Group

Amsinckia menziesii – *Amsinckia tessellata* – *Phacelia* spp. Herbaceous Alliance

Amsinckia tessellata – *Erodium cicutarium* Association

NVC Association Code: CEPP005792; Alliance Code: A4182

Association Concept

The *Amsinckia tessellata* – *Erodium cicutarium* Association forms an open to continuous herb layer, in which the herbaceous cover is 67 percent cover in the one stand sampled within the Mojave Desert. The emergent tree layer is typically absent, and the shrub layer is sparse (e.g., 0 to 4 percent cover). *Amsinckia tessellata* is dominant or co-dominant in the herbaceous layer with *Erodium cicutarium*. Other commonly associated herbs include, *Asclepias subulata*, *Chamaesyce polycarpa*, *Chorizanthe brevicornu*, *Eschscholzia minutiflora*, *Leptosiphon aureus*, *Lupinus sparsiflorus*, *Mirabilis laevis*, *Pectocarya recurvata*, *Phacelia distans*, *Physalis hederifolia*, *Plagiobothrys*, *Porophyllum gracile*. Shrubs that are present can include *Acamptopappus sphaerocephalus*, *Ambrosia dumosa*, *Encelia farinosa*, *Eriogonum plumatella*, *Larrea tridentata*, *Salazaria mexicana*, *Stephanomeria pauciflora*, *Tetradymia stenolepis*, *Viguiera parishii*, *Yucca schidigera*.

The association is found sporadically in Death Valley National Park, Lake Mead National Recreation Area, and Mojave National Preserve in California and Nevada, sampled at mid elevation. Elevation in the stand samples is 874 meters, and the slope steepness is gentle (e.g., 3 degrees). It is found on a lowslope with a neutral aspects. Soils are derived from a variety of substrates including alluvium and alkali-granite.

Other stands of this association occur outside of the Mojave Desert in California such as in the Great Valley and Central Coast Ranges in semi-desert grassland environments.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Am

Park Sampling Zones: LAKE: Katherine

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=1

LAKE (n=1): LAKE9524; DEVA (n=0): ; MOJA (n=0): ; MOJN-Johnson (n=0):

References

Buck-Diaz and Evens 2011, Buck-Diaz et al. 2012

2. Shrub & Herb Vegetation Class

2.B.2 Temperate Grassland & Shrubland Formation

2.B.2.Nd Western North American Interior Chaparral Division

M091. Warm Interior Chaparral Macrogroup

G281. Western Madrean Chaparral Group

Arctostaphylos pungens - *Arctostaphylos pringlei* - *Ceanothus greggii* Shrubland Alliance

***Ceanothus greggii* var. *vestitus* Association**

NVC Association Code: CEPP005938; **Alliance Code:** A3790

Association Concept

The *Ceanothus greggii* var. *vestitus* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 26 to 50 percent cover. An emergent tree layer is sparse at 1 percent cover, and the herb understory is variable and ranges from 24 to 26 percent cover. *Ceanothus greggii* var. *vestitus* (= *Ceanothus vestitus*) is the dominant shrub in the overstory, while *Artemisia tridentata* and *Eriogonum umbellatum* are characteristic. Other shrubs often present include *Chamaebatiaria millefolium*, *Chrysothamnus viscidiflorus*, *Eriogonum microthecum*, *Gutierrezia sarothrae*, *Holodiscus discolor*, *Monardella linoides*, *Opuntia polyacantha* var. *erinacea*, *Purshia stansburiana*, *Salvia pachyphylla*, and *Tetradymia canescens*. Dominant and characteristic herbs include *Bromus tectorum*, *Chaenactis douglasii*, *Eriogonum nidularium*, and *Heliomeris multiflora*, and those often present are *Achnatherum hymenoides*, *Achnatherum parishii*, *Argemone corymbosa*, *Bromus rubens*, *Castilleja linariifolia*, *Eriogonum eremicola*, *Eriogonum panamintense*, *Eriophyllum*, *Linanthus pungens*, *Lupinus* spp., *Lupinus caudatus* ssp. *caudatus*, *Mimulus bigelovii*, and *Penstemon rostriflorus*.

The association is uncommon in Death Valley National Park in California and was sampled twice at upper elevation in a post burn area of Porter Peak within the Panamint Mountains. Another stand was observed along Saline Valley Road in the Nelson Range. Elevation ranges from approximately 2,600 to 2,800 meters, and elevation averages 2,710 meters. The association is found on various aspects on somewhat steep to steep slopes (25-27 degrees). Soils are derived from sandstone in the two stands sampled. Most stands of this association are associated with relatively recent fires. *Ceanothus greggii* var. *vestitus* is an obligate seeder, and its seedlings germinate post-fire and attain dominance. Other longer-lived shrubs become (co-)dominant upon decades of time after disturbance. Other stands of this association occur further east in California in the Transverse Ranges to southern Sierra Nevada and Sierra Nevada Foothills in recent post-burn settings, including in San Gabriel Mountains National Forest in Los Angeles County and in the Sequoia National Forest in Kern County. A similar taxon, *Ceanothus greggii* var. *perplexans*, dominates in chaparral stands in post-burn settings including in the Peninsular Ranges and desert transition areas such as Anza-Borrego Desert State Park in San Diego County (Keeler-Wolf et al. 1998). *Ceanothus vestitus* and *Ceanotus pauciflorus* (see Jepson Flora Project 2017) are other taxonomic names used for *Ceanothus greggii* var. *vestitus*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (2): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G4 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=2

LAKE (n=0):

DEVA (n=2): DEVAD127, DEVAD128

MOJA (n=0):

MOJN-Johnson (n=0):

References

Keeler-Wolf et al. 1998

***Quercus turbinella* – *Baccharis sergiloides* Association**

NVC Association Code: CEPP006751; **Alliance Code:** A0793

Association Concept

The *Quercus turbinella* – *Baccharis sergiloides* Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 27 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 2 to 10 percent cover. *Quercus turbinella* is co-dominant in the shrub canopy and *Baccharis sergiloides* is characteristically present and often co-dominant. Other wash-related and upland shrubs that are characteristically or often present include *Artemisia ludoviciana*, *Ericameria linearifolia*, *Eriogonum wrightii*, *Fallugia paradoxa*, *Gutierrezia sarothrae*, *Lotus rigidus*, *Prunus fasciculata*, *Rhus trilobata*, and *Yucca baccata*. Commonly associated herbs include *Achnatherum speciosum*, *Bouteloua curtipendula*, *Bromus diandrus*, *Bromus rubens*, *Bromus tectorum*, *Elymus elymoides*, *Erigeron divergens*, *Pellaea mucronata*, *Sphaeralcea ambigua*. An emergent trees is often present including *Pinus edulis*, and those sometimes present are *Chilopsis linearis*, *Fraxinus anomala*, *Juniperus osteosperma*, and *Pinus monophylla*. Nonvascular plants include moss.

The association is uncommon in Mojave National Preserve in California, sampled at mid to upper elevations in draws and drainages in the New York Mountains. Elevation ranges from approximately 1,200 to 1,850 meters, and elevation averages 1,433 meters. It is found primarily in moist to wet canyon drainages often with a high degree of bedrock and boulders. Slopes are gentle to somewhat steep (5 to 15 degrees), and soil is primarily sand derived from granodiorite.

A similar association of *Quercus turbinella* – (*Chilopsis linearis*, *Prunus fasciculata*) Wash Shrubland was additionally identified from the Spring Mountains of Red Rock Canyon National Conservation Area, in Nevada, within arroyos where other wash shrub and tree species intermix with the dominant to co-dominant *Quercus turbinella*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322A1

Park Sampling Zones: MOJA: New York Mtns

Classification Confidence: Low; **Rarity Rank (Global, State-CA):**

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=0): ; DEVA (n=0):

MOJA (n=8): MOJA9685, MOJA9686, MOJAE140, MOJAE141, MOJAE143, MOJAE144, MOJAE145, MOJAE146; MOJN-Johnson (n=0):

References

Evens 2000

Quercus turbinella – Juniperus californica – Eriogonum spp. Association

NVC Association Code: CEPP006752; **Alliance Code:** A0793

Association Concept

The *Quercus turbinella* – *Juniperus californica* – *Eriogonum* spp. Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 10 to 60 percent cover. The emergent tree layer is sparse and ranges from 0 to 15 percent cover, and the herb understory is variable and ranges from 0 to 10 percent cover. *Quercus turbinella* is the dominant or co-dominant shrub and *Eriogonum fasciculatum*, *Eriogonum wrightii*, and *Gutierrezia sarothrae* are characteristic. Typically, a mosaic of shrubs intermix in the stands; shrubs often present include *Ephedra nevadensis*, *Ericameria linearifolia*, *Ferocactus cylindraceus*, *Keckiella antirrhinoides*, *Lotus rigidus*, and *Yucca schidigera*. Commonly associated herbs include *Achnatherum speciosum* and *Sphaeralcea ambigua*. *Juniperus californica* is a characteristic tree at similar or lower cover than *Quercus turbinella*. *Pinus monophylla* is sometimes present at sparse cover, and some post-fire stands with resprouting oaks previously had *Pinus monophylla* present.

The association is found in Lake Mead National Recreation Area in Nevada, sampled at mid to upper elevations on side-slopes to ridgetops in the Newberry Mountains, usually at sites with granite outcroppings and/or exposed bedrock. Elevation ranges from approximately 950 to 1,700 meters, and elevation averages 1,260 meters. Slopes range from gentle to steep (from 2 to 40 degrees). The association is found on variable aspects, though often north-facing or in draws. Soil is primarily derived from alkali-granite (alaskite) and is often shallow and gravelly.

A similar *Quercus turbinella* - *Juniperus osteosperma* Shrubland Association is described from Grand Canyon National Park and Grand Canyon-Parashant National Monument in Arizona, though associated shrub species are different in this type.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (11): 322Am

Park Sampling Zones: LAKE: Bridge Canyon, Juniper Mine, Katherine, Searchlight SE, Spirit Mountain

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=11

LAKE (n=11): LAKE9518, LAKE9520, LAKE9620, LAMEN094, LAMEN095, LAMEN099, LAMEN100, LAMEN102, LAMEN108, LAMEN114, LAMEN115

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

2. Shrub & Herb Vegetation Class

2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation

2.C.4.Nb Western North American Temperate & Boreal Freshwater Marsh, Wet Meadow & Shrubland Division

M301. Western North American Ruderal Marsh, Wet Meadow & Shrubland Macrogroup

G524. Western North American Ruderal Marsh, Wet Meadow & Shrubland Group

Phragmites australis – *Arundo donax* – *Alopecurus pratensis* Ruderal Marsh Alliance

***Phragmites australis* ssp. *americanus* Native Western Marsh Association**

NVC Association Code: CEPP6866; Alliance Code: A3847

Association Concept

The *Phragmites australis* ssp. *americanus* Native Western Marsh Association forms an open to continuous herb layer, in which the herbaceous cover ranges from 23 to 90 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the shrub layer is sparse and ranges from 0 to 7 percent cover. *Phragmites australis* is characteristically dominant in the herbaceous layer. Other commonly associated herbs include *Distichlis spicata*. Shrubs that are often present include *Suaeda moquinii*. Those trees sometimes present include *Populus fremontii*, *Prosopis glandulosa*, and *Tamarix* spp.

The association is scattered in the Mojave Desert and southern Great Basin within alkaline seep, stream, and lacustrine areas, including in Saline Valley, Saratoga Spring, and other various seeps such as near Shoshone in Death Valley National Park, California. It is also found at the edge of Soda Lake and along spring-fed washes in the Granite Mountains in the Mojave National Preserve, California, and along Las Vegas Wash, near Salt Spring, and along a concrete channel at the west end of the lake near Northshore Rd. in Lake Mead National Recreation Area, in Arizona and Nevada. It occurs at low elevations, ranging from approximately 150 to 500 meters, and averages 351 meters. Slopes are typically very gentle (between 1 to 2 degrees), allowing water to flow slowly or pool in areas. It is found primarily in alkaline seeps, stream beds/channels, and lake edges at various aspects. Soils range between clay, silt, to sandy loam, and are usually derived from alluvium.

Across the western U.S., *Phragmites australis* has various genetic strains including native, introduced and hybrid lineages. Introduced populations of *Phragmites australis* are invasive in or near major urban centers and associated with anthropogenic disturbance in wetlands and rivers. Within the NPS lands in the Mojave Desert, most stands are native and limited to naturally occurring, unmanaged freshwater and alkaline wetland sites; however both hybrid and native stands occur along Las Vegas Wash (Lambert et al. 2016).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ab, 322Ad, 322Ai, 322Av, 322Az; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Saline Valley, Shoshone; **LAKE:** Lakeshore, Temple Bar; **MOJA:** Soda Lake, (Granite Mountains)

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=2): LAKE9537, LAKE9638

DEVA (n=3): DEVA9620, MOJC0045, MOJC0052

MOJA (n=1): MOJC0056

MOJN-Johnson (n=0):

References

cf NatureServe (for CEGl001475 and CEGl004115), cf. Hickson and Keeler-Wolf 2007, cf. Keeler-Wolf and Vaghti 2000

2. Shrub & Herb Vegetation Class

2.C.4 Temperate to Polar Freshwater Marsh, Wet Meadow & Shrubland Formation

2.C.4.Nc Southwestern North American Warm Desert Freshwater Marsh & Bosque Division

M076. Warm Desert Lowland Freshwater Marsh, Wet Meadow & Shrubland Macrogroup

G533. North American Warm Desert Riparian Low Bosque & Shrubland Group

Baccharis emoryi - *Baccharis sergiloides* Wet Shrubland Alliance

Baccharis sergiloides / (*Muhlenbergia rigens* - *Typha domingensis*) Association

NVC Association Code: CEPP005846; Alliance Code: A3874

Association Concept

The *Baccharis sergiloides* / (*Muhlenbergia rigens* - *Typha domingensis*) Association forms an open to dense shrub canopy, in which the shrub cover ranges from 10 to 77 percent cover. The emergent tree layer is sparse and ranges from 0 to 5 percent cover, and the herb understory is variable and ranges from 1 to 49 percent cover. *Baccharis sergiloides* is dominant in the shrub canopy, occurring with characteristic shrubs *Acacia greggii* (= *Senegalia greggii*) and *Lotus rigidus*. Other shrubs often present include *Artemisia ludoviciana*, *Brickellia californica*, *Ephedra viridis*, *Eriogonum fasciculatum*, *Ferocactus cylindraceus*, *Gutierrezia microcephala*, *Lycium andersonii*, *Phoradendron californicum*, *Prunus fasciculata*, *Tamarix ramosissima*, *Viguiera parishii*, and *Yucca schidigera*.

The understory is typically species rich including a variety of wetland herbs such as *Juncus macrophyllus*, *Juncus mexicanus*, *Cynodon dactylon*, *Muhlenbergia rigens*, and *Typha domingensis*. Other commonly associated herbs include *Achnatherum speciosum*, *Aristida purpurea*, *Erodium cicutarium*, *Oenothera caespitosa*, *Polypogon monspeliensis*, *Schismus* spp., and *Sphaeralcea ambigua*. Trees that are sometimes present include *Prosopis glandulosa*. Nonvascular plants include moss and algae.

The association is found intermittently in Mojave National Preserve in California, sampled along mountain drainages of the Granite Mountains and Providence Mountains. It occurs along mid to upper elevations ranging from approximately 900 to 1,600 meters, and averaging 1,280 meters. It is found primarily in bed rock and boulder drainages and canyon bottoms with sandy stretches and boulder ravines interrupted by vertical bedrock waterfall with variable aspects on gentle to somewhat steep slopes (4 to 20 degrees). The majority of stands sampled had flowing water at the time of spring and summer sampling. Soils are primarily sandy alluvium, derived from a variety of substrates such as granodiorite, gneiss, shale, and schist.

This association is also found in mountain ravines within the Spring Mountains of Red Rock Canyon National Conservation Area, in Nevada. Additionally, it is found in mountain drainage channels and borders or tails of springs and seeps in both Anza-Borrego Desert State Park and Joshua Tree National Park in California, adjacent to stands of *Juncus mexicanus*, *Salix exigua*, and *Populus fremontii*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322A1

Park Sampling Zones: MOJA: Granite Mtns, Providence Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0):

DEVA (n=0):

MOJA (n=10): MOJA0428, MOJA0919, MOJA0925, MOJA9452, MOJA9590, MOJAE003, MOJAE008, MOJAE201, MOJAE203, MOJAE204

MOJN-Johnson (n=0):

References

Evens 2000, Evens et al. 2012, Keeler-Wolf et al. 1998, Keeler-Wolf and Thomas 2000

Baccharis sergiloides – Prunus fasciculata – Rhus trilobata Association

NVC Association Code: CEPP005842; **Alliance Code:** A3874

Association Concept

The *Baccharis sergiloides* – *Prunus fasciculata* – *Rhus trilobata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 19 to 39 percent cover. The emergent tree layer is sparse and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 2 to 22 percent cover. *Baccharis sergiloides* is co-dominant in the shrub canopy with characteristic shrubs *Prunus fasciculata* and *Rhus trilobata*. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Artemisia ludoviciana*, *Brickellia californica*, *Cylindropuntia acanthocarpa*, *Ericameria linearifolia*, *Eriogonum fasciculatum*, *Eriogonum wrightii*, *Gutierrezia microcephala*, *Lotus rigidus*, and *Yucca baccata*. Commonly associated herbs include *Bromus tectorum*, *Elymus elymoides*, *Erodium cicutarium*, and *Sphaeralcea ambigua*, and those trees sometimes to often present include *Pinus monophylla* and *Juniperus osteosperma*. Nonvascular plants include moss.

The association is uncommon in Mojave National Preserve in California, sampled within four mountain ranges at mid to upper elevations (ranging from approximately 1,200 to 1,500 meters with averaging 1,365 meters). It is found in spring-fed mountain drainages and canyon bottoms with sandy and bedrock stretches on variable aspects on gentle to somewhat steep slopes (2 to 16 degrees). Of the stands sampled, many had flowing water present at the time of spring and summer sampling. Soils are primarily sand derived from granodiorite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322A1

Park Sampling Zones: MOJA: Granite Mtns, Providence Mtns, Van Winkle Mtn, Woods Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=0):

DEVA (n=0):

MOJA (n=7): MOJA9413, MOJA9908, MOJAE196, MOJAE198, MOJAE237, MOJAE238, MOJAE239

MOJN-Johnson (n=0):

References

Evens 2000, Keeler-Wolf et al. 1998, Keeler-Wolf 2007

***Prosopis glandulosa* / *Pluchea sericea* Association**

NVC Association Code: CEPP006737; **Alliance Code:** A3877

Association Concept

The *Prosopis glandulosa* / *Pluchea sericea* Association forms an open to continuous tree canopy, in which tree cover ranges from 7 to 67 percent cover. The shrub layer is variable and ranges from 7 to 63 percent cover, and the herb understory is also variable and ranges from 0 to 51 percent cover.

Prosopis glandulosa is the dominant tree in the overstory, and *Pluchea sericea* is usually co-dominant to dominant in the shrub understory. Other shrubs may include *Atriplex* spp., *Baccharis sergiloides*, *Bebbia juncea*, *Ericameria* spp., *Suaeda moquinii*, and *Tamarix* spp. The herbaceous layer is variable and may include *Schoenoplectus americanus*, *Solidago* spp., and *Sporobolus airoides*.

The association is found often in Death Valley National Park, California, and rarely in Lake Mead National Recreation Area, Nevada. It also has been documented in Anza-Borrego Desert State Park (as the Mesquite-alkaline spring association). Its habitat includes spring-fed drainages, spring-fed marshes, lake-edge drawdown areas, and springs sites adjacent to mud hills and badlands where above and below ground water is perennially available. It is sampled at low elevations (ranging from approximately 0 to 600 meters, and averaging 187 meters) on eastern to southern aspects. Slopes range from gentle to somewhat steep (from 1 to 18 degrees). Soils are alkaline alluvium, derived primarily from granodiorite and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (16): 322Ab, 322Af, 322Ay

Park Sampling Zones: **DEVA:** Death Valley, Panamint Mtns; **LAKE:** Cottonwood Cove

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=16

LAKE (n=1): LAKE9316

DEVA (n=15): DEVA8075, DEVA8076, DEVA8077, DEVA8078, DEVA8079, DEVA8080, DEVA8081, DEVA8082, DEVA8083, DEVA8084, DEVA8085, DEVA8086, DEVA9916, DEVA8087, DEVAD037

MOJA (n=0): MOJN-Johnson (n=0):

References

None

Prosopis glandulosa / (Atriplex spp. – Suaeda moquinii) Association

NVC Association Code: CEG006861; **Alliance Code:** A3877

Association Concept

The *Prosopis glandulosa* / (*Atriplex* spp. – *Suaeda moquinii*) Association forms an open to continuous tree canopy, in which tree cover ranges from 4 to 70 percent cover. The shrub layer is variable and ranges from 2 to 67 percent cover, and the herb understory is also variable and ranges from 0 to 70 percent cover. *Prosopis glandulosa* is the dominant tree in the overstory, and *Atriplex* spp. and/or *Suaeda moquinii* is usually dominant or co-dominant in the shrub understory. Other commonly associated shrubs include *Larrea tridentata* and *Phoradendron californicum*.

The association is often found in Death Valley National Park, California, and rarely in Mojave National Preserve, California or Lake Mead National Recreation Area in Arizona and Nevada. It also has been documented in Anza-Borrego Desert State Park (as the Mesquite-alkaline association). Its habitats include edges of sand dunes and sand flats, edges of dry lakes, alkali sinks, and major wetland areas adjacent to low elevation washes. It is found at low to mid elevations on all slope positions and aspects. Sites have a high water table, where the *Prosopis* can tap into underground water resources. Soils are often aeolian sand or sandy alluvium, and soil texture is variable (e.g., sandy or clay loam to silty clay). Elevation ranges from approximately -88 to 1,274 meters, and elevation averages 361 meters. Slopes range from gentle to somewhat steep (0 to 21 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (12): 322Ab, 322Ac, 322Ai, 322Av, 322Az; Southeastern Great Basin (5): 341Fc

Park Sampling Zones: **DEVA:** Ballarat, Death Valley, Grapevine Mtns, Saline Valley; **LAKE:** Overton, Temple Bar; **MOJA:** Soda Lake South

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=16

LAKE (n=3): LAKE0415, LAKE0639, LAKE9643

DEVA (n=10): DEVA0519, DEVA9435, DEVA9621, DEVA9811, DEVA9813, DEVA9818, DEVA9916, DEVAD192, MOJC0040, MOJC0551, MOJC0733

MOJA (n=3): MOJA9193, MOJA9195, MOJA9646

MOJN-Johnson (n=0):

References

Evens et al. 2012, cf. Keeler-Wolf et al. 1998, Evens and Hartman 2007

Prosopis glandulosa – (Salix exigua, Salix lasiolepis) Association

NVC Association Code: CEPP006860; **Alliance Code:** A3877

Association Concept

The *Prosopis glandulosa* – (*Salix exigua* – *Salix lasiolepis*) Association forms an open to intermittent tree canopy, in which tree cover ranges from 5 to 50 percent cover. The shrub layer is variable and ranges from 18 to 50 percent cover, and the herb understory is also variable and ranges from 4 to 20 percent cover. *Prosopis glandulosa* is characteristically present in the tree overstory, which is usually co-dominant with *Salix exigua*, *Salix lasiolepis* or other *Salix* (willow) species. Other trees sometimes present include *Chilopsis linearis*. Commonly associated shrubs include *Acacia greggii* (= *Senegalia greggii*), *Baccharis sergiloides*, *Ephedra nevadensis*, and *Phoradendron californicum*, and commonly associated herbs include *Bromus rubens*, *Typha*, *Amsinckia*, *Aristida purpurea*, *Carex*, *Cynodon dactylon*, *Eleocharis*, *Polypogon monspeliensis*, and *Vulpia*.

The association is found rarely in Lake Mead National Recreation Area, in Arizona and Nevada, and in Mojave National Preserve, in California. It also has been observed in Death Valley National Park and documented in Anza-Borrego Desert State Park, in California. Its habitat is seasonally flooded riparian drainages typically within spring-fed canyons, at low to mid elevations with variable aspects. Elevation ranges from approximately 580 to 1,240 meters, and elevation averages 835 meters. Slopes are gentle to somewhat steep (from 2 to 25 degrees). Soils include clay loam and loamy sand, and are derived from a variety of substrates such as conglomerate, granite, and granodiorite.

Ecoregion Sections and Subsection Codes: Mojave Desert (3): 322Al, 322At, 322Av

Park Sampling Zones: LAKE: Gold Butte, Pearce Ferry; MOJA: Granite Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=2): LAKE9263, LAKE9534

DEVA (n=0):

MOJA (n=1): MOJA9453

MOJN-Johnson (n=0):

References

Keeler-Wolf et al. 1998

Prosopis glandulosa – Tamarix ramosissima Association

NVC Association Code: CEPP006736; **Alliance Code:** A3877

Association Concept

The *Prosopis glandulosa* – *Tamarix ramosissima* Association forms an open to intermittent tree canopy, in which tree cover ranges from 6 to 35 percent cover. The shrub layer is variable and ranges from 13 to 36 percent cover, and the herb understory is also variable and ranges from 1 to 42 percent cover. The dominant and/or characteristic tree is *Prosopis glandulosa*. Commonly associated shrubs include *Tamarix ramosissima*, *Acacia greggii* (= *Senegalia greggii*), and *Encelia farinosa*, and commonly associated herbs include *Bromus rubens* and *Schismus*.

The association is found uncommonly in Lake Mead National Recreation Area, in Arizona and Nevada. It is sampled at low elevations, along stream channels to spring-fed mid-slopes with northerly to easterly aspects. Elevation ranges from approximately 180 to 470 meters, and averages 330 meters. Slopes are gentle to moderate (ranging from 1 to 15 degrees). Soils include sandy loam, and are alluvium derived from various substrates such as alkali-granite (alaskite) and schist. Stands appear to exhibit disturbance from a variety of sources, including soil erosion, cattle grazing, and intermittent flooding.

Ecoregion Sections and Subsection Codes: Mojave Desert (5): 322Am, 322Av, 322Ay

Park Sampling Zones: LAKE: Cottonwood Cove, Katherine, Parashant, Temple Bar

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=5): LAKE9167, LAKE9256, LAKE9404, LAKE9435, LAKE9642

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

Prosopis pubescens / Baccharis sergiloides Association

NVC Association Code: CEPP006738; **Alliance Code:** A3877

Association Concept

The *Prosopis pubescens* / *Baccharis sergiloides* Association forms an open tree canopy, in which tree cover ranges from 6 to 28 percent cover. The shrub layer is variable and ranges from 10 to 78 percent cover, and the herb understory is also variable and ranges from 13 to 57 percent cover.

Prosopis pubescens is dominant or co-dominant in the tree overstory, while other trees often or sometimes present include *Prosopis glandulosa* or *Washingtonia filifera*. *Baccharis sergiloides* is dominant or co-dominant in the shrub layer, and other associated shrubs include *Acacia greggii* (= *Senegalia greggii*) and *Gutierrezia sarothrae*. Commonly associated herbs include *Bromus tectorum*, *Pectocarya recurvata*, *Plagiobothrys*, and *Schismus*.

The association is found uncommonly in Death Valley National Park, California, and Lake Mead National Recreation Area, Nevada. It is sampled at low to mid elevation spring-fed sites, including alkaline seeps and marshes at bottoms of slopes, where running and below-ground water is typically present. Elevation ranges from approximately 220 to 1,140 meters, and elevation averages 785 meters. Slopes are gentle (from 2 to 3 degrees). Soils include silt loam, and are alkaline alluvium derived from substrates such as alkali-granite (alaskite) and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (4): 322Ab, 322Ad, 322Am

Park Sampling Zones: **DEVA:** Death Valley, Funeral Mtns; **LAKE:** Katherine

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=2): LMJOS028, LMJOS029

DEVA (n=2): DEVA8020, DEVA9412

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

Prosopis pubescens / Pluchea sericea alkaline spring Association

NVC Association Code: CEPP006739; **Alliance Code:** A3877

Association Concept

The *Prosopis pubescens* / *Pluchea sericea* alkaline spring Association forms an open to intermittent tree canopy, in which tree cover ranges from 2 to 40 percent cover. The shrub layer is variable and ranges from 15 to 94 percent cover, and the herb understory is also variable and ranges from 0 to 84 percent cover. *Prosopis pubescens* is dominant in the tree overstory. *Pluchea sericea* is characteristically present and usually dominant or co-dominant with other wetland shrubs including *Allenrolfea occidentalis*, *Baccharis emoryi*, *Suaeda moquinii*, and *Vitis arizonica*. Commonly associated herbs include *Distichlis spicata* and *Phragmites australis*, and those herbs sometimes present include *Anemopsis californica*, *Cladium californicum*, *Eleocharis rostellata*, *Schoenoplectus americanus*, *Solidago spectabilis* var. *confinis* and *Sporobolus airoides*.

The association is often found in Lake Mead National Recreation Area, Nevada, and uncommonly in Death Valley National Park, California. It also has been documented in Anza-Borrego Desert State Park (as the Mesquite-alkaline spring association). Its habitat is spring-fed sites including bottom lands adjacent to mudhills and badlands, terraced slopes, and stream edges. It occurs at low to mid elevations (ranging from 300 to 750 meters, and averaging 502 meters). Slopes are gentle to moderate (ranging from 1 to 7 degrees). Soils include clay, clay loam, and silty clay, and are alkaline alluvium often derived from limestone and sandstone, in which alkaline/saline crusts are often visible.

Ecoregion Sections and Subsection Codes: Mojave Desert (17): 322Ab, 322Ad, 322Az; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Grapevine Mtns, Saline Valley; **LAKE:** Echo Bay

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=18

LAKE (n=13): LAKE9296, LAKE9501, LMJOS013, LMJOS014, LMJOS015, LMJOS016, LMJOS017, LMJOS019, LMJOS020, LMJOS021, LMJOS022, LMJOS024, LMJOS025

DEVA (n=5): DEVA9283, DEVA9564, DEVA9566, DEVA9567, DEVA9815

MOJA (n=0):

MOJN-Johnson (n=0):

References

cf. Keeler-Wolf et al. 1998

Salix exigua – Baccharis sergiloides Association

NVC Association Code: CEPP006753; **Alliance Code:** A0947

Association Concept

The *Salix exigua* – *Baccharis sergiloides* Association forms an open to dense shrub canopy, in which the shrub cover ranges from 17 to 94 percent cover. The emergent tree layer is sparse and ranges from 0 to 7 percent cover, and the herb understory is variable and ranges from 1 to 10 percent cover. *Salix exigua* is dominant in the shrub layer and *Baccharis sergiloides* is characteristically present as a sub- to co-dominant shrub. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Artemisia ludoviciana*, *Brickellia californica*, *Ephedra viridis*, *Ericameria linearifolia*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Lotus rigidus*, *Prunus fasciculata*, *Rhus trilobata*, *Stephanomeria pauciflora*, *Tamarix ramosissima*, *Viguiera parishii*, and *Yucca schidigera*. Commonly associated herbs include *Achnatherum speciosum*, *Cirsium neomexicanum*, *Dudleya pulverulenta*, *Epilobium* spp., *Erodium cicutarium*, *Euphorbia* spp., *Juncus macrophyllus*, *Juncus mexicanus*, *Melica frutescens*, *Mirabilis laevis*, *Muhlenbergia rigens*, *Oenothera caespitosa*, *Schismus* spp., *Sonchus oleraceus*, and *Sphaeralcea ambigua*. Those trees sometimes present include *Prosopis glandulosa* and *Pinus monophylla*. Nonvascular plants include moss.

The association is uncommon in both Death Valley National Park and Mojave National Preserve in California, sampled at lower to upper elevations ranging from approximately 500 to 1,500 meters and averaging 1,160 meters. It is found mostly in spring-fed mountain drainages and canyon bottoms on primarily southerly aspects with gentle to moderate slopes (2 to 14 degrees). Running water was present in a majority of the plots at the time sampled. Soils are primarily sandy alluvium, and they are derived from a variety of substrates such as granodiorite and limestone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Al; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: **DEVA:** Craig Canyon; **MOJA:** Granite Mtns, Van Winkle Mtn

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0): ; DEVA (n=1): MOJC1237

MOJA (n=5): MOJA0912, MOJAE009, MOJAE195, MOJAE199, MOJAE202; MOJN-Johnson (n=0):

References

Evens 2000, Keeler-Wolf and Thomas 2000

Vitis arizonica Association

NVC Association Code: CEPP009693; **Alliance Code:** A4162

Association Concept

The *Vitis arizonica* (provisional) Association forms a dense shrub canopy, in which the shrub cover ranges from 75 to 98 percent cover. The emergent tree layer is typically absent and the herb understory is variable and ranges from 12 to 44 percent cover. *Vitis arizonica* is dominant or co-dominant in the shrub canopy, and *Salix exigua* may be co-dominant in this layer. Other shrubs often to sometimes present include *Baccharis sergiloides*, *Acacia greggii* (= *Senegalia greggii*), *Pluchea sericea*, and *Viguiera parishii*. The herbaceous layer is variable including *Phragmites australis* as a dominant or co-dominant herb, and other commonly associated herbs include *Bromus tectorum*, *Marah macrocarpus*, and *Amsinckia tessellata*.

The association is found rarely in Lake Mead National Recreation Area in Nevada, where it was sampled along rocky, spring-fed riparian drainage channels in mountains at mid elevations such as at Grapevine Canyon in the Newberry Mountains. Elevation ranges from approximately 750 to 800 meters, and elevation averages 786 meters. Soils are primarily derived from granitoid parent material.

This association is also found uncommonly in riparian areas within Grand Canyon National Park and in other mountain ravines such as the Grapevine Spring area of the Spring Mountains within Red Rock Canyon National Conservation Area, in Nevada.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Am, (322Ar)

Park Sampling Zones: LAKE: Katherine

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=9

LAKE (n=9): LMJOS001, LMJOS003, LMJOS004, LMJOS005, LMJOS006, LMJOS007, LMJOS008, LMJOS009

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

NatureServe 2010

Vitis arizonica / Cladium californicum Association

NVC Association Code: CEPP006832; **Alliance Code:** A4162

Association Concept

The *Vitis arizonica* / *Cladium californicum* (provisional) Association forms an open to dense shrub canopy, in which the shrub cover ranges from 26 to 67 percent cover. The emergent tree layer is typically absent and the herb understory is variable and ranges from 26 to 40 percent cover. *Vitis arizonica* is the dominant shrub in the shrub canopy and *Allenrolfea occidentalis* is characteristic. Other shrubs often present include *Pluchea sericea* and *Suaeda moquinii*. *Cladium californicum* is the dominant herb and other commonly associated herbs include *Phragmites australis* and *Schismus* spp. Sometimes non-native herbs, such as *Arundo donax*, may be present and competing in the herb layer.

The association is found rarely in Lake Mead National Recreation Area in Nevada, where it was sampled along riparian channels at low to upper elevations in Echo Bay area, such as at Rogers Spring/Wash complex. Elevation ranges from approximately 450 to 1,600 meters, and elevation averages 695 meters. Soils are primarily derived from sandstone.

This association is also found in other mountain ravines such as the La Madre Spring area of the Spring Mountains within Red Rock Canyon National Conservation Area, in Nevada.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): (322Ar), 322Az

Park Sampling Zones: LAKE: Echo Bay

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=4): LMJOS010, LMJOS011, LMJOS012, LMJOS018

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

Vitis girdiana Association

NVC Association Code: CEPP006842; **Alliance Code:** A4162

Association Concept

The *Vitis girdiana* Association forms a dense shrub canopy, in which the shrub cover ranges from 67 to 99 percent cover. The emergent tree layer is sparse and the herb understory is variable and ranges from 0 to 7 percent cover. *Vitis girdiana* is the dominant to co-dominant shrub. Other shrubs sometimes to often present include *Atriplex canescens*, *Baccharis sergiloides*, *Clematis ligusticifolia*, *Ericameria nauseosa*, *Pluchea sericea*, and *Salix* spp. The herbaceous layer is variable and may include *Bromus rubens*, *Bromus tectorum*, *Eleocharis rostellata*, *Phragmites australis*, *Stanleya pinnata*, and *Schoenoplectus americanus*.

The association is uncommon in Death Valley National Park in California, where it was sampled at mid to upper elevation riparian canyon drainages of the Grapevine Mountains, Nelson Range, and Panamint Range. Elevation ranges from approximately 650 to 1,650 meters, and elevation averages 1,130 meters. Slope and aspect data are not available for the plots sampled. Soils are derived from a variety of substrates such as alluvium, granodiorite, rhyolite, and sandstone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ab, 322Af; Southeastern Great Basin (4): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Grapevine Mtns, Nelson Range, Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=6): DEVA8057, DEVA8058, DEVA8091, DEVA8092, DEVA8093, DEVA8094

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

2. Shrub & Herb Vegetation Class

2.C.5 Salt Marsh Formation

2.C.5.Nd North American Western Interior Brackish Marsh, Playa & Shrubland Division

M082. Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup

G537. North American Desert Alkaline-Saline Wet Scrub Group

Allenrolfea occidentalis Wet Shrubland Alliance

Allenrolfea occidentalis / *Distichlis spicata* Association

NVC Association Code: CEPP005788; **Alliance Code:** A0866

Association Concept

The *Allenrolfea occidentalis* / *Distichlis spicata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 3 to 42 percent cover. The emergent tree layer is absent, and the herb understory is open to intermittent and ranges from 5 to 26 percent cover.

Allenrolfea occidentalis is dominant in the shrub canopy while *Atriplex polycarpa* may be present at low cover. *Distichlis spicata* is usually dominant in the herb layer, and those herbs often present include *Amsinckia* spp., *Hordeum* spp. and *Juncus cooperi*.

The association is uncommon in Death Valley National Park in California, sampled at low elevation alkaline/saline playas and basins in Death Valley and below the Black Mountains. Elevation ranges from approximately 0 to 70 meters, and elevation averages 54 meters. Slope is typically flat or gentle, as stands are found along alkaline stream terraces, such as along the Amargosa River, and along salt flats and alkaline seeps such as at Saratoga Springs. Soils are derived primarily from alluvium, though fragments of volcanic and sandstone sediments may be present.

This association is also found in inland Great Valley of California in alkaline/saline flats and seeps. It also was found during map accuracy assessment field sampling at LAKE in the Overton Wash/Muddy River basin along with other alkaline-wet shrubland alliances.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ab, (322Az)

Park Sampling Zones: DEVA: Black Mtns, Death Valley; (LAKE: Overton)

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0):

DEVA (n=10): DEVA8063, DEVA8064, DEVA8065, DEVA8066, DEVA8067, DEVA8068, DEVA8069, DEVA8070, DEVA9812, MOJC0054

MOJA (n=0): ; MOJN-Johnson (n=0):

References

Bradley 1970, Buck-Diaz et al. 2012, Hickson and Keeler-Wolf 2007

Allenrolfea occidentalis – Suaeda moquinii Association

NVC Association Code: CEPP005787; **Alliance Code:** A0866

Association Concept

The *Allenrolfea occidentalis* – *Suaeda moquinii* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 15 to 40 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 8 percent cover. *Allenrolfea occidentalis* is dominant in the shrub canopy and *Suaeda moquinii* is characteristic. Another shrub often present is *Atriplex hymenelytra* and those trees sometimes present include *Prosopis glandulosa*. Herbs are variable and may include *Amsinckia* spp., *Bromus rubens*, and *Distichlis spicata*, among others.

The association is found rarely in Death Valley National Park in California, sampled at low to upper elevations along edges of playas and basins such as in Death Valley, Saline Valley, and Saratoga Springs. Elevation ranges from approximately 50 to 1,300 meters, and elevation averages 475 meters. It is found primarily on basin floors on gentle slopes (1 degree) on variable aspects. Soils are alkaline/saline and primarily derived from alluvium.

This association is also commonly found in the inland Great Valley of California, as well as other parts of the Mojave and Colorado/Sonoran Deserts in California. It is commonly found along playa edges and other alkaline/saline flats with high water tables and/or seeps.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Ab; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: DEVA: Death Valley, Saline Valley

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=2

LAKE (n=0): ; DEVA (n=2): DEVAD083, DEVAD189

MOJA (n=0): ; MOJN-Johnson (n=0):

References

Bradley 1970, Buck-Diaz et al. 2012, Hickson and Keeler-Wolf 2007, Keeler-Wolf and Thomas 2000

***Pluchea sericea* / *Phragmites australis* Association**

NVC Association Code: CEPP006734; **Alliance Code:** A0798

Association Concept

The *Pluchea sericea* / *Phragmites australis* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 16 to 65 percent cover. The emergent tree layer, if present, is sparse and ranges from 0 to 5 percent cover. The herb understory is open to continuous and ranges from 17 to 94 percent cover. *Pluchea sericea* is the dominant and characteristic shrub, and *Allenrolfea occidentalis* is sometimes present. *Phragmites australis* is strongly dominant in the herbaceous understory, and those herbs sometimes present include *Anemopsis californica* and *Distichlis spicata*.

The association is found in Lake Mead National Recreation Area in both Arizona and Nevada, and was sampled along alkali/saline washes and riparian areas that typically are spring-fed such as at Rogers Wash complex, Meadow Spring, Salt Springs Wash, and Spring Canyon/Burro Spring. Elevation is low, ranging from approximately 400 to 500 meters, and averaging 435 meters. It is found on variable slope positions on variable aspects, with slopes ranging from gentle to steep (2 to 28 degrees). Soils are typically alluvium that can include gypsum and other alkaline sediments, and they are derived from a variety of substrates such as granodiorite, dolostone, and limestone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Av, 322Az

Park Sampling Zones: LAKE: Echo Bay, Temple Bar

Classification Confidence: Low

Rarity Rank (Global, State-CA): GNR, SNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=10): LAKE9500, LAKE9640, LMFMH056, LMFMH057, LMFMH058, LMFMH060, LMFMH061, LMFMH062, LMFMH063, LMJOS023

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

***Suaeda moquinii* – *Atriplex canescens* Association**

NVC Association Code: CEPP006758; **Alliance Code:** A3880

Association Concept

The *Suaeda moquinii* – *Atriplex canescens* Association forms an open shrub canopy, in which the shrub cover ranges from 4 to 9 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 9 percent cover. *Atriplex canescens* and *Suaeda moquinii* are co-dominant shrubs.

The association is found rarely in Death Valley National Park in California, and was sampled at low to mid elevations in the Black Mountains, Death Valley, and Eureka Valley. It is found primarily in wetland basins, dune fields, and playa edges that have high water tables. Slopes are typically flat to gentle (ranging from 0 to 6 degrees). Elevation ranges from approximately 0 to 950 meters, and elevation averages 372 meters. Soils are derived from alluvium and aeolian dune sand, and they are typically alkaline/saline and may have salt crusts.

This association is also known from the Colorado/Sonoran Desert in California, found along sand dunes and playa edges that have high water tables and high alkali/salinity. It is often adjacent to stands of *Prosopis glandulosa* and *Allenrolfea occidentalis*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Ab; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Eureka Valley

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=0):

DEVA (n=4): DEVA9642, DEVAS180, MOJC0720, MOJC0722

MOJA (n=0):

MOJN-Johnson (n=0):

References

Evens and Hartman 2007, Keeler-Wolf and Thomas 2000

2. Shrub & Herb Vegetation Class

2.C.5 Salt Marsh Formation

2.C.5.Nd North American Western Interior Brackish Marsh, Playa & Shrubland Division

M082. Warm & Cool Desert Alkali-Saline Marsh, Playa & Shrubland Macrogroup

G538. North American Desert Alkaline-Saline Marsh & Playa Group

Anemopsis californica – *Helianthus nuttallii* – *Solidago spectabilis* Alkaline Wet Meadow Alliance

Solidago (spectabilis var. *confinis*, *spectabilis* var. *spectabilis*) Meadow Association

NVC Association Code: CEPP006757; **Alliance Code:** A4247

Association Concept

The *Solidago (spectabilis* var. *confinis*, *spectabilis* var. *spectabilis*) Association forms an open to continuous herb layer, in which the herbaceous cover ranges from 29 to 81 percent cover. The tree layer is typically absent, and the shrub layer is sparse and ranges from 0 to 0.5 percent cover. *Solidago confinis* or *Solidago spectabilis* is dominant or co-dominant in the herbaceous layer. Other commonly associated herbs include *Juncus mexicanus*. Shrubs that are sometimes present include *Pluchea sericea* and *Tamarix ramosissima*.

The association is found rarely in Death Valley National Park, California, around alkaline springs such as Little Sand, Blackjack and Surprise Spring at mid to low elevations (ranging approximately 550 to 950 meters, and averaging 732 meters). Soils are alluvial derived from sedimentary substrates, but has also been observed on conglomerate and rhyolite.

Stands of *Solidago spectabilis* var. *confinis* and/or *Solidago spectabilis* var. *spectabilis* occur in a fine-scale mosaic with other dominant herbaceous types (including those with *Anemopsis californica*, *Distichlis spicata*, *Eleocharis rostellata*, and *Juncus mexicanus*) in calcareous springs in alkaline spring/marsh settings. Another area in California where this and related alkali forb and graminoid vegetation occur includes the upper Owens River Valley such as at Fish Slough (VegCamp 2014).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Ab; Southeastern Great Basin (1): 341Fd

Park Sampling Zones: DEVA: Death Valley, Grapevine Mtns, Last Chance Villy

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=0):

DEVA (n=4): DEVA8047, DEVA8048, DEVA8049, DEVA8050

MOJA (n=0):

MOJN-Johnson (n=0):

References

VegCAMP 2014

Cladium californicum Seep Association

NVC Association Code: CEG009683; **Alliance Code:** A4164

Association Concept

The *Cladium californicum* Seep Association forms an intermittent to continuous herb layer, in which the herbaceous cover ranges from 85 to 97 percent cover. The shrub layer is open, and ranges from 0 to 6 percent cover, and the tree layer if present is sparse. *Cladium californicum* is dominant in the herb layer, and other herbs may include *Anemopsis californica*, *Cirsium neomexicanum*, *Distichlis spicata*, *Eleocharis rostellata*, *Juncus arcticus*, *Samolus valerandi* ssp. *parviflorus*, *Schoenoplectus americanus*, and *Solidago spectabilis*. Associated emergent shrubs include *Pluchea sericea*, *Allenrolfea occidentalis*, and *Vitis arizonica*.

The association is found rarely in Death Valley National Park (including Nevares Springs and Travertine Springs complexes) in California and in Lake Mead National Recreation Area (including Rogers Wash) in Nevada. Elevation ranges from approximately 220 to 440 meters, and averages 332 meters. This association occurs along low elevation margins of alkaline, calcareous spring-fed marshes and spring-fed washes. Soils are alluvium or derived from sandstone. Soils are poorly drained, intermittently saturated and alkaline.

Stands with *Cladium californicum* dominant or co-dominant typically associate with other species of low-lying, alkali-calcareous and wetland seeps or meadows. Stands are typically small and occur with other moisture loving associations, such as *Schoenoplectus americanus* marsh association. Sites have impacts from water extraction for human usage, and stands may have been larger in the past.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ab, 322Az

Park Sampling Zones: LAKE: Echo Bay; DEVA: Death Valley

Classification Confidence: Low

Rarity Rank (Global, State-CA): G4 S1

Surveys (with Sample Sizes) Used in Description

MOJN: N=2

LAKE (n=1): LMJOA033

DEVA (n=1): DEVA8051; MOJA (n=0); MOJN-Johnson (n=0)

References

NatureServe 2010

Juncus cooperi Association

NVC Association Code: CEPP006712; **Alliance Code:** A1332

Association Concept

The *Juncus cooperi* Association forms a continuous herb layer, in which the herbaceous cover ranges from 70 to 86 percent cover. The emergent tree layer is sparse, if present, and less than 2 percent cover, and the shrub layer is also sparse, if present and is less than 1 percent cover. *Juncus cooperi*, is either dominant or co-dominant with other herbs such as *Distichlis spicata* in the herbaceous layer. Other commonly associated herbs include *Typha* spp. Herbs that are sometimes present include *Anemopsis californica*, *Helianthus annuus*, *Juncus arcticus*, *Nicolletia occidentalis*, and *Phragmites australis*. Shrubs, if present, include *Atriplex hymenelytra*, *Isocoma acradenia*, and *Suaeda moquinii*. Trees sometimes present include *Washingtonia filifera*, which is non-native in stands where this association occurs.

The association is found uncommonly in Death Valley National Park and Mojave National Preserve in California, sampled at low elevation spring-fed marshes and playa edges. Elevation ranges from approximately 50 to 300 meters, and averages 137 meters. Slopes are flat to gentle (ranging from 0 to 1 degrees). This association occurs along margins of alkaline calcareous springs, moist meadows, marshes and ponds associated with playa edges. Aspects vary from east and south aspects. Soils are often silty clay, and they are derived from alluvium including from sandstone and felsic volcanic rock. Soils are poorly drained, intermittently saturated and alkaline.

Stands with *Juncus cooperi* dominant or co-dominant typically associate with other species of low-lying, alkali-calcareous, wetland seeps or meadows. Stands are typically small and form rings around other moisture loving associations, such as *Phragmites australis* or *Schoenoplectus americanus* marsh associations.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Ab, 322Ai

Park Sampling Zones: **DEVA:** Black Mtns, Death Valley; **MOJA:** Soda Lake

Classification Confidence: Low

Rarity Rank (Global, State-CA): GNR S1

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=0):

DEVA (n=2): DEVA8054, DEVA8055

MOJA (n=2): MOJA9550, MOJA9552; MOJN-Johnson (n=0):

References

Thomas et al. 2004

3. Desert & Semi-Desert Class

3.A.2 Warm Desert & Semi-Desert Scrub & Grassland Formation

3.A.2.Na North American Warm Desert Scrub & Grassland Division

M088. Mojave-Sonoran Semi-Desert Scrub Macrogroup

G295. Mojave-Sonoran Bajada & Valley Desert Scrub Group

Ambrosia dumosa Desert Dwarf Scrub Alliance

Ambrosia dumosa – *Ephedra torreyana*(– *Psoralea fremontii*) Association

NVC Association Code: CEPP005789; **Alliance Code:** A3279

Association Concept

The *Ambrosia dumosa* – *Ephedra torreyana*(– *Psoralea fremontii*) Association forms an open shrub canopy, in which the shrub cover ranges from 7 to 16 percent and averages 10 percent. The tree layer is absent, and the herb understory is variable ranging from 0 to 15 percent cover. *Ambrosia dumosa* is dominant in the shrub canopy, and *Ephedra torreyana* is characteristic along with *Krameria erecta*. Other shrubs often present include *Psoralea fremontii*, *Acacia greggii* (= *Senegalia greggii*), *Amphipappus fremontii*, and *Larrea tridentata*. Commonly associated herbs include *Bromus rubens*, *Pleuraphis rigida*, and *Schismus* spp. Nonvascular plants are often present including cryptogamic crust.

The association is found in Lake Mead National Recreation Area in Nevada, sampled at low to mid elevations in both Calville and Echo Bay areas. It is found primarily along alluvial fans and low level valleys, as well as on the flat tops of interfluvial ridges, with primarily gentle slopes (though with a range of 1 to 24 degrees), and on variable aspects. Elevation ranges from approximately 550 to 1,200 meters, and elevation averages 760 meters. Soils are typically alluvium derived from red sandstone often with gypsum sediment.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Az

Park Sampling Zones: LAKE: Callville, Echo Bay

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=7): LAKE0126, LAKE0322, LAKE0325, LAKE9186, LAKE9323, LAKE9324, LMJOA042

DEVA (n=0): ; MOJA (n=0): ; MOJN-Johnson (n=0):

References

None

***Encelia farinosa* – *Peucephyllum schottii* Association**

NVC Association Code: CEG005749; **Alliance Code:** A4215

Association Concept

The *Encelia farinosa* – *Peucephyllum schottii* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 1 to 35 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 14 percent cover. *Encelia farinosa* is dominant in the shrub canopy, and *Peucephyllum schottii* is characteristic along with *Larrea tridentata*.

The association is found in both Death Valley National Park in California and Lake Mead National Recreation Area in Arizona and Nevada, and was sampled along canyon walls, cliffs, erosional highlands, and exposed ridges. The association is found at low to mid elevations (ranging from approximately 400 to 950 meters, and averaging 641 meters). It is found primarily on mid- to high slope positions, with typically steep to abrupt slope (though ranging from 3 to 70 degrees), often on south to south-east aspects. Soil textures are variable, and soils are derived from a variety of substrates though often basalt, sandstone, dolostone/limestone, and sedimentary (gypsum).

This association is also found in the Colorado/Sonoran Desert in California, also found along steep xeric slopes to ridges often on nutrient poor calcareous or volcanic rock outcrops and cliffs.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (9): 322Ad, 322Af, 322Av, 322Ay, 322Az; Southeastern Great Basin (3): 341Fe, 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Funeral Mtns, Nelson Range, Owlshead Mtns, Panamint Mtns; **LAKE:** Boulder City, Callville, Cottonwood Cove, Temple Bar

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=4): LAKE9154, LAKE9226, LAKE9291, LAKE9441

DEVA (n=8): DEVA9282, DEVA9409, DEVA9411, DEVAD043, DEVAS072, MOJC0489, MOJC0576, MOJC0927

MOJA (n=0):

MOJN-Johnson (n=0):

References

Evens and Hartman 2007, Keeler-Wolf and Thomas 2000

***Larrea tridentata* (sparse post-burn / herbaceous) Association**

NVC Association Code: CEPP006724; **Alliance Code:** cf. A3278

Association Concept

The *Larrea tridentata* (sparse post-burn / herbaceous) Association forms an open shrub canopy, in which the shrub cover ranges from 1 to 8 percent cover and averages 3 percent. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 16 percent cover. *Larrea tridentata* is the characteristic and dominant shrub at low cover, and *Ambrosia dumosa*, *Ephedra* spp., and *Lycium andersonii* are often present at trace cover. Commonly associated herbs include *Amsinckia tessellata*, *Antheropeas* spp., *Chaenactis* spp., *Bromus rubens*, *Bromus tectorum*, *Eriogonum nidularium*, *Oxytheca perfoliata*, and *Salvia columbariae*.

The association is uncommon in Death Valley National Park in California and Nevada, and was sampled at mid to upper elevations in the Black Mountains, Greenwater Valley, and the Nevada Triangle. It is also present, but not sampled, in the Mojave National Preserve and Lake Mead National Recreation Area. Elevation ranges from approximately 850 to 1,300 meters with an elevation average of 1,140 meters. This association inhabits post-burn and disturbed areas, and there is often debris from dead *Larrea tridentata* present in the stand. It is found primarily on toeslopes and lower slopes, ranging from gentle to somewhat steep (1 to 24 degrees) with variable aspects. Soils are derived from a variety of substrates including alluvium and rhyolite.

This association occurs in post-burn settings in the Mojave Desert where shrubs are low in cover and have standing dead plants. Herbs are often higher in cover than the shrubs in these sites. Various herbs that respond favorably after fire include non-native *Bromus* spp. and native *Chaenactis* spp. and *Salvia columbariae*.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Ac, 322Ad (Others not sampled)

Park Sampling Zones: DEVA: Black Mtns, Green Water Rng/Vlly, Nevada Triangle

Classification Confidence: Low

Rarity Rank (Global, State-CA): GNR, SNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=0):

DEVA (n=7): DEVAS128, DEVAS129, DEVAS130, DEVAS137, DEVAS140, DEVAS142, DEVAS143

MOJA (n=0): ; MOJN-Johnson (n=0):

References

None

Larrea tridentata / Pleuraphis rigida Association

NVC Association Code: CEGJ005768; **Alliance Code:** cf. A3278

Association Concept

The *Larrea tridentata* / *Pleuraphis rigida* Association forms an open shrub canopy, in which the shrub cover ranges from 4 to 11 percent cover. The emergent tree layer is sparse, if present, and the herb understory is variable and ranges from 6 to 11 percent cover. *Larrea tridentata* is the dominant shrub, and *Ambrosia dumosa*, *Cylindropuntia echinocarpa*, *Cylindropuntia ramosissima*, *Hymenoclea salsola*, *Krameria* spp., and *Lycium* spp. are commonly associated shrubs. *Pleuraphis rigida* is the characteristic and dominant herb, and other commonly associated herbs include *Cryptantha* spp., *Dasyochloa pulchella*, *Erodium cicutarium*, *Lupinus* spp., *Muhlenbergia porteri*, and *Sphaeralcea ambigua*. *Yucca brevifolia* is sometimes present in the tree layer, and nonvascular plants include cryptogamic crust.

The association is found in the Ivanpah Valley and other areas of the Mojave National Preserve in California, and was sampled at mid to upper elevations of approximately 1,050 to 1,350 meters with an elevation average of 1,190 meters. It is found primarily on gentle sloping alluvium and (though ranging from 0 to 8 degrees) with variable aspects. Soils data is limited but includes loamy sands and sandy loams, and soils are alluvium.

This association is common in the central Mojave Desert south to the Sonoran Desert of California, where it is often on lower alluvial fans into valleys/basins that have fine-textured soils, with low cover of gravel and little/no rock cover. Sites may have been subjected to and impacted by past grazing and/or other disturbance (e.g., intermittent flooding) such as observed in the Ivanpah Valley.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ak

Park Sampling Zones: MOJA: Ivanpah Villy

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=13

LAKE (n=0):

DEVA (n=0):

MOJA (n=2): MOJA0203, MOJA9202

MOJN-Johnson (n=11): MOJJE532, MOJJE537, MOJJE541, MOJJE542, MOJJE547, MOJJE551, MOJJE554, MOJJE688, MOJJE737, MOJJE741, MOJJE742

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000

Larrea tridentata – Atriplex polycarpa Association

NVC Association Code: CEG005765; **Alliance Code:** cf. A3278

Association Concept

The *Larrea tridentata* – *Atriplex polycarpa* Association forms an open shrub canopy, in which the shrub cover ranges from 2 to 13 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 6 percent cover. *Atriplex polycarpa* and *Larrea tridentata* are co-dominant in the shrub canopy, and *Atriplex hymenelytra* is sometimes present at low cover. Herbs that are sometimes present include *Schismus* spp.

The association is in Death Valley National Park and Mojave National Preserve in California, and was sampled at low to mid elevations (ranging approximately 0 to 850 meters and averaging 500 meters). It is found primarily in low areas, drainages, toe-slopes and on slopes ranging from flat to somewhat steep (0 to 22 degrees) with variable aspects. Soils include sands and loam, and they are usually alluvium and dune sand derived from a variety of substrates.

This association is usually found in lower alluvial fans, small washes, and terraces adjacent to large washes, grading into basins and valleys that have at least slightly alkaline/saline soil and intermittent flooding. It is found sporadically across the Mojave Desert and into the southern Great Basin and Colorado/Sonoran Deserts of California.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322Ab, 322Ae, 322Ai, 322Ak; Southeastern Great Basin (3): 341Fc, 341Fe

Park Sampling Zones: **DEVA:** Death Valley, Last Chance Vly, Nelson Range, Panamint Dunes, Saline Valley; **MOJA:** Crucero Hill, Ivanpah Vly

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=9

LAKE (n=0):

DEVA (n=6): DEVA9624, DEVAS015, DEVAS027, DEVAS029, DEVAS032, DEVAS080

MOJA (n=3): MOJA0105, MOJA9553, MOJC0865

MOJN-Johnson (n=0):

References

Evens and Hartman 2007, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998

NVC Association Code: CEPP006722; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* / (*Oenothera deltoidea* – *Palafoxia arida* – *Plantago ovata*) Association forms an open shrub canopy, in which the shrub cover ranges from 11 to 18 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 4 to 13 percent cover. *Ambrosia dumosa* is the dominant to co-dominant with *Larrea tridentata* in the shrub canopy, and *Krameria erecta* is characteristic at trace cover. Other shrubs often present include *Opuntia basilaris* and *Psoralea argemone*. The herbaceous layer is quite species rich, including *Abronia villosa*, *Oenothera deltoidea*, *Palafoxia arida*, and *Plantago ovata*, and other commonly associated herbs include *Aliciella micromeria*, *Brassica tournefortii*, *Bromus rubens*, *Camissonia brevipes*, *Chaenactis fremontii*, *Chorizanthe brevicornu*, *Cryptantha angustifolia*, *Cryptantha micrantha*, *Cryptantha nevadensis*, *Cryptantha pterocarya*, *Dithyrea californica*, *Gilia* spp., *Langloisia setosissima*, *Lupinus shockleyi*, *Mentzelia albicaulis*, *Pectocarya heterocarpa*, *Pectocarya platycarpa*, *Phacelia crenulata*, *Rafinesquia neomexicana*, *Salsola* spp., *Schismus* spp., *Sphaeralcea ambigua*, and *Streptanthella longirostris*. Rare and uncommon plants can be found in this association such as *Astragalus geyeri* var. *triquetrus*, *Androstaphyllum breviflorum*, and *Astragalus sabulorum*.

The association is found in Lake Mead National Recreation Area in Nevada, and was sampled at low elevation sand dunes and sandy washes, such as along the shore of Lake Mead in the Calville – NPS area such as at Sandy Cove and Ebony Cove, and in the Moapa East – BLM area along Moapa Wash. Elevation ranges from approximately 350 to 550 meters, and elevation averages 421 meters. Slope and aspect are variable. Soils are aeolian sand.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ay, 322Az

Park Sampling Zones: LAKE: Callville, Moapa East

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=10): ASGEE1av, ASGEE2av, ASGES2av, ASGES3av, ASGES5av, ASGES6av, ASGES7av, ASGES8av, ASGEW1av, ASGEW2av

DEVA (n=0): ; MOJA (n=0): ; MOJN-Johnson (n=0):

References

None

Larrea tridentata – Ambrosia dumosa / Cryptogamic Crust Association

NVC Association Code: CEG005763; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* / *Cryptogamic Crust* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 14 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 2 to 6 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are co-dominant in the shrub canopy. Other shrubs often present include *Cylindropuntia ramosissima*. Commonly associated herbs include *Schismus* spp., and those sometimes present include *Allionia incarnata*, *Bromus rubens*, *Chorizanthe rigida*, *Eriogonum inflatum*, and *Oenothera deltoides*. Cryptogamic crust is the dominant non-vascular plant.

The association is found in Lake Mead National Recreation Area in Arizona, and Death Valley National Park and Mojave National Preserve in California, and was sampled along lower to upper bajadas at low to mid elevation. Elevation ranges from approximately 50 to 1,050 meters, and elevation averages 630 meters. It is found on bajadas and in valleys, as well as less commonly on ridge tops, with typically gentle slopes (ranging from 1 to 7 degrees) on variable aspects. Soils are also variable but are primarily derived from mixed alluvium, and desert pavement is often well-developed.

This association is found regularly in the Mojave Desert and also is found further south into the Colorado/Sonoran Desert region of California, often in extensive stands with well-developed desert pavement and cryptogamic crust.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (13): 322Ab, 322Ae, 322Af, 322Ai, 322Aj, 322Ak, 322Am

Park Sampling Zones: **DEVA:** Death Valley, Owlshead Mtns, Panamint Dunes; **LAKE:** Temple Bar; **MOJA:** Cima Dome NW, Cima Dome SE, Ivanpah Vly, Kelso Dunes, Kelso-Cima

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=13

LAKE (n=1): LAKE0249

DEVA (n=4): DEVA9192, MOJC0519, MOJC0767, MOJC0768

MOJA (n=8): MOJA9206, MOJA9606, MOJC0148, MOJC0149, MOJC0151, MOJC0223, MOJC0226, MOJC0228

MOJN-Johnson (n=0):

References

Evens and Hartman 2007

Larrea tridentata – Ambrosia dumosa / Pleuraphis rigida Association

NVC Association Code: CEG005764; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* / *Pleuraphis rigida* Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 18 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 26 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are dominant in the shrub canopy while *Pleuraphis rigida* is the dominant herb in the understory.

The association is found commonly in the Mojave National Preserve in California and also in Lake Mead National Recreation Area in Arizona and Nevada, and was sampled along bajadas and valley floors that intergrade into sand dune fields. It is found at low to upper elevation (ranging from approximately 200 to 1,250 meters, and averaging 850 meters). It is found on variable slope positions, with a flat to steep slope (0 to 28 degrees), on variable aspects. Soil textures include sand and sandy loam, and soils are typically mixed alluvium and aeolian dune sand, derived from a variety of substrates such as gneiss, granodiorite, rhyolite, sand, sandstone, and schist.

This association is found across the Colorado/Sonoran Desert of California as well as the Mojave Desert in California, Arizona and Nevada. Sites include sandy washes interrupting larger bajada features and sandy lower bajadas with younger soils, which are transitional to stabilized to more active sand dunes with *Pleuraphis rigida* grassland and related dune vegetation.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (26): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Av, 322Az

Park Sampling Zones: **LAKE:** Callville, Katherine, Searchlight SE, Temple Bar, Valley of Fire East; **MOJA:** Baker-Halloran, Clipper Vly, Devil's Playground, Ivanpah Mtns, Ivanpah Vly, Kelso Dunes, Nipton, Old Dad Mtns, Piute Range

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=47

LAKE (n=12): LAKE0292, LAKE9108, LAKE9160, LAKE9326, LAKE9354, LAKE9634, LAMEN004, LAMEN032, LAMEN034, LAMEN035, LAMEN082, LAMEN083

DEVA (n=0):

MOJA (n=14): MOJA0192, MOJA0300, MOJA9209, MOJA9305, MOJA9524, MOJA9620, MOJA9659, MOJA9661, MOJA9663, MOJC0231, MOJC0342, MOJC0345, MOJC0737, MOJC1219

MOJN-Johnson (n=21): MOJJE143, MOJJE201, MOJJE317, MOJJE322, MOJJE363, MOJJE502, MOJJE508, MOJJE522, MOJJE525, MOJJE640, MOJJE659, MOJJE660, MOJJE661, MOJJE662, MOJJE672, MOJJE720, MOJJE733, MOJJE747, MOJJE751, MOJJE89a, MOJJE96a

References

Evens and Hartman 2007, Keeler-Wolf et al. 2005, Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – (Echinocactus polycephalus – Opuntia basilaris) Association

NVC Association Code: CEPP006718; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – (*Echinocactus polycephalus* – *Opuntia basilaris*) Association forms an open shrub canopy, in which the shrub cover ranges from 2 to 17 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 20 percent cover. *Larrea tridentata* is co-dominant in the shrub canopy with *Ambrosia dumosa* along with other characteristic shrubs *Cylindropuntia echinocarpa*, *Echinocactus polycephalus*, and *Opuntia basilaris*. Commonly associated herbs include *Chaenactis carphoclinia*, *Eriogonum inflatum*, *Eriogonum* spp., and *Pectocarya recurvata*. Nonvascular plants include cryptogamic crust. The cacti may be as abundant as the *Larrea tridentata* and *Ambrosia dumosa* often signifying rocky and gravelly bajadas that are adjacent to mountain ranges, often the older portions of bajadas that may be dissected by episodic washes.

The association is intermittently in the Mojave Desert in both Death Valley National Park and Mojave National Preserve in California. It was sampled along lower to upper bajadas from the Cottonwood Mountains, Last Chance Range, and Kelso Mountains. It is found at low to upper elevations (ranging from approximately 350 to 1,350 meters, and averaging 960 meters). It is found on variable slope positions, with gentle to somewhat steep slopes (3 to 24 degrees), on variable aspects. Soils include fine-textured clay and sandy loams as well as loamy sand, and they are derived from a variety of substrates such as alluvium and sandstone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Aj; Southeastern Great Basin (4): 341Fc

Park Sampling Zones: **DEVA:** Cottonwood Mtns, Last Chance Range; **MOJA:** Kelso Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=4): DEVA0902, DEVA9556, DEVA9808, DEVAS033

MOJA (n=1): MOJC0296; MOJN-Johnson (n=1): MOJJE252

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – (Ephedra nevadensis – Lycium andersonii) Association

NVC Association Code: CEG005755; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – (*Ephedra nevadensis* – *Lycium andersonii*) Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 6 to 35 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 35 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are the dominant shrubs, and *Lycium andersonii* is characteristic. Commonly associated herbs include *Bromus rubens*, *Eriogonum inflatum*, and *Xylorhiza tortifolia*.

The association is common in Death Valley National Park and Mojave National Preserve in California and Lake Mead National Recreation Area in Arizona and Nevada, and was sampled along lower to upper bajadas and higher elevation valley floors. It is found at low to upper elevations, ranging from approximately 500 to 1,500 meters and averaging of 1,035 meters. It is found at all slope positions and on all aspects, with slopes ranging from flat to steep (0 to 40 degrees). Soil textures are variable, and soils are derived from a variety of substrates such as alkali-granite (alaskite), alluvium, basalt, conglomerate, granodiorite, limestone, rhyolite, sandstone, and tephrite (basanite).

This association is common across the Mojave Desert and southeastern Great Basin in California, Arizona, and Nevada. It occurs in a transition between creosote bush – white bursage alliance and mid-elevation desert scrub alliances such as *Yucca schidigera* scrub. Sites can include bajadas with regularly flooded undulating wash features, lower mountains and hillslopes with colluvial rock-fall, and plateau-like lava fields with cinder cones. Also, livestock grazing has been noted in some stands of this association.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (32): 322Ab, 322Ac, 322Ad, 322Af, 322Ai, 322Aj, 322Am, 322Av; Southeastern Great Basin (5): 341Fc, 341Fe, 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Funeral Mtns, Green Water Rng/Vlly, Last Chance Range, Last Chance Villy, Nelson Range, Nevada Triangle, Panamint Mtns; **LAKE:** Bridge Canyon, Katherine, Temple Bar; **MOJA:** Baker-Halloran, Cima Dome NW, Cinder Cones, Granite Mtns, Old Dad Mtns

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=87

LAKE (n=5): LAKE9151, LAKE9251, LAMEN052, LAMEN053, LAMEN104

DEVA (n=22): DEVA0209, DEVA0598, DEVA9202, DEVA9308, DEVA9313, DEVA9314, DEVA9344, DEVA9405, DEVA9524, DEVA9922, DEVAS036, DEVAS053, DEVAS089,

DEVAS132, DEVAS160, DEVAS162, MOJC0416, MOJC0957, MOJC0991, MOJC0993,
MOJC1035, MOJC1036

MOJA (n=11): MOJA0375, MOJA0517, MOJA9167, MOJA9377, MOJA9513, MOJA9557,
MOJA9922, MOJC0815, MOJC0816, MOJC0817, MOJC1119

MOJN-Johnson (n=49): MOJJE024, MOJJE028, MOJJE041, MOJJE049, MOJJE051, MOJJE054,
MOJJE058, MOJJE059, MOJJE064, MOJJE065, MOJJE066, MOJJE072, MOJJE147, MOJJE163,
MOJJE178, MOJJE187, MOJJE190, MOJJE209, MOJJE222, MOJJE227, MOJJE276, MOJJE285,
MOJJE296, MOJJE320, MOJJE326, MOJJE350, MOJJE373, MOJJE374, MOJJE375, MOJJE381,
MOJJE389, MOJJE399, MOJJE410, MOJJE593, MOJJE610, MOJJE612, MOJJE613, MOJJE664,
MOJJE676, MOJJE718, MOJJE734, MOJJE748, MOJJE766, MOJJE817, MOJJE818, MOJJE913,
MOJJE915, MOJJE933, MOJJE934

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Amphipappus fremontii Association

NVC Association Code: CEG005756; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Amphipappus fremontii* Association forms an open shrub canopy, in which the shrub cover ranges from 7 to 28 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 21 percent cover. *Ambrosia dumosa* is co-dominant in the shrub canopy with the characteristic shrubs *Amphipappus fremontii* and *Larrea tridentata*. Other shrubs often present include *Echinocactus polycephalus*, *Encelia farinosa*, and *Opuntia basilaris*. Commonly associated herbs include *Cryptantha* spp. and nonvascular plants include cryptogamic crust.

The association is found in Death Valley National Park and Mojave National Preserve in California and Lake Mead National Recreation Area in Arizona and Nevada, and was sampled along erosional highlands to low ridges at low to upper elevations, which range from approximately 450 to 1,300 meters, and average of 916 meters. It is found on slopes ranging from gentle to steep (2 to 29 degrees) and on variable aspects though northwest to northeast (cooler slopes) are most common. Soils include sandy and clay loams as well as loamy sand, and they are derived from a variety of substrates such as alluvium, andesite, basalt, gneiss, limestone, and sandstone.

This association is common in the Mojave Desert ecoregion in cooler-facing alluvial fans and hill slopes to ridges, which can be dissected by washes, and that transition to mid-elevation mixed desert scrub plant alliances.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (9): 322Ad, 322Ae, 322Af, 322Al, 322Am, 322Az; Southeastern Great Basin (7): 341Fc, 341Fd, 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Eureka Valley, Funeral Mtns, Grapevine Mtns, Last Chance Range, Panamint Mtns; **LAKE:** Boulder City, Temple Bar; **MOJA:** Goffs

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=18

LAKE (n=4): LAKE9174, LAKE9330, LAKE9333, LAKE9346

DEVA (n=11): DEVA0300, DEVA9159, DEVA9226, DEVA9279, DEVA9307, DEVA9636, DEVAS159, DEVAS166, MOJC0573, MOJC0616, MOJC0617

MOJA (n=1): MOJC0114

MOJN-Johnson (n=2): MOJJE592, MOJJE931

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Atriplex confertifolia Association

NVC Association Code: CEG005757; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Atriplex confertifolia* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 30 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 19 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are co-dominant shrubs, and *Atriplex confertifolia* is characteristic and also can be co-dominant. Other shrubs often present include *Echinocactus polycephalus* and *Opuntia basilaris*. Commonly associated herbs include *Eriogonum inflatum* and *Xylorhiza tortifolia*.

The association is found extensively in Death Valley National Park in California, and was sampled at mid to upper elevations throughout the park on upper bajadas to lower hills and mountains that are erosional highlands. Elevation ranges from approximately 700 to 1,750 meters, and elevation averages 1,125 meters. It is found on variable slope positions with slopes ranging from gentle to steep (1 to 40 degrees) and on variable aspects though southeast to southwest and west (warmer-facing slopes) are most common. Soil textures include clay, silt, and sandy loams, as well as sands and silty clay, and soils are derived from a variety of substrates, but primarily alluvium, conglomerate, sandstone, and dolostone that often have calcareous and/or volcanic material.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Ab, 322Ad, 322Af; Southeastern Great Basin (24): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Cottonwood Mtns, Death Valley, Eureka Valley, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Last Chance Vlly, Panamint Mtns

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=46

LAKE (n=0):

DEVA (n=45): DEVA0666, DEVA9120, DEVA9310, DEVA9338, DEVA9359, DEVA9419, DEVA9452, DEVA9511, DEVA9640, DEVA9647, DEVAD002, DEVAD010, DEVAD019, DEVAD031, DEVAD032, DEVAD063, DEVAD067, DEVAD222, DEVAS062, DEVAS066, DEVAS069, DEVAS123, MOJC0172, MOJC0362, MOJC0376, MOJC0417, MOJC0456, MOJC0457, MOJC0544, MOJC0545, MOJC0546, MOJC0558, MOJC0570, MOJC0614, MOJC0615, MOJC0642, MOJC0647, MOJC0653, MOJC0656, MOJC0687, MOJC0688, MOJC0710, MOJC0960, MOJC1042, MOJC1104

MOJA (n=0):

MOJN-Johnson (n=1): MOJJE614

References

Annable 1985, Keeler-Wolf and Thomas 2000, cf. NatureServe 2015, Peterson 1984

Larrea tridentata – Ambrosia dumosa – Atriplex hymenelytra Association

NVC Association Code: CEG005758; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Atriplex hymenelytra* Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 23 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 16 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are co-dominant in the shrub canopy, and *Atriplex hymenelytra* characteristically occurs. Commonly associated herbs include *Eriogonum inflatum*.

The association is found often in Death Valley National Park in California and also in Lake Mead National Recreation Area in Arizona and Nevada, and was sampled at low to mid elevation bajadas to exposed, lower slopes and hills that are often gravelly and cobbly. Elevation ranges from approximately 100 to 1,050 meters, and elevation averages 640 meters. It is found on variable slope positions with slopes ranging from gentle to steep (1 to 40 degrees), and on variable aspects though south to west (warmer-facing slopes) are most common. Soils are variable and are derived from a variety of substrates such as alluvium, conglomerate, gravel, plutonic rock (phaneritic), and sandstone.

This association is found in eastern Anza-Borrego Desert State Park and other areas of the Colorado/Sonoran Desert region as well as the Mojave Desert of California on steep conglomerate, eroding older alluvial fans, and eroding rocky highlands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Ab, 322Ad, 322Ae, 322Af, 322Am, 322Ar; Southeastern Great Basin (2): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Cottonwood Mtns, Death Valley, Devil's Hole, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Last Chance Range, Last Chance Vlly, Owlshead Mtns, Panamint Dunes; **LAKE:** Temple Bar

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=25

LAKE (n=1): LAKE9131

DEVA (n=22): DEVA9181, DEVA9271, DEVA9334, DEVA9364, DEVA9367, DEVA9536, DEVA9622, DEVA9963, DEVAD008, DEVAD017, DEVAD095, DEVAD096, DEVAD165, DEVAS102, MOJC0537, MOJC0538, MOJC0539, MOJC0572, MOJC0578, MOJC0629, MOJC0646, MOJC0873

MOJA (n=0):

MOJN-Johnson (n=2): MOJJE282, MOJJE827

References

Keeler-Wolf et al. 1998

Larrea tridentata – Ambrosia dumosa – Cyllindropuntia (acanthocarpa, ramosissima) Association

NVC Association Code: CEPP006719; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Cyllindropuntia (acanthocarpa, ramosissima)* Association forms an open to intermittent shrub canopy. The emergent tree layer is not typically present, and the herb understory is usually sparse to open in cover. *Larrea tridentata* and *Ambrosia dumosa* are co-dominant in the shrub canopy, and *Cyllindropuntia acanthocarpa* and/or *Cyllindropuntia ramosissima* are characteristic and often co-dominant with the nominate species. Other shrubs often present include *Echinocereus engelmannii*, *Krameria erecta*, *Thamnosma montana*, and *Salazaria mexicana*. Commonly associated herbs include *Pleuraphis rigida* and *Xylorhiza tortifolia*.

The association is found across the Mojave Desert and southeastern Great Basin, along gravelly to cobbly upper bajadas near bouldery mountain slopes that transition to mid-elevation mixed scrub associations with *Eriogonum fasciculatum* and *Yucca schidigera*. It was sampled at low to mid elevations ranging from approximately 240 to 1,100 meters, with an elevation averages 735 meters. It is found on variable aspects on slopes ranging from gentle to somewhat steep (1 to 17 degrees). Sites may endure grazing from livestock, where the spiny cacti often increase in cover at the expense of other shrubs.

Ecoregion Section Names (Sample Size) and Subsection Codes: (not able to derive from survey data)

Park Sampling Zones: MOJA: Various

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=16

LAKE (n=0):

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=16): MOJJE142, MOJJE169, MOJJE254, MOJJE280, MOJJE299, MOJJE318, MOJJE349, MOJJE357, MOJJE499, MOJJE520, MOJJE521, MOJJE579, MOJJE591, MOJJE595, MOJJE771, MOJJE909

References

cf. Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Ephedra funerea Association

NVC Association Code: CEG005759; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Ephedra funerea* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 42 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 11 percent cover. *Larrea tridentata* and *Ambrosia dumosa* are co-dominant in the shrub canopy, and *Ephedra funerea* is characteristic and often co-dominant. Other shrubs often present include *Echinocactus polycephalus* and *Stephanomeria pauciflora*. *Eriogonum inflatum* is characteristic of the herbaceous understory and *Bromus rubens* is often present.

The association is common in Death Valley National Park, in California and Nevada, and is less common in the Mojave National Preserve, in California, often along bases of mountains and lower slopes. It was sampled at mid to upper elevations (ranging from approximately 600 to 1,650 meters and averaging 1,000 meters). It is found on variable slope positions with gentle to steep slopes (1 to 34 degrees) and often on south to west-facing aspects. Soils are also variable and they are typically alluvium derived from nutrient-poor substrates such as limestone, rhyolite, and sandstone/dolostone.

This association occurs from the central Mojave Desert to the southeastern Great Basin Desert.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (19): 322Ab, 322Ac, 322Ad, 322Af, 322Aj, 322Ar; Southeastern Great Basin (1): 341Fd

Park Sampling Zones: **DEVA:** Black Mtns, Devil's Hole, East of Deadman Pass, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Last Chance Range, Owlshead Mtns; **MOJA:** Old Dad Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=25

LAKE (n=0):

DEVA (n=20): DEVA9526, DEVA9964, DEVAD001, DEVAD054, DEVAD182, DEVAS035, DEVAS087, DEVAS097, DEVAS109, DEVAS113, DEVAS117, MOJC0414, MOJC0415, MOJC0421, MOJC0500, MOJC0501, MOJC0685, MOJC0686, MOJC1037, MOJC1038

MOJA (n=1): MOJC0255

MOJN-Johnson (n=4): MOJJE269, MOJJE283, MOJJE284, MOJJE395

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Eriogonum fasciculatum Association

NVC Association Code: CEG005760; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Eriogonum fasciculatum* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 21 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 7 percent cover. *Larrea tridentata* is co-dominant in the shrub canopy occurring along with characteristic shrubs *Ambrosia dumosa* and *Eriogonum fasciculatum*. Other shrubs often present include *Krameria erecta*, *Viguiera parishii*, and *Yucca schidigera*, and commonly associated herbs include *Porophyllum gracile*.

The association is found in Lake Mead National Recreation Area in Arizona and Nevada, and is also found in Death Valley National Park and Mojave National Preserve in California. This association was sampled at mid to upper elevations with ranges from approximately 700 to 1,350 meters, and an elevation average of 890 meters. It is found primarily on mid- to high slope positions with gentle to steep slopes (1 to 38 degrees) and on variable aspects. Soils include loams and sands, and are usually derived from igneous substrates such as alkali-granite (alaskite), granite, and granodiorite, and sometimes from basalt or rhyolite.

This association occurs from the central Mojave Desert to the southeastern Great Basin Desert in lower to middle slopes of mountains to ridges in which rock outcrops are common, and this association transitions to mid-elevation mixed desert scrub (including *Coleogyne ramosissima* and *Yucca schidigera*) alliances.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (23): 322Ab, 322Ak, 322Al, 322Am, 322Av, 322Az; Southeastern Great Basin (1): 341Fd

Park Sampling Zones: **DEVA:** Grapevine Mtns, Last Chance Vly; **LAKE:** Boulder City, Bridge Canyon, Juniper Mine, Katherine, Searchlight SE, Willow Beach; **MOJA:** Clipper Vly, Ivanpah Mtns, West of Juniper Mine

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=31

LAKE (n=17): LAKE0114, LAKE0445, LAKE9113, LAKE9306, LAKE9395, LAMEN014, LAMEN018, LAMEN039, LAMEN048, LAMEN065, LAMEN068, LAMEN069, LAMEN071, LAMEN072, LAMEN076, LAMEN080, LAMEN086

DEVA (n=2): DEVA9629, DEVA9644

MOJA (n=5): MOJA0101, MOJC0229, MOJC0240, MOJC0241, MOJC0243

MOJN-Johnson (n=7): MOJJE158, MOJJE211, MOJJE229, MOJJE232, MOJJE235, MOJJE728, MOJJE903

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Hymenoclea salsola Association

NVC Association Code: CEG005761; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Hymenoclea salsola* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 6 to 35 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 26 percent cover.

Ambrosia dumosa and *Larrea tridentata* are the dominant shrubs, and *Hymenoclea salsola* is characteristic. Herbs in the understory include *Amsinckia tessellata*, *Eriogonum inflatum*, *Chaenactis* spp., and *Cryptantha* spp., and *Schismus* spp.

The association is found in Death Valley National Park and Mojave National Preserve in California, and in Lake Mead National Recreation Area in Nevada, and was sampled at low to upper elevations. Elevation ranges from approximately 100 to 1,250 meters with an elevation average of 810 meters. It is found on variable slope positions on variable aspects, and slopes range from gentle to moderate (1 to 14 degrees). Soils include primarily sands and sandy loams, and they are derived from a variety of substrates such as alluvium, rhyolite, and sandstone.

This association occurs across the Mojave Desert into the southern Great Basin and into the Colorado/Sonoran Desert of California within dissected bajadas, along minor episodic washes, and wash edges, and along disturbed roadsides.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (17): 322Ab, 322Ac, 322Ad, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am; Southeastern Great Basin (2): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Death Valley, Eureka Valley, Last Chance Range, Owlshead Mtns, West of Eagle Mountain; **LAKE:** Searchlight SE; **MOJA:** Devil's Playground, Kelso Dunes, Kelso-Cima, Turquoise Mountain, Van Winkle Mtn

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=45

LAKE (n=1): LAMEN033

DEVA (n=12): DEVA0285, DEVA9186, DEVA9623, DEVA9631, DEVA9643, DEVAD091, DEVAS118, MOJC0507, MOJC0769, MOJC1013, MOJC1015, MOJC1056

MOJA (n=6): MOJA9650, MOJA9920, MOJC0130, MOJC0222, MOJC0227, MOJC0800

MOJN-Johnson (n=26): MOJJE000, MOJJE036, MOJJE055, MOJJE076, MOJJE124, MOJJE168, MOJJE213, MOJJE236, MOJJE253, MOJJE275, MOJJE305, MOJJE328, MOJJE336, MOJJE361, MOJJE382, MOJJE504, MOJJE513, MOJJE528, MOJJE565, MOJJE583, MOJJE641, MOJJE803, MOJJE804, MOJJE805, MOJJE84b, MOJJE911

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Psoralea (arborescens, fremontii) Association

NVC Association Code: CEPP006720; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Psoralea (arborescens, fremontii)* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 6 to 39 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 0 to 21 percent cover. *Larrea tridentata* is co-dominant in the shrub canopy, and *Ambrosia dumosa* is characteristic and often co-dominant as well. *Psoralea arborescens* or *Psoralea fremontii* is also characteristically present, and may be co-dominant with the other indicators of the association. *Opuntia basilaris* is sometimes present at trace cover. Commonly associated herbs include *Eriogonum inflatum*, *Chaenactis* spp., and *Cryptantha* spp.

The association is common throughout Death Valley National Park, in California, and is also found in Lake Mead National Recreation Area, in Arizona and Nevada. The association was sampled at low to upper elevations of approximately 350 to 1,550 meters with an elevation average of 970 meters. It is found on variable slope positions with gentle to somewhat steep slopes (1 to 26 degrees) and on variable aspects. Soils are variable as well and are derived from a variety of substrates, though primarily alluvium with sediments of igneous and sedimentary rocks.

This association is common within the central and northern Mojave Desert and southern Great Basin along dissected bajadas, episodic washes, canyon mouths, and lower mountain slopes dissected by washes, which typically have gravelly and cobbly alluvium.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (23): 322Ab, 322Ac, 322Ad, 322Ae, 322Af, 322Am, 322Av, 322Ay; Southeastern Great Basin (26): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Cottonwood Mtns, Death Valley, East of Deadman Pass, Eureka Valley, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Owlshead Mtns, Panamint Dunes, Panamint Mtns, Saline Valley; **LAKE:** Government Wash, Temple Bar, Willow Beach

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=51

LAKE (n=5): LAKE0189, LAKE0312, LAKE0635, LAKE9147, LAKE9362

DEVA (n=44): DEVA0559, DEVA9105, DEVA9124, DEVA9172, DEVA9358, DEVA9539, DEVA9606, DEVA9819, DEVA9909, DEVAD078, DEVAD176, DEVAS028, DEVAS031, DEVAS045, DEVAS056, DEVAS067, DEVAS077, DEVAS101, DEVAS104, DEVAS105, DEVAS114, DEVAS125, DEVAS155, MOJC0373, MOJC0377, MOJC0418, MOJC0498, MOJC0547, MOJC0548, MOJC0549, MOJC0550, MOJC0579, MOJC0580, MOJC0620,

MOJC0621, MOJC0622, MOJC0623, MOJC0624, MOJC0625, MOJC0651, MOJC0652,
MOJC0959, MOJC0961, MOJC1016
MOJA (n=0): ; MOJN-Johnson (n=2): MOJJE210, MOJJE816

References

cf. Keeler-Wolf and Thomas 2000

Larrea tridentata – Ambrosia dumosa – Senna armata Association

NVC Association Code: CEPP006721; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Senna armata* Association forms an open to intermittent shrub canopy. The emergent tree layer, if present, is sparse r, and the herb understory is variable. *Larrea tridentata* and *Ambrosia dumosa* are co-dominant in the shrub layer with *Senna armata*. Other shrubs often present include *Eriogonum fasciculatum*, *Hymenoclea salsola*, *Krameria* spp., *Salazaria mexicana*, and *Thamnosma montana*. Commonly associated herbs include *Pleuraphis rigida*.

The association is found in Death Valley National Park in California, where it was sampled upper bajadas underlain by pediment or in washes, at mid elevations which range in elevation from approximately 700 to 1,100 meters, and average 981 meters. It is found usually on gentle aspects (though the range is 2 to 10 degrees).

This association is found across the Mojave Desert south to the Colorado/Sonoran Desert area of California. It is a wash margin or upper bajada/fan association that is typically found in positions slightly higher up the fan and along less frequently flooded washes and channels that are concave, undulating, or hummocky or swaley in topography.

Ecoregion Section Names (Sample Size) and Subsection Codes: (not able to derive from survey data)

Park Sampling Zones: MOJA: Various

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0): ; DEVA (n=0): ; MOJA (n=0):

MOJN-Johnson (n=10): MOJJE108, MOJJE111, MOJJE112, MOJJE127, MOJJE128, MOJJE132, MOJJE145, MOJJE161, MOJJE216, MOJJE337

References

Evens and Hartman 2007, Evens et al. 2012

Larrea tridentata – Ambrosia dumosa – Yucca schidigera Association

NVC Association Code: CEG005762; **Alliance Code:** A3277

Association Concept

The *Larrea tridentata* – *Ambrosia dumosa* – *Yucca schidigera* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 33 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 1 to 84 percent cover. *Ambrosia dumosa* and *Larrea tridentata* are the co-dominant shrubs and *Yucca schidigera* is characteristic. *Ferocactus cylindraceus* and *Krameria erecta* are also characteristic at lower cover. Other shrubs often present include *Cylindropuntia acanthocarpa*, *Cylindropuntia ramosissima*, *Echinocereus engelmannii*, *Ephedra nevadensis*, and *Opuntia basilaris*. Commonly associated herbs include *Bromus rubens*, *Eriogonum inflatum*, *Erodium cicutarium*, and *Schismus* spp.

The association is found in Lake Mead National Recreation Area, in Arizona and Nevada, and throughout the Mojave National Preserve, in California. It was sampled at mid elevations ranging from approximately 600 to 1,200 meters with an elevation average of 930 meters. It is found on variable slope positions with slopes ranging from gentle to somewhat steep (1 to 20 degrees) and on variable aspects. Soils are derived from a variety of substrates such as alluvium, conglomerate, sand, sandstone, schist, and tephrite (basanite).

This association is found across the Mojave Desert south to the Colorado/Sonoran Desert area of California. It occurs on a variety of substrates and landforms in the mid elevations, and usually with a diverse mixture of shrubs. Stands of this association intergrade with the *Yucca schidigera* – *Eriogonum fasciculatum* association and the *Yucca brevifolia* / *Larrea tridentata* – *Yucca schidigera* / *Pleuraphis rigida* Association in the mid-elevation mixed desert scrub group.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (26): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Av

Park Sampling Zones: **LAKE:** Katherine, Pearce Ferry, Searchlight SE, Temple Bar; **MOJA:** Cima Dome SE, Cinder Cones, Clark Mtn West, Ivanpah Mtns, Ivanpah Vly, Kelso Mtns, Kelso-Cima, Marl Mtns, Old Dad Mtns, Providence Mtns, Van Winkle Mtn, Vulcan Mine

Classification Confidence: High

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=30

LAKE (n=10): LAKE0266, LAKE0268, LAKE0269, LAKE0273, LAKE0368, LAKE9142, LAKE9158, LAKE9371, LAMEN038, LMJOA048

DEVA (n=0): ;

MOJA (n=16): MOJA0168, MOJA0281, MOJA9164, MOJA9165, MOJA9265, MOJA9302, MOJA9304, MOJA9309, MOJA9363, MOJA9369, MOJA9384, MOJA9682, MOJA9914, MOJC0076, MOJC1120, MOJC1121
MOJN-Johnson (n=4): MOJJE517, MOJJE5T2, MOJJE810, MOJJE928

References

Evens and Hartman 2007, Keeler-Wolf et al. 2005, Evens et al. 2012

Larrea tridentata - *Encelia farinosa* - *Fouquieria splendens* Upper Bajada & Rock Outcrop Desert Scrub Alliance

Larrea tridentata – Encelia farinosa – Ambrosia dumosa Association

NVC Association Code: CEGJ005766; **Alliance Code:** A3278

Association Concept

The *Larrea tridentata* – *Encelia farinosa* – *Ambrosia dumosa* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 20 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 32 percent cover. *Encelia farinosa* and *Larrea tridentata* are the co-dominant shrubs, and *Ambrosia dumosa* is characteristic and usually co-dominant with the nominate species. Herbs that are often to sometimes present *Cryptantha* spp., *Amsinckia tessellata*, *Chaenactis* spp., *Eriogonum inflatum*, *Plantago ovata*, and *Schismus* spp.

The association is found in Death Valley National Park and Mojave National Preserve in California and Lake Mead National Recreation Area in Arizona and Nevada. It was sampled at low to mid elevations in areas that are often rocky with boulders, small rocks, and/or gravel. Elevation ranges from approximately 250 to 960 meters, and elevation averages 620 meters. It is found on varying slope positions, though primarily midslope. Slopes are usually moderate to steep (though range from 1 to 30 degrees), and are on variable aspects. Soil texture is variable, and soils are alluvium or rock often derived from igneous parent material such as alkali-granite (alaskite), basalt, dacite, gneiss, granodiorite, orthoquartzite, and rhyolite.

This association is commonly found across the Mojave Desert and into the Sonoran/Colorado Deserts of California, along steep and rocky highlands, upper alluvial fans, erosional highlands, and bottomlands/plains.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (18): 322Ai, 322Al, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (1): 341Fe

Park Sampling Zones: **DEVA:** Nelson Range; **LAKE:** Boulder City, Cottonwood Cove, Katherine, Lakeshore, Willow Beach; **MOJA:** Cow Hole Mtns, Goffs, Piute Range

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G4 S4

Surveys (with Sample Sizes) Used for Description

MOJN: N=24

LAKE (n=13): LAKE9128, LAKE9137, LAKE9214, LAKE9224, LAKE9238, LAKE9305, LAKE9307, LAKE9318, LAKE9321, LAKE9335, LAMEN010, LAMEN025, LAMEN061

DEVA (n=2): DEVA9347, DEVA5151

MOJA (n=4): MOJA9184, MOJC0115, MOJC0116, MOJC0207

MOJN-Johnson (n=5): MOJJE033, MOJJE263, MOJJE291, MOJJE806, MOJJE809

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf et al. 2005, Keeler-Wolf and Thomas 2000

Larrea tridentata – Encelia farinosa – Bebbia juncea Association

NVC Association Code: CEPP006723; **Alliance Code:** A3278

Association Concept

The *Larrea tridentata* – *Encelia farinosa* – *Bebbia juncea* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 7 to 34 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 5 percent cover. *Encelia farinosa* is co-dominant along with the characteristically occurring shrubs *Bebbia juncea* and *Larrea tridentata*. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Ambrosia dumosa*, *Hymenoclea salsola*, *Opuntia basilaris*, and *Stephanomeria pauciflora*. Herbs that are often to sometimes present include *Eriogonum inflatum*, *Bromus rubens*, *Plantago ovata*, *Schismus* spp., and *Sphaeralcea ambigua*, and nonvascular plants include cryptogamic crust.

The association is in the Panamint Mountains of Death Valley National Park and the Granite Mountains of Mojave National Preserve in California and in the Boulder City, Cottonwood Grove, Gold Butte, and Katherine areas of Lake Mead National Recreation Area in Nevada. It is found primarily in canyons, washes, and drainage channels. It was sampled at low to mid elevations of approximately 150 to 800 meters with an elevation average of 430 meters. It is found primarily on easterly and southerly aspects with slopes ranging from gentle to very steep (1 to 48 degrees). Soils include sands and are derived from a variety of substrates such as alkali-granite (alaskite), alluvium, sandstone, and schist.

This association is commonly found in the Mojave Desert region within disturbed and moister settings as compared to other associations of this mixed scrub alliance, such as along steep canyon walls with neutral exposure and episodic washes with mixed alluvium and boulders.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322A1, 322Am, 322At, 322Ay, 322Az; Southeastern Great Basin (2): 341Ff

Park Sampling Zones: **DEVA:** Panamint Mtns; **LAKE:** Boulder City, Cottonwood Cove, Gold Butte, Katherine; **MOJA:** Granite Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=5): LAKE9218, LAKE9219, LAKE9503, LAKE9526, LAMEN023

DEVA (n=2): DEVAD085, MOJC0563

MOJA (n=1): MOJC0128

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

Larrea tridentata – Encelia farinosa – Pleurocoronis pluriseta Association

NVC Association Code: CEG005767; **Alliance Code:** A3278

Association Concept

The *Larrea tridentata* – *Encelia farinosa* – *Pleurocoronis pluriseta* Association forms an open shrub canopy, in which the shrub cover ranges from 7 to 16 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 2 to 8 percent cover. *Encelia farinosa* is co-dominant along with the characteristically occurring shrubs *Larrea tridentata* and *Pleurocoronis pluriseta*. Other shrubs often to sometimes present include *Ambrosia dumosa*, *Eriogonum fasciculatum*, *Bebbia juncea*, *Ephedra nevadensis*, *Ferocactus cylindraceus*, *Peucephyllum schottii*, and *Stephanomeria pauciflora*. Commonly associated herbs include *Amsinckia tessellata*, *Chorizanthe brevicornu*, *Cryptantha* spp., *Eriogonum inflatum*, and *Schismus* spp. Nonvascular plants include cryptogamic crust and lichen.

The association occurs intermittently in Death Valley National Park, Mojave National Preserve, and Joshua Tree National Park in California and in Lake Mead National Recreation Area in Arizona and Nevada, often along exposed, southerly steep and rocky slopes. It was sampled at low to mid elevations of approximately 250 to 1,050 meters with an elevation average of 750 meters. It is found primarily on mid- to high slope positions with slopes usually moderate to steep (ranging from 15 to 35 degrees), and on primarily southerly and westerly aspects. Soils include clay and sandy loams as well as loamy sands, and they are derived from a variety of substrates such as alluvium, dacite, dune sand, gneiss, granodiorite, rhyolite, sandstone, and schist.

This association is found intermittently across the Mojave Desert and into the Colorado/Sonoran Deserts of California along exposed, often southerly or westerly slopes, canyon walls, and ridges with large amounts of bedrock.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ad, 322Af, 322Aj, 322Al, 322Av, 322Az

Park Sampling Zones: **DEVA:** Green Water Rng/Vlly, Owlshead Mtns; **LAKE:** Callville, Willow Beach; **MOJA:** Baker-Halloran, Devil's Playground, Granite Mtns, Marl Mtns, Old Dad Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=2): LAKE0222, LAKE9391

DEVA (n=2): DEVA9191, MOJC1044

MOJA (n=6): MOJA9361, MOJA9559, MOJA9561, MOJA9563, MOJA9640, MOJC0129

MOJN-Johnson (n=0):

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000

3. Desert & Semi-Desert Class

3.A.2 Warm Desert & Semi-Desert Scrub & Grassland Formation

3.A.2.Na North American Warm Desert Scrub & Grassland Division

M088. Mojave-Sonoran Semi-Desert Scrub Macrogroup

G675. North American Warm Semi-Desert Dune & Sand Flats Group

Dicoria canescens – *Abronia villosa* – *Panicum urvilleanum* Dune Alliance

Dicoria canescens Association

NVC Association Code: CEG005747; **Alliance Code:** A4026

Association Concept

The *Dicoria canescens* Association forms an open herb layer, in which the herbaceous cover ranges from 0.5 to 31 percent cover. The tree layer is usually absent, and the shrub layer is sparse and ranges from 0 to 2 percent cover. *Dicoria canescens* is typically dominant or co-dominant in the herbaceous layer. Other herbs sometimes associated include *Achnatherum hymenoides*, *Abronia villosa*, and *Astragalus lentiginosus*. Shrubs that are sometimes present include *Larrea tridentata* and *Petalonyx thurberi*.

The association is found in various sand dune areas of Death Valley National Park, California, and in Devil's Playground and Kelso Dunes of Mojave National Preserve, California. It occurs at mid to upper elevations (ranging from 50 to 1,300 meters, and averaging to 590 meters). Slopes are gentle to moderate (ranging from 1 to 10 degrees). It is found on all slope positions though often with southerly aspects, but not exclusively. Soils are sandy and are predominantly aeolian dune sand, though alluvial and dolostone (dolomite) sediments may also be present.

This association is found in the Mojave Desert and in the Sonoran and Colorado Deserts. The herbaceous cover and composition varies depending on annual and seasonal rainfall. *Dicoria canescens* is a summer annual while other various herbs found in this association are spring annuals. *Dicoria canescens* often remains as skeletal plants in the winter and spring when other annuals are blooming.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ab, 322Ae, 322Ai Southeastern Great Basin (2): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Eureka Valley, Joshua Flat, Panamint Dunes; MOJA: Devil's Playground, Kelso Dunes

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3?

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=0); DEVA (n=8): DEVA0540, DEVA9562, DEVAD025, DEVAD213, DEVAS176, DEVAS179, DEVAS184, MOJC0692; MOJA (n=4): MOJA9197, MOJC0346, MOJC0347, MOJC0348; MOJN-Johnson (n=0)

References

Sawyer et al. 2009, VegCAMP and AIS 2013

***Panicum urvilleanum* Association**

NVC Association Code: CEPP006730; **Alliance Code:** A4026

Association Concept

The *Panicum urvilleanum* Association forms a sparse to open herb layer, in which the herbaceous cover ranges from 6 to 18 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 2 percent cover, and the shrub layer is also sparse, if present, and ranges from 0 to 3 percent cover. *Panicum urvilleanum* is typically dominant or co-dominant in the herbaceous layer. Other characteristic herbs include *Achnatherum hymenoides*, *Croton californicus*, *Cryptantha* spp., and *Dicoria canescens*, and those herbs often present are *Schismus* spp. Commonly associated emergent shrubs at sparse to open cover include *Petalonyx thurberi* and *Penstemon thurberi*, and trees sometimes at sparse cover present include *Chilopsis linearis*.

This association is found uncommonly along shifting dunes at low to mid elevation in the Mojave National Preserve in California, such as at Kelso Dunes and Devil's Playground. Elevation ranges from approximately 350 to 850 meters, and averages 706 meters. Slopes are gentle to moderately steep (ranging from 5 to 23 degrees). The association is often found on the lowslopes and midslopes of the sand dunes at various aspects. Soils are medium to fine sand, and they are derived primarily from aeolian deposits of sand with minor amounts of alluvium.

The cover of *Panicum urvilleanum* varies annually based on seasonal precipitation. This association usually occurs on the core of large dune systems. It typically occupies tall, active dunes that can have relatively steep faces where *P. urvilleanum* is usually the sole dominant species, though at low cover. In the Mojave Desert region, this association occurs adjacent to stands of *Pleuraphis rigida* Association and other associations of *Dicoria canescens* – *Abronia villosa* – *Panicum urvilleanum* Alliance, where the rhizomatous nature of *Panicum urvilleanum* allows it to grow along active dunes and shifting sands, while the more bunch-forming *Pleuraphis rigida* occurs more extensively along and at higher cover on dune aprons.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ai

Park Sampling Zones: MOJA: Cow Hole Mtns, Kelso Dunes

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 S1

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=0); DEVA (n=0); MOJA (n=5): MOJA0405, MOJA0678, MOJA9406, MOJA9407, MOJA9548; MOJN-Johnson (n=0)

References

Thomas et al. 2004

Swallenia alexandrae Association

NVC Association Code: CEG005468; **Alliance Code:** A4026

Association Concept

The *Swallenia alexandrae* Association forms a sparse herb layer, in which the herbaceous cover ranges from 0.2 to 5 percent cover. Shrub and tree layers are typically absent. *Swallenia alexandrae* is characteristically present, and *Dicoria canescens* and *Mentzelia* spp. are often to sometimes present.

This association exists on sand dunes in the Eureka Valley in Death Valley National Park. It occurs at mid elevations (ranging from approximately 900 to 1,200 meters, averaging 1,206 m), along mid and high slopes to the ridges of these dunes at all aspects. Slopes are gentle to steep (ranging from 2 to 36 degrees). Soils are derived from aeolian deposits of sand, and textures are fine sand. Stands can be found on deep sand deposits, often within dune swales / concavities.

Swallenia alexandrae is a perennial grass that forms hummocks with ascending branches and rhizomes that spread across relatively steep dune slopes as well as shifting and deep sands. Stands are small and consist of several grass clumps separated by open patches and ridges of sand. In high rainfall years, other associations of the *Dicoria canescens* – *Abronia villosa* – *Panicum urvilleanum* alliance are well developed adjacent to *Swallenia alexandrae* stands. *Swallenia alexandrae* is a federally listed endangered plant and a CNPS list 1B.2 plant. Populations are recovering but are still threatened by sand boarding and vehicle trespass.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (5): 341Fc

Park Sampling Zones: DEVA: Eureka Valley, Joshua Flat

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G1 S1

Surveys (with Sample Sizes) Used in Description

MOJN: N=5

LAKE (n=0)

DEVA (n=5): DEVA0634, DEVA9633, DEVAS186, MOJC0442, MOJC0444

MOJA (n=0)

MOJN-Johnson (n=0)

References

Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, Thomas et al. 2004

Petalonyx thurberi Association

NVC Association Code: CEPP006731; **Alliance Code:** A4026

Association Concept

The *Petalonyx thurberi* Association forms a sparse herb layer, in which the herbaceous cover ranges from 0 to 4 percent cover. The tree layer is usually absent, and the shrub layer is sparse to open and ranges from 1 to 20 percent cover, though shrub cover averages 6 percent cover. *Petalonyx thurberi* is dominant in the shrub layer. Commonly associated herbs include *Dicoria canescens*. Shrubs sometimes present include *Larrea tridentata*.

The association is found along sand dunes within Death Valley National Park, such as Ibex Dunes, Panamint Dunes and Saline Valley Sand Dunes, and within Mojave National Preserve such as at Kelso Dunes, in California. It has been sampled and observed at low to upper elevations, ranging from approximately 350 to 1,300 meters, and averages 788 meters. Slopes are gentle to somewhat steep (ranging from 1 to 20 degrees). It is found primarily on low slope positions at neutral to southerly aspects. Soils are typically sand and derived from aeolian dune sand, though alluvial sediments may also be present.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322Ab, 322Ae, 322Ai Southeastern Great Basin (1): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Panamint Dunes, Saline Valley; **MOJA:** Kelso Dunes

Classification Confidence: Low

Rarity Rank (Global, State-CA): G2 S2

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=0):

DEVA (n=6): DEVAD191, DEVAS022, DEVAS178, DEVAS181, DEVAS182, DEVAS185

MOJA (n=1): MOJC0349

MOJN-Johnson (n=0):

References

None

Pleuraphis rigida Association

NVC Association Code: CEPP006858; **Alliance Code:** A3170

Association Concept

The *Pleuraphis rigida* Association forms an open to intermittent herb layer, in which the herbaceous cover ranges from 2 to 31 percent cover. The tree layer is typically absent, and the shrub layer is sparse and ranges from 0 to 6 percent cover. *Pleuraphis rigida* is dominant or co-dominant in the herbaceous layer with and *Schismus* spp. characteristically present and sometimes co-dominant. Other commonly associated herbs include *Oenothera deltoidea* and *Stephanomeria exigua*. Shrubs often present include *Larrea tridentata*.

The association is commonly found in sand dunes, flats, and ramps in the Mojave Desert including various areas of Mojave National Preserve, California, including the Kelso Dunes. It is uncommonly found in Lake Mead National Recreation Area, Arizona, such as at Sandy Point near Pearce Ferry and other sandy areas near the lake edge. It occurs at lower to upper elevations, ranging from approximately 250 to 1,450 meters, and averaging to 578 meters. Slopes are gentle to moderate (ranging from 1 to 9 degrees). It is found on all slope positions at predominantly southerly aspects, though not exclusively. Soil is typically medium to fine sand, and soils are derived primarily from aeolian sand dune deposits.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (15): 322Ai, 322Aj, 322Av

Park Sampling Zones: LAKE: (Cottonwood Cove, Katherine), Pearce Ferry; MOJA: Devil's Playground, Kelso Dunes, Old Dad Mtns, Zzyzx

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=17

LAKE (n=1): LAKE0601

DEVA (n=0):

MOJA (n=14): MOJA0400, MOJA0549, MOJA0654, MOJA9189, MOJA9408, MOJA9556, MOJA9657, MOJA9660, MOJA9662, MOJA9679, MOJC0728, MOJC0729, MOJC0730, MOJC0736

MOJN-Johnson (n=2): MOJJE321, MOJJE650

References

cf. Keeler-Wolf and Thomas 2000, McAuliffe 2016, cf. NatureServe 2012

Pleuraphis rigida / Ambrosia dumosa Association

NVC Association Code: CEGJ000955; **Alliance Code:** A3170

Association Concept

The *Pleuraphis rigida* / *Ambrosia dumosa* Association forms an open herb layer. The emergent tree layer is typically absent, and the shrub layer is sparse. *Pleuraphis rigida* is dominant or co-dominant in the herbaceous layer with a variety of herbs such as *Abronia villosa*, *Achnatherum hymenoides*, *Baileya multiradiata*, *Camissonia* spp., *Caulanthus cooperi*, *Chaenactis fremontii*, *Chaenactis stevioides*, *Croton californicus*, *Cryptantha* spp., *Machaeranthera canescens*, *Malacothrix glabrata*, *Nemacaulis denudata*, and *Oenothera deltoidea*. Shrubs that are characteristically present include *Ambrosia dumosa* which is typically dominant in the shrub layer, and other shrubs often present include *Cylindropuntia echinocarpa*, *Larrea tridentata*, *Opuntia basilaris*, and *Penstemon thurberi*.

The association is found commonly in the Mojave National Preserve in California, sampled at mid to upper elevations, in which the primary habitat is undulating sand dunes transitioning to bajadas with more alluvial/gravelly sediment. Elevation ranges from approximately 550 to 950 meters, and averages 759 meters. Slopes are gentle to moderate (ranging from 2 to 7 degrees). It is found on all aspects. Soils include sand, and they are derived from substrates such as aeolian sand, alluvium, and granodiorite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Aj

Park Sampling Zones: MOJA: Devil's Playground

Classification Confidence: Low

Rarity Rank (Global, State-CA): G2 S2

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=0):

MOJA (n=1): MOJA9562

MOJN-Johnson (n=5): MOJJE144, MOJJE175, MOJJE238, MOJJE293, MOJJE327

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2016

3. Desert & Semi-Desert Class

3.A.2 Warm Desert & Semi-Desert Scrub & Grassland Formation

3.A.2.Na North American Warm Desert Scrub & Grassland Division

M092. North American Warm-Desert Xeric-Riparian Scrub Macrogroup

G541. Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope Group

Acacia greggii - *Hyptis emoryi* - *Justicia californica* Desert Wash Shrubland Alliance

Acacia greggii – (*Ambrosia eriocentra* – *Salvia dorrii*) Association

NVC Association Code: CEG005737; **Alliance Code:** A4187

Association Concept

The *Acacia greggii* – (*Ambrosia eriocentra* – *Salvia dorrii*) Association forms an open shrub canopy, in which the shrub cover ranges from 10 to 30 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 1 to 7 percent cover. *Acacia greggii* (= *Senegalia greggii*) is the co-dominant shrub along with the characteristically occurring *Ambrosia eriocentra*, *Hymenoclea salsola*, and *Salvia dorrii*. Other shrubs often present include *Cylindropuntia acanthocarpa*, *Echinocereus engelmannii*, *Encelia virginensis*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Phoradendron californicum*, *Salazaria mexicana*, *Stephanomeria pauciflora*, and *Thamnosma montana*. Commonly associated herbs include *Achnatherum speciosum*, *Adenophyllum cooperi*, *Bromus rubens*, *Dasyochloa pulchella*, *Eriogonum inflatum*, *Erodium cicutarium*, *Muhlenbergia porteri*, *Penstemon palmeri*, and *Sphaeralcea ambigua*. Those trees often present include *Yucca brevifolia*, while *Chilopsis linearis* is sometimes present.

The association is common across Mojave National Preserve in California and is also found in Lake Mead National Recreation Area in Arizona and Nevada. It was sampled at mid to upper elevations of approximately 750 to 1,500 meters with an elevation average of 1,250 meters. The association is found primarily in gravelly and cobbly washes, arroyos, and drainage channels on gentle to moderate slopes (1 to 6 degrees) on primarily northwesterly and southwesterly aspects. Soils are sands and alluvium derived primarily from calcareous limestone/dolostone and sometimes from alkali-granite or gneiss substrate.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (24): 322Aj, 322Al, 322Am, 322Av

Park Sampling Zones: **LAKE:** Katherine, Pearce Ferry; **MOJA:** Cima Dome SE, Clark Mtn, Clark Mtn West, Pachalka Spring, Woods Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=26

LAKE (n=2): LAKE0616, LAKE9426; DEVA (n=0):

MOJA (n=22): MOJA0509, MOJA9215, MOJA9335, MOJAE050, MOJAE053, MOJAE055, MOJAE057, MOJAE059, MOJAE060, MOJAE061, MOJAE062, MOJAE063, MOJAE064, MOJAE065, MOJAE066, MOJAE067, MOJAE068, MOJAE069, MOJAE070, MOJAE172, MOJAE173, MOJAE174

MOJN-Johnson (n=2): MOJJE221, MOJJE543

References

Evens 2000, Keeler-Wolf and Thomas 2000

Acacia greggii – *Eriogonum fasciculatum* Association

NVC Association Code: CEPP005785; **Alliance Code:** A4187

Association Concept

The *Acacia greggii* – *Eriogonum fasciculatum* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 44 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 2 to 75 percent cover. *Acacia greggii* (= *Senegalia greggii*) and *Eriogonum fasciculatum* are the characteristic shrubs and usually co-dominant along with a rich mixture of shrubs. Other shrubs often present include *Cylindropuntia acanthocarpa*, *Echinocereus engelmannii*, *Ericameria laricifolia*, *Ferocactus cylindraceus*, *Hymenoclea salsola*, *Larrea tridentata*, *Lotus rigidus*, *Salvia mohavensis*, *Thamnosma montana*, *Viguiera parishii*, *Yucca baccata*, and *Yucca schidigera*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Sphaeralcea ambigua*, *Amsinckia tessellata*, *Erodium cicutarium*, and *Salvia columbariae*, and those trees sometimes present include *Pinus monophylla*.

The association is uncommon in Lake Mead National Recreation Area in Nevada, where it was found around Gold Butte and Katherine, and in Mojave National Preserve in California in the Granite, Providence, and Woods Mountain ranges. It was sampled at mid to upper elevations of approximately 650 to 1,550 meters, with an elevation average of 1,320 meters. It is found primarily on midslope positions on southerly aspects with slopes ranging from somewhat steep to steep (17 to 40 degrees). Soils include loams and loamy sand and are derived from igneous substrates such as alkali-granite (alaskite), gneiss, granite, granodiorite, and rhyolite.

This association is found intermittently across the Mojave Desert and in the Colorado/Sonoran Deserts of California in post-burn sites that are recovering after fire and along washes and colluvial slopes that experience intermittent disturbance from alluvial/sediment movement.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322A1, 322Am, 322At

Park Sampling Zones: **LAKE:** Gold Butte, Katherine; **MOJA:** Granite Mtns, Providence Mtns, Woods Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=2): LAKE9535, LMJOA054

DEVA (n=0):

MOJA (n=4): MOJA9412, MOJA9460, MOJA9697, MOJA9900

MOJN-Johnson (n=1): MOJJE016

References

Evens et al. 2012, Keeler-Wolf et al. 1998

Acacia greggii – Larrea tridentata – Hymenoclea salsola Association

NVC Association Code: CEG009522; **Alliance Code:** A4187

Association Concept

The *Acacia greggii* – *Larrea tridentata* – *Hymenoclea salsola* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 7 to 48 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 1 to 93 percent cover. *Acacia greggii* (= *Senegalia greggii*) is the co-dominant shrub with *Hymenoclea salsola* and other wash shrubs, and *Larrea tridentata* is characteristic. Other shrubs often present include *Encelia virginensis*, *Ephedra nevadensis*, *Salazaria mexicana*, *Salvia dorrii*, and *Senna armata*. Commonly associated herbs include *Erodium cicutarium*, *Bromus rubens*, and *Schismus* spp.

The association is common in the gravelly drainage channels and washes of the Mojave National Preserve in California and is also found in Lake Mead National Recreation Area in Arizona and Nevada. It was sampled at low to upper elevations of approximately 150 to 1,350 meters with an elevation average of 990 meters. The association is found on variable slope positions, with primarily gentle slopes (0 to 6 degrees), and on variable aspects. Soils include sands and loams and are derived from a variety of substrates but primarily alluvium, alkali-granite, and granodiorite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (32): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av, 322Ay

Park Sampling Zones: **LAKE:** Gold Butte, Katherine, Temple Bar; **MOJA:** Baker-Halloran, Clark Mtn West, Clipper Villy, Fenner Villy, Fenner Villy West, Granite Mtns, Hackberry Vontrigger, Ivanpah Villy, Kelso Mtns, Mid Hills, Providence Mtns, Turquoise Mountain, Vulcan Mine

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=39

LAKE (n=7): LAKE0138, LAKE0236, LAKE9328, LAKE9369, LAKE9439, LMJOA034, LMJOA035

DEVA (n=0):

MOJA (n=25): MOJA0200, MOJA0303, MOJA0541, MOJA9374, MOJA9401, MOJA9416, MOJA9522, MOJA9633, MOJA9805, MOJA9916, MOJAE123, MOJAE124, MOJAE152, MOJAE153, MOJAE155, MOJAE156, MOJAE157, MOJAE158, MOJAE159, MOJAE187, MOJAE188, MOJC0096, MOJC0797, MOJC1226, MOJC1227

MOJN-Johnson (n=7): MOJJE007, MOJJE098, MOJJE099, MOJJE347, MOJJE503, MOJJE588, MOJJE696

References

Evens 2000, Keeler-Wolf and Thomas 2000

Acacia greggii – *Prunus fasciculata* Association

NVC Association Code: CEG005738; **Alliance Code:** A4187

Association Concept

The *Acacia greggii* – *Prunus fasciculata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 6 to 45 percent cover. The emergent tree layer is sparse and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 1 to 23 percent cover. *Acacia greggii* (= *Senegalia greggii*) and *Prunus fasciculata* are characteristic and co-dominant in the shrub layer that is typically species rich, and other shrubs often present include *Cylindropuntia acanthocarpa*, *Ephedra viridis*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Hymenoclea salsola*, *Lotus rigidus*, *Salazaria mexicana*, *Salvia mohavensis*, *Stephanomeria pauciflora*, *Thamnosma montana*, *Viguiera parishii*, and *Yucca schidigera*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Erodium cicutarium*, *Mirabilis laevis*, and *Sphaeralcea ambigua*.

The association is common in Mojave National Preserve, Castle Mountains National Monument, and Joshua Tree National Park in California, and was sampled at mid to upper elevations of approximately 700 to 1,600 meters, with an elevation average of 1,360 meters. It is found primarily in canyons and drainage channels on gentle to steep slopes (2 to 28 degrees) at southerly aspects. Soils include sands and sandy and clay loams, and they are derived primarily from gravelly and cobbly alluvium with a variety of sediments such as gneiss, granodiorite, limestone, plutonic rock (phaneritic), rhyolite, and sandstone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Aj, 322Al, 322Am

Park Sampling Zones: MOJA: Castle Mtns, Clark Mountain, Clark Mtn, Granite Mtns, Mid Hills, Providence Mtns, West of Juniper Mine, Woods Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=23

LAKE (n=0):

DEVA (n=0):

MOJA (n=21): CAMO9106, MOJA0289, MOJA0438, MOJA0691, MOJA9250, MOJA9511, MOJA9573, MOJAE002, MOJAE004, MOJAE005, MOJAE006, MOJAE007, MOJAE076, MOJAE168, MOJAE170, MOJAE197, MOJC0192, MOJC0239, MOJC0940, MOJC1153, MOJC1155

MOJN-Johnson (n=2): MOJJE083, MOJJE454

References

Evens 2000, Evens et al. 2012, Keeler-Wolf et al. 2005, Keeler-Wolf and Thomas 2000

Acacia greggii – Viguiera parishii Association

NVC Association Code: CEPP005786; **Alliance Code:** A4187

Association Concept

The *Acacia greggii* – *Viguiera parishii* Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 31 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 1 to 78 percent cover. *Acacia greggii* (= *Senegalia greggii*) is co-dominant in the shrub overstory with *Viguiera parishii*, occurring with another characteristic shrub *Larrea tridentata*. Other shrubs often present include *Cylindropuntia acanthocarpa*, *Echinocereus engelmannii*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, *Gutierrezia sarothrae*, *Phoradendron californicum*, *Stephanomeria pauciflora*, and *Yucca schidigera*. Commonly associated herbs include *Eriogonum inflatum*, *Erodium cicutarium*, *Penstemon palmeri*, and *Sphaeralcea ambigua*, and those trees sometimes to often present include *Chilopsis linearis*.

The association is found in Lake Mead National Recreation Area in Arizona and Nevada, and in Mojave National Preserve in California. It was sampled at mid to upper elevations ranging from approximately 550 to 1,450 meters with an elevation average of 1,029 meters. It is found primarily in drainage channels and arroyos and adjacent canyon side slopes. Slopes are generally gentle to moderate (though with a range of 2 to 37 degrees), and aspects are variable. Soils include sands, sandy loams, and clay, and they are alluvium derived from a variety of substrates such as alkali-granite (alaskite), basalt, gneiss, granodiorite, limestone, and rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Ak, 322Al, 322Am, 322Av, 322Az

Park Sampling Zones: **LAKE:** Boulder City, Katherine, Willow Beach; **MOJA:** Clipper Vlly, Lanfair Vlly, Providence Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA):

Surveys (with Sample Sizes) Used for Description

MOJN: N=14

LAKE (n=4): LAKE9225, LAKE9444, LMJOA052, LMJOA053

DEVA (n=0):

MOJA (n=10): MOJA9433, MOJA9539, MOJA9581, MOJAE080, MOJAE082, MOJAE083, MOJAE119, MOJAE120, MOJAE121, MOJAE122

MOJN-Johnson (n=0):

References

Evens 2000

***Chilopsis linearis* / (*Ambrosia eriocentra* – *Salvia dorrii*) Association**

Association Code: CEG005742; **Alliance Code:** A1044

Association Concept

The *Chilopsis linearis* / (*Ambrosia eriocentra* – *Salvia dorrii*) Association forms an open tree canopy, in which tree cover ranges from 2 to 19 percent cover. The shrub layer is variable and ranges from 2 to 23 percent cover, and the herb understory is also variable and ranges from 1 to 15 percent cover. *Chilopsis linearis* is dominant and characteristic in the tree overstory, while other trees often or sometimes present include *Yucca brevifolia*. *Ambrosia eriocentra* and/or *Salvia dorrii* is dominant or co-dominant in the shrub understory with a variety of other wash-associated species. Other commonly associated shrubs include *Acacia greggii* (= *Senegalia greggii*), *Cylindropuntia acanthocarpa*, *Encelia virginensis*, *Fallugia paradoxa*, *Gutierrezia microcephala*, *Hymenoclea salsola*, *Prunus fasciculata*, and *Salazaria mexicana*, and commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Penstemon palmeri*, and *Sphaeralcea ambigua*.

The association is often found in Mojave National Preserve, California, and rarely in Lake Mead National Recreation Area, Nevada. It is found at mid to upper elevations along intermittently flooded channel beds within arroyos and low slope canyon drainages, and occasionally on a slope/summit canyon drainages, with no aspect preference. Elevation ranges from approximately 700 to 1,550 meters, and elevation averages 1,295 meters. Slopes are gentle to moderate (ranging from 1 to 6 degrees). Soils range from loamy sand to sand, and are alluvium derived from a variety of substrates such as alkali-granite (alaskite), granodiorite, limestone, and sandstone.

Ecoregion Sections and Subsection Codes: Mojave Desert (16): 322Aj, 322Ak, 322Al, 322Am

Park Sampling Zones: LAKE: Katherine; MOJA: Castle Mtns, Cima Dome NW, Clark Mtn, Ivanpah Vly, Mid Hills, New York Mtns, Providence Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=16

LAKE (n=1): LAKE9433

DEVA (n=0):

MOJA (n=15): CAMO9110, CAMO9123, MOJA0326, MOJA0351, MOJA9431, MOJAE047, MOJAE048, MOJAE049, MOJAE052, MOJAE054, MOJAE056, MOJAE058, MOJAE147, MOJAE148, MOJAE154

MOJN-Johnson (n=0):

References

Evens 2000, Spolsky 1979

Chilopsis linearis / Ericameria paniculata Association

Association Code: CEG005743; **Alliance Code:** A1044

Association Concept

The *Chilopsis linearis* / *Ericameria paniculata* Association forms an open tree canopy, in which tree cover ranges from 2 to 14 percent cover. The shrub layer is variable and ranges from 3 to 20 percent cover, and the herb understory is also variable and ranges from 0.2 to 23 percent cover. *Chilopsis linearis* is dominant and characteristic in the tree overstory, and *Ericameria paniculata* is dominant in the shrub understory. Other commonly associated shrubs include *Hymenoclea salsola*, *Ambrosia eriocentra*, *Brickellia incana*, *Encelia virginensis*, *Eriogonum fasciculatum*, *Larrea tridentata*, and *Stephanomeria pauciflora*. Commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Physalis hederifolia*, *Schismus*, and *Sphaeralcea ambigua*.

The association is found often in Mojave National Preserve, California, and rarely in Lake Mead National Recreation Area, Nevada. It is found at low to mid elevations, primarily in intermittently flooded washes along bajadas and lower canyon channel beds often with southerly aspects. Soils are usually medium to fine sand, and are mostly from alluvium derived from a variety of substrates such as alkali-granite (alaskite), dune sand, limestone, and tephrite. Elevation ranges from approximately 560 to 1,410 meters, and elevation averages 970 meters. Slopes are gentle (from 1 to 4 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (17): 322Ai, 322Aj, 322Ak, 322Al, 322Am

Park Sampling Zones: **LAKE:** Katherine; **MOJA:** Cinder Cones, Clipper Vly, Devil's Playground, Kelso Dunes, Mid Hills, Piute Range

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=17

LAKE (n=1): LAKE0447

DEVA (n=0):

MOJA (n=16): MOJA0566, MOJA9379, MOJA9508, MOJA9530, MOJA9564, MOJA9664, MOJAE090, MOJAE092, MOJAE096, MOJAE097, MOJAE098, MOJAE099, MOJAE100, MOJAE101, MOJAE102, MOJC0009

MOJN-Johnson (n=0):

References

Evens 2000, Keeler-Wolf and Thomas 2000

Chilopsis linearis / *Hymenoclea salsola* Association

Association Code: CEG005744; **Alliance Code:** A1044

Association Concept

The *Chilopsis linearis* / *Hymenoclea salsola* Association forms an open to intermittent tree canopy, in which tree cover ranges from 2 to 38 percent cover. The shrub layer is variable and ranges from 2 to 26 percent cover, and the herb understory is also variable and ranges from 0.2 to 3 percent cover. *Chilopsis linearis* is dominant in the tree overstory. The understory shrub layer is characterized *Hymenoclea salsola*, which is dominant or co-dominant with other wash-related species. Other commonly associated shrubs include *Acacia greggii* (= *Senegalia greggii*), *Cleome isomeris*, *Ephedra californica*, *Larrea tridentata*, *Phoradendron californicum*, and *Senecio flaccidus*, and commonly associated herbs include *Schismus* spp., *Bromus rubens*, and *Erodium cicutarium*.

The association is often found in Mojave National Preserve, California, and rarely in Lake Mead National Recreation Area, Nevada. It is found at low elevations, primarily in arroyos, washes, or canyon drainages with low to mid slopes at southerly aspects. Soils are typically coarse to medium sand, and are alluvium derived from alluvium as substrates such as granodiorite, rhyolite, and sandstone/limestone. Elevation ranges from approximately 581 to 1,190 meters, and elevation averages 994 meters. Slopes are gentle (from 2 to 5 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (24): 322Ai, 322Aj, 322Ak, 322Al, 322Ay

Park Sampling Zones: **LAKE:** Lakeshore; **MOJA:** Granite Mtns, Kelso Mtns, Providence Mtns, Van Winkle Mtn, Vulcan Mine

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=25

LAKE (n=1): LAKE9422

DEVA (n=0):

MOJA (n=23): MOJA0158, MOJA9521, MOJA9591, MOJA9915, MOJAE011, MOJAE012, MOJAE127, MOJAE131, MOJAE132, MOJAE133, MOJAE206, MOJAE207, MOJAE209, MOJAE212, MOJAE213, MOJAE214, MOJAE216, MOJAE217, MOJAE218, MOJAE219, MOJAE246, MOJAE249, MOJAE250

MOJN-Johnson (n=1): MOJJE043

References

Evens 2000, Keeler-Wolf et al. 1998, Keeler-Wolf and Thomas 2000

***Chilopsis linearis* / *Prunus fasciculata* Association**

Association Code: CEG005745; **Alliance Code:** A1044

Association Concept

The *Chilopsis linearis* / *Prunus fasciculata* Association forms an open tree canopy, in which tree cover ranges from 2 to 17 percent cover. The shrub layer is variable and ranges from 8 to 33 percent cover, and the herb understory is also variable and ranges from 1 to 10 percent cover. *Chilopsis linearis* is dominant in the tree overstory. The understory shrub layer is characterized by *Prunus fasciculata*, which is dominant or co-dominant with other wash-associated species such as *Acacia greggii* (= *Senegalia greggii*) and *Viguiera parishii*. Other commonly associated shrubs include *Artemisia ludoviciana*, *Cylindropuntia acanthocarpa*, *Gutierrezia sarothrae*, *Opuntia phaeacantha*, *Phoradendron californicum*, *Salvia dorrii*, *Stephanomeria pauciflora*, *Yucca baccata*, and *Yucca schidigera*. Commonly associated herbs include *Bromus rubens*, *Sphaeralcea ambigua*, *Erodium cicutarium*, *Euphorbia*, *Oenothera caespitosa*, and *Penstemon palmeri*.

The association is often found in Mojave National Preserve, California. It is sampled at low to mid elevations, primarily in intermittently flooded canyon drainages and gravelly arroyos that are within the mid-slopes of mountain to upper bajada positions with north to northwesterly aspects. Soil is typically medium to coarse sand, which are derived from sedimentary formations like limestone and sandstone as well as other igneous and metamorphic substrates such as gneiss, granodiorite, and schist. Elevation ranges from approximately 970 to 1,380 meters, and elevation averages 1,217 meters. Slopes range from gentle to moderate (from 2 to 8 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (17): 322Ai, 322Al

Park Sampling Zones: MOJA: Granite Mtns, Ivanpah Vly, New York Mtns, Providence Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=17

LAKE (n=0):

DEVA (n=0):

MOJA (n=17): MOJA0906, MOJA9440, MOJA9924, MOJAE077, MOJAE078, MOJAE079, MOJAE108, MOJAE109, MOJAE110, MOJAE111, MOJAE112, MOJAE113, MOJAE149, MOJAE150, MOJAE151, MOJAE200, MOJAE242

MOJN-Johnson (n=0):

References

Evens 2000, Keeler-Wolf et al. 1998, Keeler-Wolf and Thomas 2000

Psorothamnus spinosus / Hymenoclea salsola – (Bebbia juncea – Ephedra californica) Association

Association Code: CEPP006745; **Alliance Code:** A1044

Association Concept

The *Psorothamnus spinosus* / *Hymenoclea salsola* – (*Bebbia juncea* – *Ephedra californica*) Association forms an open tree canopy, in which tree cover ranges from 1 to 8 percent cover. The shrub layer is variable and ranges from 1 to 13 percent cover, and the herb understory is also variable and ranges from 0.2 to 10 percent cover. *Psorothamnus spinosus* is the dominant tree in the overstory. The understory shrub layer is characterized by *Hymenoclea salsola*, which is dominant or co-dominant with other wash species such as *Acacia greggii* (= *Senegalia greggii*), *Bebbia juncea*, and *Ephedra californica*. Other commonly associated shrubs include *Ambrosia dumosa* and *Larrea tridentata*, and commonly associated herbs include *Chamaesyce* spp., *Cryptantha* spp., *Erodium cicutarium*, *Schismus* spp. and *Stephanomeria pauciflora*.

The association is often found in Mojave National Preserve, California, but rarely in Joshua Tree National Park, California, and Lake Mead National Recreation Area, Nevada. It is found at low to mid elevations, primarily in channel beds / washes with low to mid-slope positions at easterly aspects. Elevation ranges from approximately 200 to 920 meters, and elevation averages 537 meters. Slopes are gentle (range from 0 to 3 degrees). Soils include loamy sand to medium sand, and substrates are sandy to gravelly alluvium.

Ecoregion Sections and Subsection Codes: Mojave Desert (7): 322Ai, 322Al, 322Am

Park Sampling Zones: LAKE: Katherine; MOJA: Brown Buttes, Fenner Vlly West, Van Winkle Mtn, Zzyzx

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=13

LAKE (n=1): LAKE0617

DEVA (n=0):

MOJA (n=6): MOJA0555, MOJA0649, MOJA0801, MOJA0927, MOJAE231, MOJAE232

MOJN-Johnson (n=6): MOJJE255, MOJJE259, MOJJE355, MOJJE358, MOJJE582, MOJJE597

References

cf. Evens 2000, Evens et al. 2012, Evens and Hartman 2007, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005, Keeler-Wolf and Thomas 2000

Encelia actonii Association

NVC Association Code: CEG005748; **Alliance Code:** A4163

Association Concept

The *Encelia actonii* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 9 to 40 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 8 percent cover. *Encelia actonii* is the dominant shrub, and other shrubs often or sometimes present include *Hymenoclea salsola*, *Larrea tridentata*, *Ambrosia dumosa*, *Eriogonum fasciculatum*, *Psoralea arborescens*, *Stephanomeria pauciflora* and *Viguiera reticulata*. Commonly associated herbs include *Bromus rubens*, *Eriogonum inflatum*, *Mirabilis* spp., and *Sphaeralcea ambigua*.

The association is found in Death Valley National Park in California, and was sampled at low to upper elevations in the Black Mountains, Green Water Valley, Joshua Flat, and the Last Chance Range. Elevation ranges from approximately 550 to 1,650 meters, and elevation averages 1,135 meters. It is found primarily in gravelly and cobbly wash areas and canyon bottoms and adjacent canyon walls with flat to steep slopes (0 to 37 degrees) on variable aspects. Soils include sands and loams, and they are derived from alluvium often with calcareous limestone/dolomite sediments but also can include rhyolite and other parent materials.

This association is found sporadically in alluvial wash settings from the northern Mojave Desert and southern Great Basin west to the southeastern Great Valley and inner Southern California Mountains and Valleys.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ab, 322Ad; Southeastern Great Basin (6): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=11

LAKE (n=0):

DEVA (n=11): DEVA0137, DEVA0306, DEVA9204, DEVA9252, DEVA9303, DEVA9463, DEVAS165, MOJC0372, MOJC0468, MOJC0469, MOJC0641

MOJA (n=0):

MOJN-Johnson (n=0):

References

Buck-Diaz and Evens 2011, Buck-Diaz et al. 2012, Keeler-Wolf and Thomas 2000

Viguiera reticulata Association

NVC Association Code: CEG002962; **Alliance Code:** A4163

Association Concept

The *Viguiera reticulata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 40 percent cover. The emergent tree layer, if present, is sparse, and the herb understory is variable and ranges from 0 to 18 percent cover. *Viguiera reticulata* is co-dominant in the shrub canopy. Other shrubs often present include *Ambrosia dumosa*, *Eriogonum fasciculatum*, *Hymenoclea salsola*, *Larrea tridentata*, and *Stephanomeria pauciflora*. The herbaceous layer typically includes *Bromus rubens*, and those that are often present include *Eriogonum inflatum* and *Sphaeralcea ambigua*.

The association is found along dry washes or adjacent steep rocky canyon slopes in mid to high elevations, and is well-defined in sampling at Death Valley National Park in California. *Viguiera reticulata* stands appear to occur on alluvium derived mostly from calcareous substrates (dolomite, limestone, and marble) where irregular flooding occurs. Elevation ranges from 600 to 1,550 meters and averages 1,039 meters, and aspect is variable.

This association is found in the central Mojave Desert and southern Great Basin in both California and western Nevada. Stands are usually on small terraces (less than 0.5 ha), adjacent to the most active parts of washes or directly above on colluvial, rocky slopes.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ab, 322Ad, 322Af; Southeastern Great Basin (13): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Cottonwood Mtns, Funeral Mtns, Grapevine Mtns, Owlshead Mtns, Panamint Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used in Description

MOJN: N=23

LAKE (n=0)

DEVA (n=23): DEVA0467, DEVA0529, DEVA0607, DEVA0667, DEVA0668, DEVA9188, DEVA9397, DEVA9416, DEVA9425, DEVA9528, DEVA9532, DEVA9541, DEVA9543, DEVA9615, DEVA9915, DEVA9927, DEVAS175, DEVAS211, MOJC0458, MOJC0613, MOJC0654, MOJC0707, MOJC1045

MOJA (n=0)

MOJN-Johnson (n=0)

References

Keeler-Wolf and Thomas 2000, Sawyer et al. 2009

***Ephedra californica* – *Hymenoclea salsola* Association**

NVC Association Code: CEG002958; **Alliance Code:** A2536

Association Concept

The *Ephedra californica* – *Hymenoclea salsola* Association forms an open shrub canopy, in which the shrub cover ranges from 10 to 25 percent cover. Both the emergent tree layer and the herb understory are sparse, if present, with ranges from 0 to 1 percent cover. *Ephedra californica* and *Hymenoclea salsola* are co-dominant in the overstory, and *Larrea tridentata* is characteristic. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Ambrosia dumosa*, and *Cleome isomeris*. Commonly associated herbs include *Adenophyllum cooperi*, *Bromus rubens*, and *Erodium cicutarium*.

The association is common in southern Mojave National Preserve in California, where it was sampled in mid elevation washes and arroyos of the Brown Buttes, the Budweiser Wash, the Granite Mountains, and the Van Winkle Mountains. Elevation ranges from approximately 750 to 1,150 meters, and elevation averages 946 meters. It is found primarily on gentle slopes (2 to 4 degrees) on variable aspects. Soils are primarily sands, and are alluvium derived from igneous substrates such as granite and rhyolite.

This association is distributed in California from the southern Mojave Desert to the Sonoran Desert and potentially into the southeastern Great Valley. Stands are found on intermittently flooded arroyos, washes, and adjacent alluvial fans, and on residual dunes.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (28): 322A1

Park Sampling Zones: DEVA: Brown Buttes, Budweiser Wash, Granite Mtns, Van Winkle Mtn

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=32

LAKE (n=0): ; DEVA (n=0):

MOJA (n=28): MOJAE017, MOJAE019, MOJAE020, MOJAE022, MOJAE023, MOJAE024, MOJAE025, MOJAE026, MOJAE027, MOJAE028, MOJAE029, MOJAE030, MOJAE031, MOJAE032, MOJAE033, MOJAE034, MOJAE035, MOJAE208, MOJAE210, MOJAE211, MOJAE215, MOJAE220, MOJAE221, MOJAE222, MOJAE227, MOJAE228, MOJAE229, MOJAE230

MOJN-Johnson (n=4): MOJJE057, MOJJE060, MOJJE074, MOJJE287

References

Buck-Diaz et al. 2012, Evens 2000, cf. Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000

***Ericameria paniculata* – *Hymenoclea salsola* Association**

NVC Association Code: CEPP006864; **Alliance Code:** A2509

Association Concept

The *Ericameria paniculata* – *Hymenoclea salsola* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 23 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 0 to 9 percent cover.

Ericameria paniculata and *Hymenoclea salsola* are the dominant shrubs. Commonly associated herbs include *Bromus rubens* and *Erodium cicutarium*.

The association is found in Death Valley National Park and Mojave National Preserve in California, as well as in Lake Mead National Recreation Area in Nevada. It was sampled at low to upper elevations ranging from approximately 400 to 1,400 meters with an elevation average of 950 meters. It is found primarily in drainage channels and washes with flat to moderate slopes (0 to 13 degrees) and on variable aspects. Soils include sands and sandy loams, and they are derived primarily from alluvium with sediments including dune sand, gneiss, granite, mudstone, and sandstone.

This association is localized found in the Mojave Desert ecoregion occurring along intermittently flooded, mixed sandy and gravelly washes.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (11): 322Ab, 322Af, 322Ai, 322Aj, 322Al, 322Am, 322Az; Southeastern Great Basin (1): 341Ff

Park Sampling Zones: **DEVA:** Owlshead Mtns, Panamint Mtns; **LAKE:** Echo Bay, Juniper Mine; **MOJA:** Cima Dome NW, Devil's Playground, HackberryVontraigger, Lanfair Villy, New York Mtns, Van Winkle Mtn

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G4 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=21

LAKE (n=2): LAKE0514, LAMEN081

DEVA (n=5): DEVA0109, DEVA9190, DEVA9350, DEVAS037, DEVAS038

MOJA (n=6): MOJA9162, MOJA9317, MOJA9501, MOJA9630, MOJAE223, MOJC0738

MOJN-Johnson (n=8): MOJJE188, MOJJE274, MOJJE306, MOJJE394, MOJJE498, MOJJE524, MOJJE646, MOJJE917

References

Keeler-Wolf and Thomas 2000

Ambrosia eriocentra - Brickellia spp. Sparse Desert Wash Association

NVC Association Code: CEPP005790; **Alliance Code:** A4188

Association Concept

The *Ambrosia eriocentra* - *Brickellia* spp. Sparse Desert Wash Association forms a sparse herbaceous layer (at 0.5% cover) and sparse shrub layer (at approximately 2% cover). The tree layer, if present, is sparse. Various shrubs can occur at sparse cover including *Ambrosia eriocentra*, *Brickellia atractyloides*, *Brickellia desertorum*, *Hymenoclea salsola*, *Bebbia juncea*, *Eriogonum fasciculatum*, *Acacia greggii* (= *Senegalia greggii*), *Gutierrezia sarothrae*, *Lepidium fremontii*, *Lycium andersonii*, and *Prunus fasciculata*. Herbs can include *Achnatherum speciosum*, *Amsinckia* spp., *Bromus rubens*, *Eriogonum deflexum*, *Eriogonum inflatum*, *Erodium cicutarium*, *Penstemon* spp., *Acourtia wrightii*, *Dasyochloa pulchella*, *Physalis* spp., and *Thelypodium integrifolium*. Unknown lichens also can occur at sparse cover.

This type likely occurs within the three park areas, and the Mojave Desert in general; though, it was sampled only once in the study area in the Piute Range of the Mojave National Preserve at mid elevation, 919 m, with a somewhat gentle slope, 7 degrees. Stands also have been sampled in Red Rock Canyon National Conservation Area and other projects in the Mojave Desert. Stands are found on along intermittently flooded washes and river channels. Soil substrates include alluvial sand, gravel and rock fragments, and soil texture is typically sandy.

Open washes with sparse cover of vegetation occur throughout the region, especially in areas with high intensity, large flooding events and/or in areas with irregular flooding frequencies. Depending upon site history and flooding events, these sparsely vegetated river and wash channels can change quickly and become more vegetated by native herb and shrub species.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322A1 (Expected across Mojave Desert 322Ab-322Az and Great Basin 341Fa-341Ff)

Park Sampling Zones: **MOJA:** Piute Range (**DEVA**, **LAKE**, and **MOJA:** throughout)

Classification Confidence: Low

Rarity Rank (Global, State-CA): GNR SNR

Surveys (with Sample Sizes) Used in Description

MOJN: N=1

LAKE (n=0)

DEVA (n=0)

MOJA (n=1): MOJA9621

MOJN-Johnson (n=0)

References

VegCAMP and AIS 2013

Hymenoclea salsola – Eriogonum fasciculatum Association

NVC Association Code: CEPP006711; **Alliance Code:** A4188

Association Concept

The *Hymenoclea salsola* – *Eriogonum fasciculatum* Association forms an open shrub canopy, in which the shrub cover ranges from 11 to 20 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 2 to 12 percent cover. *Hymenoclea salsola* is dominant in the shrub layer and *Eriogonum fasciculatum* is characteristic and sub- to co-dominant in this layer. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Ambrosia dumosa*, *Atriplex canescens*, *Brickellia incana*, *Coleogyne ramosissima*, *Encelia frutescens*, *Ephedra californica*, *Ephedra nevadensis*, *Gutierrezia sarothrae*, *Larrea tridentata*, *Lycium cooperi*, *Petalonyx thurberi*, *Senecio flaccidus*, *Thamnosma montana*, and *Yucca baccata*. Commonly associated herbs include *Bromus rubens*, *Cryptantha* spp., *Erodium cicutarium*, *Mirabilis multiflora*, and *Schismus* sp.

The association is uncommon in Mojave National Preserve in California, where it was sampled at mid to upper elevations of the Mid Hills, the Van Winkle Mountains, and the Woods Mountains. Elevation ranges from approximately 900 to 1,450 meters, and elevation averages 1,185 meters. It is found primarily in washes and drainages with gentle slopes (1 to 2 degrees) on southerly aspects. Soils include sands and sandy loams and they are derived from a variety of substrates such as alluvium and rhyolite.

This association is found sporadically in the southern and central Mojave Desert to the Colorado Desert of California, occurring in episodic washes, dry swales, and small valleys surrounded by mid-elevation desert scrub including *Yucca schidigera* scrub alliance.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322A1

Park Sampling Zones: MOJA: Mid Hills, Van Winkle Mtn, Woods Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=0):

MOJA (n=4): MOJA0506, MOJA9673, MOJAE225, MOJAE226

MOJN-Johnson (n=2): MOJJE080, MOJJE102

References

Keeler-Wolf et al. 1998, Keeler-Wolf and Thomas 2000

Hymenoclea salsola – Larrea tridentata Association

NVC Association Code: CEG005753; **Alliance Code:** A4188

Association Concept

The *Hymenoclea salsola* – *Larrea tridentata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 6 to 61 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.5 percent cover, and the herb understory is variable and ranges from 0 to 22 percent cover. *Hymenoclea salsola* is the dominant shrub and *Larrea tridentata* is co-dominant. *Ambrosia dumosa* is characteristic, and other commonly occurring shrubs include *Acacia greggii* (= *Senegalia greggii*) and *Cylindropuntia* spp. Commonly associated herbs include *Erodium cicutarium* and *Schismus* sp.

The association is found in low-gradient drainage channels, basins, and valley floors throughout Death Valley National Park, Mojave National Preserve, and Joshua Tree National Park in California, and Lake Mead National Recreation Area in Arizona and Nevada. It was sampled at low to upper elevations ranging from approximately 250 to 1,450 meters with an elevation average of 887 meters. It is found primarily on gentle slopes (approximately ranging 0 to 5 degrees) on variable aspects. Soils are usually sandy and gravelly, and derived from a variety of substrates but primarily alluvium.

This association occurs commonly in intermittently flooded, low-gradient washes, basins, and alluvial fans with terminal washes, and other disturbed areas (e.g., roadsides, ghost towns), within the Mojave Desert and into the southern Great Basin and Sonoran Desert of California.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (38): 322Ab, 322Ac, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (3): 341Fc, 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Cottonwood Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Vly, Owlshead Mtns, Panamint Mtns; **LAKE:** Boulder City, Callville, Cottonwood Cove, Juniper Mine, Katherine, Lakeshore, Temple Bar, Willow Beach; **MOJA:** Budweiser Wash, Cima Dome SE, Clipper Vly, Ivanpah Mtns, Ivanpah Vly, Kelso Mtns, Marl Mtns, Old Dad Mtns, Van Winkle Mtn, Vulcan Mine

Classification Confidence: High

Rarity Rank (Global, State-CA): G4 S4

Surveys (with Sample Sizes) Used for Description

MOJN: N=57

LAKE (n=11): LAKE0209, LAKE0334, LAKE0379, LAKE0401, LAKE0607, LAKE9228, LAKE9243, LAKE9319, LAKE9359, LAKE9622, LAMEN019

DEVA (n=8): DEVA0319, DEVA9337, DEVA9362, DEVA9513, DEVAD159, DEVAD212, DEVAS194, MOJC1052

MOJA (n=22): MOJA9282, MOJA9285, MOJA9312, MOJA9316, MOJA9526, MOJA9593, MOJA9594, MOJA9611, MOJA9666, MOJAE014, MOJAE016, MOJAE021, MOJAE163,

MOJAE251, MOJAE253, MOJAE255, MOJAE259, MOJAE260, MOJAE261, MOJAE262,
MOJAE263, MOJAE264
MOJN-Johnson (n=16): MOJJE001, MOJJE182, MOJJE191, MOJJE290, MOJJE338, MOJJE519,
MOJJE546, MOJJE562, MOJJE563, MOJJE586, MOJJE600, MOJJE674, MOJJE749, MOJJE919,
MOJJE920, MOJJE924

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000

Senna armata – Hymenoclea salsola Wash Association

NVC Association Code: CEPP006756; **Alliance Code:** A4188

Association Concept

The *Senna armata* – *Hymenoclea salsola* Wash Association forms an open shrub canopy, in which the shrub cover ranges from 10 to 27 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 1 to 10 percent cover. *Senna armata* is dominant or co-dominant with other shrubs including *Hymenoclea salsola* and/or *Larrea tridentata* in the shrub canopy. Other shrubs often present include *Ambrosia dumosa*, *Thamnosma montana*, and *Yucca schidigera*. Characteristic herbs include *Bromus rubens* and *Erodium cicutarium*, and those often present are *Amsinckia* spp., *Cryptantha* spp., *Salvia columbariae*, and *Schismus* spp.

The association is found often in the Mojave Desert ecoregion, including in Death Valley National Park, Joshua Tree National Monument, and Mojave National Preserve in California, and in Lake Mead National Recreation Area, in Nevada, where it is found along gently sloping (1 to 7 degrees), mid to upper elevations arroyos, washes, and upper bajada pediment surfaces. Elevation ranges from approximately 600 to 1,300 meters, and elevation averages 983 meters. Soils often are coarse sand and loamy sand, and sometimes sandy loam, and they are alluvium derived from a variety of substrates such as granite, gneiss, and tephrite.

Similar to *Bebbia juncea* stands, stands with *Senna armata* dominant or co-dominant occur in gravelly and cobbly washes with intermittent or seasonal flooding often within or below mountain slopes, while stands dominated solely by *Hymenoclea salsola* occur further down in washes on bajadas with more intermittent disturbance and/or finer alluvial sediment. These stands occur in both the Mojave Desert of California and Nevada and the Sonoran Desert of California.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Ad, 322Ai, 322Aj, 322Al, 322Am

Park Sampling Zones: **DEVA:** Green Water Rng/Vlly; **LAKE:** Bridge Canyon; **MOJA:** Cima Dome NW, Cima Dome SE, Cinder Cones, Clipper Vlly, Kelso-Cima, Turquoise Mountain, Van Winkle Mtn, Vulcan Mine

Classification Confidence: High

Rarity Rank (Global, State-CA): GNR SNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=28

LAKE (n=2): LAMEN046, LAMEN047

DEVA (n=2): DEVA0503, DEVA9605

MOJA (n=10): MOJA0147, MOJA0514, MOJA9366, MOJA9518, MOJA9600, MOJA9667, MOJA9683, MOJA9802, MOJC0023, MOJC0799

MOJN-Johnson (n=14): MOJJE040, MOJJE121, MOJJE134, MOJJE149, MOJJE196, MOJJE199, MOJJE277, MOJJE325, MOJJE390, MOJJE722, MOJJE826, MOJJE912, MOJJE921, MOJJE922

References

cf. Evens et al. 2012, cf. Keeler-Wolf and Thomas 2000

Keckiella antirrhinoides – Prunus fasciculata (provisional) Association

NVC Association Code: CEPP006717; **Alliance Code:** A4185

Association Concept

The *Keckiella antirrhinoides* – *Prunus fasciculata* (provisional) Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 12 to 22 percent cover. The emergent tree layer is sparse, if present, and the herb understory is variable and ranges from 1 to 14 percent cover. *Keckiella antirrhinoides* is dominant or co-dominant in the shrub overstory, and *Prunus fasciculata* along with *Acacia greggii* (= *Senegalia greggii*), *Ephedra nevadensis*, *Ericameria linearifolia*, *Eriogonum fasciculatum*, *Salvia mohavensis*, *Stephanomeria pauciflora*, *Yucca schidigera* are characteristic in this layer at lower cover. Other shrubs often present include *Echinocereus engelmannii*, *Ephedra nevadensis*, *Ephedra viridis*, *Galium stellatum*, and *Thamnosma montana*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Cryptantha* spp., and *Erodium cicutarium*, and nonvascular plants include lichen and moss.

The association is rare, found primarily on granitic bedrock slopes such as in the Granite Mountains in the Mojave National Preserve and along wind-flagged Wilson Ridge in the Lake Mead National Recreation Area. It was sampled at mid to upper elevations, ranging from approximately 1,000 to 1,400 meters, with an elevation average of 1,192 meters. It occurs on low to high slopes, that are steep (from 28 to 31 degrees), and on northerly and easterly aspects. Soils are loamy sand or sandy loam, which are derived from granitic substrate.

This association is localized in the central and northern Mojave Desert, particularly along bouldery canyon walls and ridges with granitoid parent material.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Ai, 322Al

Park Sampling Zones: **MOJA:** Granite Mtns; **LAKE:** Temple Bar

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 S2

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=0): LAKE9711,

DEVA (n=5):

MOJA (n=5): MOJA9918, MOJA9455

MOJN-Johnson (n=0):

References

None

Prunus fasciculata – (Purshia stansburiana – Viguiera reticulata) Association

NVC Association Code: CEG006863; **Alliance Code:** A4185

Association Concept

The *Prunus fasciculata* – (*Purshia stansburiana* – *Viguiera reticulata*) Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 36 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 26 percent cover. *Prunus fasciculata* is co-dominant in the shrub overstory, and *Purshia stansburiana* is characteristic and typically is co-dominant or sub-dominant. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Echinocereus engelmannii*, *Ephedra viridis*, *Gutierrezia sarothrae*, *Opuntia phaeacantha*, *Stephanomeria pauciflora*, *Viguiera reticulata*, and *Yucca baccata*. Commonly associated herbs include *Achnatherum speciosum*, *Elymus elymoides*, *Erodium cicutarium*, and *Sphaeralcea ambigua*, and nonvascular plants include moss.

The association is uncommon, found in primarily calcareous limestone/dolomite substrates of the Cottonwood Mountains, Greenwater Valley, and Last Chance Range of Death Valley National Park, of the Clark and Providence Mountain ranges of Mojave National Preserve, and of the Spring Mountains in Red Rock Canyon National Conservation Area in Nevada. It was sampled at mid to upper elevations, ranging from approximately 850 to 1,900 meters, with an elevation average of 1,443 meters. It occurs on variable slope positions, on gentle to steep slopes (4 to 45 degrees), and on variable aspects.

This association is localized in the central and northern Mojave Desert to the southern Great Basin in both California and Nevada, particularly along calcareous washes, canyon bottoms, and adjacent canyon walls.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322Ad, 322Aj, 322Al; Southeastern Great Basin (4): 341Fc

Park Sampling Zones: DEVA: Cottonwood Mtns, Green Water Rng/Vlly, Last Chance Range;
MOJA: Clark Mtn, Clark Mtn West, Providence Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G2? S2

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0):

DEVA (n=5): DEVA9455, DEVA9803, DEVA9804, DEVAS418, MOJC0526

MOJA (n=5): MOJA9143, MOJAE073, MOJAE074, MOJAE075, MOJAE167

MOJN-Johnson (n=0):

References

Evens 2000, Keeler-Wolf and Thomas 2000

Prunus fasciculata – Ambrosia eriocentra Association

NVC Association Code: CEG005773; **Alliance Code:** A4185

Association Concept

The *Prunus fasciculata* – *Ambrosia eriocentra* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 7 to 48 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 6 percent cover, and the herb understory is variable and ranges from 0 to 18 percent cover. *Prunus fasciculata* is typically co-dominant with *Ambrosia eriocentra* in the shrub layer, and *Salvia dorrii* is also characteristically present in this layer. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Cylindropuntia acanthocarpa*, *Eriogonum fasciculatum*, and *Hymenoclea salsola*. Commonly associated herbs include *Amsinckia* spp., *Bromus rubens*, *Erodium cicutarium*, *Penstemon palmeri*, *Salvia columbariae*, and *Sphaeralcea ambigua*. Trees sometimes present include *Juniperus osteosperma*, *Pinus monophylla*, and *Yucca brevifolia*.

The association is found in Mojave National Preserve and Castle Mountains National Monument in California, where it was sampled in mid to upper elevation washes and arroyos coming off the base of mountains, some of which have had recent burn history. Elevation ranges from approximately 1,150 to 1,550 meters, and elevation averages 1,361 meters. This association is found on mostly gentle slopes (ranging 1 to 6 degrees) at varying aspects, though primarily southerly. Soils include sands and sandy loams and are derived from a variety of substrates such as alluvium, gneiss, granodiorite, and rhyolite.

This association is found in the Mojave Desert of California within actively flooded portions of gravelly and cobbly washes and canyon drainages near the base of mountains.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Ak, 322Al

Park Sampling Zones: MOJA: Castle Mtns, Lanfair Vlly, Mid Hills, New York Mtns, Providence Mtns, Woods Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G4? S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=14

LAKE (n=0):

DEVA (n=0):

MOJA (n=14): CAMO8101, MOJA0270, MOJA0292, MOJA0808, MOJA9291, MOJA9357, MOJA9359, MOJA9387, MOJA9504, MOJA9510, MOJAE243, MOJAE244, MOJAE245, MOJAE247

MOJN-Johnson (n=0):

References

Evens 2000

Prunus fasciculata – Rhus trilobata Association

NVC Association Code: CEPP006741; **Alliance Code:** A4185

Association Concept

The *Prunus fasciculata* – *Rhus trilobata* Association forms an open shrub canopy, in which the shrub cover ranges from 12 to 29 percent cover. The emergent tree layer is usually absent, and the herb understory is variable and ranges from 1 to 7 percent cover. *Prunus fasciculata* is co-dominant in the shrub canopy with *Rhus trilobata* and other characteristic shrubs such as *Artemisia ludoviciana*, *Echinocereus engelmannii*, *Eriogonum fasciculatum*, and *Stephanomeria pauciflora*. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Artemisia dracunculus*, *Baccharis sergiloides*, *Brickellia californica*, *Brickellia longifolia*, *Cylindropuntia acanthocarpa*, *Ephedra viridis*, *Ericameria linearifolia*, *Gutierrezia microcephala*, *Gutierrezia sarothrae*, *Hymenoclea salsola*, *Salazaria mexicana*, *Salvia mohavensis*, *Thamnosma montana*, and *Yucca baccata*. Commonly associated herbs include *Achnatherum speciosum*, *Erodium cicutarium*, *Oenothera caespitosa*, *Penstemon palmeri*, and *Sphaeralcea ambigua*. Trees, if present, include *Yucca brevifolia*. Nonvascular plants include lichen.

The association is uncommon in Lake Mead National Recreation Area in Arizona, where it was sampled in Grapevine Canyon, and in Mojave National Preserve in California, where it was found in the Clark and Providence Mountains ranges. It was sampled at low to upper elevations, ranging from approximately 750 to 1,650 meters, with an elevation average of 1,247 meters. This association is found primarily in canyons and drainage channels on gentle to moderate slopes (2 to 8 degrees) and on variable aspects. Soils are sandy and derived from a variety of substrates such as granodiorite, limestone/dolostone, and sandstone.

This association is found in the Mojave Desert in Arizona, California, and Nevada within mountain drainages and adjacent colluvial, rocky canyon walls.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Aj, 322Al, 322Av

Park Sampling Zones: LAKE: Pearce Ferry; MOJA: Clark Mtn, Providence Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3? S2

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=1): LAKE0425

DEVA (n=0):

MOJA (n=3): MOJAE166, MOJAE240, MOJAE241

MOJN-Johnson (n=0):

References

Evens 2000, Evens et al. 2012, Keeler-Wolf and Thomas 2000

Salvia dorrii Wash Association

NVC Association Code: CEG005774; **Alliance Code:** A4185

Association Concept

The *Salvia dorrii* Wash Association forms an open shrub canopy, in which the shrub cover ranges from 13 to 29 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 2 to 12 percent cover. *Salvia dorrii* is dominant or co-dominant in the shrub canopy with other characteristic shrubs *Cylindropuntia acanthocarpa*, *Salazaria mexicana*, and *Thamnosma montana*. *Prunus fasciculata* occurs often at relatively high cover (sometimes co-dominant), and other shrubs often present at lower cover include *Acacia greggii* (= *Senegalia greggii*), *Ambrosia eriocentra*, *Echinocereus engelmannii*, *Encelia virginensis*, *Ephedra nevadensis*, *Escobaria vivipara*, *Gutierrezia microcephala*, *Hymenoclea salsola*, *Rhus trilobata*, *Stephanomeria pauciflora*, *Yucca baccata*, and *Yucca schidigera*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Adenophyllum cooperi*, *Eriogonum inflatum*, *Erodium cicutarium*, *Mirabilis pumila*, *Oenothera caespitosa*, *Penstemon palmeri*, *Sphaeralcea ambigua*, and *Tridens muticus*. Trees sometimes to often present include *Yucca brevifolia*.

The association is found in mid to upper elevation arroyos and drainage channels of the Castle Mountains, Clark Mountains, Ivanpah Mountains, Woods Mountains, and Lanfair Valley of the Mojave National Preserve in California. Elevation ranges from approximately 1,150 to 1,600 meters, and elevation averages 1,385 meters. It is found on gentle to moderate slopes (2 to 11 degrees) on variable aspects. Soils include sands and sandy loams, and they are derived from a variety of substrates such as alluvium, gneiss, limestone, rhyolite, and sandstone.

This association occurs within intermittently flooded arroyos and washes in the eastern Mojave Desert in California, often on gravelly alluvium with nutrient poor sediments from limestone/dolomite, rhyolite, and such. It also may be found in small patches on slopes in post-burn rocky highland environments, such as in the Woods Mountains in the Hackberry Complex.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (13): 322Aj, 322Al

Park Sampling Zones: MOJA: Castle Mtns, Clark Mtn, Clark Mtn West, Ivanpah Mtns, Lanfair Villy, Woods Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=15

LAKE (n=0); DEVA (n=0); MOJA (n=13): CAMO9121, MOJA9104, MOJA9135, MOJA9299, MOJA9348, MOJAE044, MOJAE051, MOJAE171, MOJAE175, MOJAE176, MOJAE179, MOJAE180, MOJAE181

MOJN-Johnson (n=2): MOJJE601, MOJJE655

References

Evens 2000, Keeler-Wolf and Thomas 2000

***Psorothamnus fremontii* – *Ambrosia dumosa* Association**

NVC Association Code: CEPP006742; **Alliance Code:** A4186

Association Concept

The *Psorothamnus fremontii* – *Ambrosia dumosa* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 17 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 12 percent cover. *Psorothamnus fremontii* is the dominant shrub in the overstory along with characteristically occurring *Ambrosia dumosa*, *Krameria erecta*, and *Opuntia basilaris*. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Amphipappus fremontii*, *Bebbia juncea*, *Encelia farinosa*, *Ephedra* spp., *Ephedra torreyana*, *Eriogonum fasciculatum*, *Ferocactus cylindraceus*, *Larrea tridentata*, and *Stephanomeria pauciflora*. Commonly associated herbs include *Amsinckia* spp., *Chaenactis* spp., *Cryptantha* spp., *Eriogonum inflatum*, *Pectocarya* spp., *Phacelia crenulata*, *Plantago ovata*, and *Sphaeralcea ambigua*.

The association is found in Lake Mead National Recreation Area, Red Rock Canyon National Conservation Area, and beyond in Nevada, sampled at low to mid elevations. Elevation ranges from approximately 500 to 1,200 meters, and elevation averages 903 meters. It is found on variable slope positions, with slopes ranging from gentle to somewhat steep (3 to 20 degrees), and on variable aspects. Soils include loamy sand and sandy loam, and they are derived from a variety of substrates such as basalt, gneiss, and sandstone/limestone.

This association is found on lower slopes and toe-slope along hills and mountains that transition between creosote – white bursage scrub and mid-elevation mixed desert scrub within the Mojave Desert of Nevada. Shrub cover is variable from sparse to open in cover, which could be related to nutrient availability as stands are often found on nutrient-poor calcareous or volcanic sediments.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Az

Park Sampling Zones: LAKE: Boulder City, Callville

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3? SU

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=4): LAKE0308, LAKE0331, LAKE0513, LAKE9332

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

3. Desert & Semi-Desert Class

3.A.2 Warm Desert & Semi-Desert Scrub & Grassland Formation

3.A.2.Na North American Warm Desert Scrub & Grassland Division

M117. North American Warm Semi-Desert Cliff, Scree & Rock Vegetation Macrogroup

G569. North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation Group

Atriplex hymenelytra Scrub Alliance

Atriplex hymenelytra Sparse Association

NVC Association Code: CEPP005798; **Alliance Code:** A0872

Association Concept

The *Atriplex hymenelytra* Sparse Association has sparse shrub and herb layers, in which the shrub layer ranges from 0.5 to 4 percent cover and the herb layer ranges from 0 to 6 percent cover. The tree layer is usually absent. *Atriplex hymenelytra* is characteristically present in the shrub layer, and other shrubs sometimes present include *Ambrosia dumosa* and *Larrea tridentata*. Various herbs occur including *Eriogonum inflatum*, *Cryptantha* spp., and *Atrichoseris platyphylla* which are sometimes present.

The association is found scattered along gravelly, bajadas and hill slopes across Death Valley National Park, California, and in the Lakeshore Rd. area of Lake Mead National Recreation Area, Nevada. It occurs at low to mid elevations (ranging from approximately -50 to 950 meters, and averages 335 meters). Slopes are flat to steep (ranging from 0 to 35 degrees). It is found at all landscape positions at primarily westerly aspects. Soils are usually a mixture of loam and sand, and are derived typically from sedimentary substrates such as alluvium, sandstone, and gypsum, but also volcanic types including basalt and rhyolite. Sites are usually hot, dry alluvial fans that often have a well-developed desert pavement dissected by small washes on older alluvial landforms, or on nutrient-poor gypsum hills.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Ab, 322Ad, 322Ae, 322Ay Southeastern Great Basin (3): 341Fc, 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Death Vly, Eureka Vly, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Panamint Dunes, Panamint Mtns; **LAKE:** Lakeshore

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): GNR SU

Surveys (with Sample Sizes) Used for Description

MOJN: N=24

LAKE (n=1): LAKE0702

DEVA (n=23): DEVA0429, DEVA9183, DEVA9369, DEVA9383, DEVA9390, DEVA9392, DEVAR049, DEVAR094, DEVAS019, DEVAS115, MOJC0542, MOJC0559, MOJC0585,

MOJC0663, MOJC0713, MOJC0740, MOJC0741, MOJC0742, MOJC0744, MOJC0745,
MOJC0746, MOJC0895, MOJC0897
MOJA (n=0): ; MOJN-Johnson (n=0):

References

cf. Keeler-Wolf and Thomas (for Rock and *Atriplex hymenelytra*)

Atriplex hymenelytra – Ambrosia dumosa Association

NVC Association Code: CEG005740; **Alliance Code:** A0872

Association Concept

The *Atriplex hymenelytra* – *Ambrosia dumosa* Association forms a sparse to open herb and shrub layers, in which the shrub layer ranges from 4 to 21 percent cover and the herb layer ranges from 0.1 to 20 percent cover. The tree layer is usually absent. *Ambrosia dumosa* and *Atriplex hymenelytra* are characteristically present and dominant or co-dominant in the shrub layer. Shrubs that are often present include *Larrea tridentata*, and those sometimes present are *Echinocactus polycephalus*, *Opuntia basilaris*, *Encelia farinosa*, and *Stephanomeria pauciflora*. *Eriogonum inflatum* is often present in the herb layer, while herbs sometimes present include *Chorizanthe rigida*, *Cryptantha* spp., *Plantago ovata*, *Schismus* spp., and *Xylorhiza tortifolia*.

The association is found commonly along gravelly bajadas and slopes in Death Valley National Park, California, and rarely in Lake Mead National Recreation Area, Arizona. It occurs in low to upper elevations (from approximately 300 to 1,300 meters, and averages 704 meters). Slopes are gentle to very steep (ranging from 3 to 49 degrees). It is found primarily on all slope positions at generally non-westerly aspects. Soils range from sand to loam, but occasionally from clay loam or silty clay. They are typically derived from sedimentary substrates such as alluvium, conglomerate, sandstone, and limestone, but sometimes rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (15): 322Ab, 322Ac, 322Ad, 322Af, 322Am, 322Av Southeastern Great Basin (3): 341Fc, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Death Valley, East of Deadman Pass, Funeral Mtns, Grapevine Mtns, Last Chance Rng, Owlshead Mtns, Panamint Mtns; **LAKE:** Temple Bar

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): GNR SNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=18

LAKE (n=2): LAKE0397, LAKE9352; DEVA (n=16): DEVA0395, DEVA9289, DEVA9407, DEVA9500, DEVAD094, DEVAD196, DEVAS013, DEVAS153, MOJC0374, MOJC0499, MOJC0540, MOJC0564, MOJC0586, MOJC0588, MOJC0591, MOJC0592; MOJA (n=0): ; MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

***Atriplex hymenelytra* – *Larrea tridentata* Association**

NVC Association Code: CEG001264; **Alliance Code:** A0872

Association Concept

The *Atriplex hymenelytra* – *Larrea tridentata* Association forms a sparse to open herb layer, in which the herbaceous cover ranges from 0 to 11 percent cover. The emergent tree layer is absent to sparse and ranges from 0 to 0.1 percent cover, and the shrub layer is sparse to open and ranges from 1 to 21 percent cover. *Atriplex hymenelytra* and *Larrea tridentata* are characteristically present and dominant or co-dominant in the shrub layer. Other shrubs sometimes associated include *Opuntia basilaris*, *Ambrosia dumosa*, and *Tidestromia* spp. *Plantago ovata*, *Eriogonum inflatum*, and *Chorizanthe rigida* sometimes occur in the herbaceous layer, and those trees rarely present include *Prosopis glandulosa*.

The association is commonly found in the Mojave Desert, such as across Death Valley National Park, California, but known less commonly in Mojave National Preserve's Cinder Cones area and in the Callville Bay, Government Wash, and Temple Bar areas of Lake Mead National Recreation Area in Arizona and Nevada. It is usually found on alluvial fans with drainages and interfluvies on all slope positions at typically easterly to southwesterly aspects. It occurs at mid to upper elevations (ranging from approximately 50 to 1,300 meters, and averages 508 meters). Slopes are gentle to somewhat steep (ranging from 0 to 25 degrees). Soils typically range between loam and sand, though silt clays also occurs. The soils are usually derived from sedimentary substrates, such as alluvium or sandstone, but occasionally from igneous types like rhyolite, basalt, or tephrite (basanite).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (20): 322Ab, 322Ad, 322Aj, 322Am, 322Ar, 322Ay, 322Az; Southeastern Great Basin (6): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Cottonwood Mtns, Death Valley, Devil's Hole, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Panamint Mtns, Saline Valley; **LAKE:** Callville, Government Wash, Temple Bar; **MOJA:** Cinder Cones

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=25

LAKE (n=4): LAKE0628, LAKE9353, LAKE9388, LAKE9420

DEVA (n=20): DEVA0128, DEVA9273, DEVA9332, DEVA9394, DEVA9965, DEVAD084, DEVAD195, DEVAD202, DEVAS006, MOJC0420, MOJC0560, MOJC0562, MOJC0584, MOJC0665, MOJC0743, MOJC0867, MOJC0868, MOJC0874, MOJC0875, MOJC1184

MOJA (n=1): MOJC0154

MOJN-Johnson (n=0):

References

cf. NatureServe 2012, cf. Keeler-Wolf and Thomas 2000 (for *Larrea tridentata* – *Atriplex hymenelytra* association, and for *Atriplex hymenelytra* – *Larrea tridentata* – *Ambrosia dumosa* assoc, which we are merging here)

Atriplex hymenelytra – *Tidestromia oblongifolia* Association

NVC Association Code: CEG005741; **Alliance Code:** A0872

Association Concept

The *Atriplex hymenelytra* – *Tidestromia oblongifolia* Association forms a sparse layer of both shrubs and herbs, in which the shrub layer ranges from 0.6 to 9 percent cover, and the herbaceous cover ranges from 0 to 5 percent cover. The emergent tree layer is typically absent. *Atriplex hymenelytra* and *Tidestromia oblongifolia* are characteristically present in the shrub layer, in which either may be dominant or co-dominant though usually at very low cover. The herbaceous layer is variable, often depending on rainfall, and includes ephemeral annual herbs such as *Anulocaulis annulatus*, *Atrichoseris platyphylla*, *Camissonia claviformis*, *Chamaesyce* spp., *Chorizanthe rigida*, *Cryptantha* spp., *Dalea mollissima*, *Eremalche rotundifolia*, and *Geraea canescens*. Other shrubs are sometimes to rarely present including *Ambrosia dumosa*, *Larrea tridentata*, and *Suaeda moquinii*.

The association is found commonly in Death Valley National Park in California, sampled at low elevation alluvial fans/bajadas, dune aprons, and steep colluvium. Expansive stands occur along with alluvial fans draining into Death Valley, and extensive stands occur on the disturbed fringe of the Dumont Dunes adjacent to OHV staging areas. Stands occur upon all aspects of bajadas though drier south and west aspects were most often. Elevation ranges from approximately -45 to 362 meters, and averages 139 meters. Slopes are gentle to moderately steep (ranging from 1 to 20 degrees). Soils include sand to loam, and they are derived usually from alluvial substrates and sometimes volcanic or sedimentary rock. Both desert pavement and intermittent wash rivulets often occur along the bajada landform where this association is found, whereby the ground surface is often hot and dry. The plants often endure drought-conditions and fluctuate in cover and decadence. Thomas et al. (2004) suggested that *Tidestromia oblongifolia* becomes common in degraded sites where *Atriplex* spp. occur.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (23), Southeastern Great Basin (1): 322Ab, 322Ad, 341Fc

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Death Valley, Grapevine Mtns;

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=24

LAKE (n=0):

DEVA (n=24): DEVA9602, DEVA9618, DEVAD226, DEVAR003, DEVAR004, DEVAR030, DEVAR050, DEVAR053, DEVAR065, DEVAR079, DEVAS007, DEVAS009, MOJC0662, MOJC0712, MOJC0869, MOJC0899, MOJC0900, MOJC0901, MOJC1086, MOJC1087, MOJC1088, MOJC1182, MOJC1183, MOJC1185

MOJA (n=0): MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000, cf. Thomas et al. 2004

***Chorizanthe rigida* – *Geraea canescens* Desert Pavement Association**

NVC Association Code: CEG009686; **Alliance Code:** A4024

Association Concept

The *Chorizanthe rigida* – *Geraea canescens* Desert Pavement Association forms an open to intermittent herb layer, in which the herbaceous cover ranges from 0 to 52 percent cover. The tree layer is usually absent, and the shrub layer is sparse and ranges from 0 to 2 percent cover.

Chorizanthe rigida and/or *Geraea canescens* is characteristically present, and either may be dominant or co-dominant with a variety of other herbs in the herbaceous layer. Other commonly associated herbs include species of the following genera: *Camissonia*, *Chaenactis*, *Cryptantha*, *Eriogonum*, *Pectocarya*, and *Schismus*. Shrubs that are often or sometimes present with sparse cover include *Atriplex hymenelytra* and *Larrea tridentata*.

The association is found commonly in the Mojave Desert including in Death Valley National Park, California (such as in Death Valley, Eureka Valley, and various mountain bajadas), and in Mojave National Preserve (such as Cow Hole Mtns), and Lake Mead National Recreation Area (such as near Government Wash in Nevada). The habitat is typically bajada often with well-developed desert pavement interrupted by wash rivulets. It is observed at low to mid elevations (ranging from -100 to 900 meters, and averages 211 meters). Slopes are gentle to somewhat steep (ranging from 0 to 23 degrees). It is found primarily, though not exclusively, on low lying areas such as low slopes or valleys floors at typically western to southerly aspects. Soils are usually sand, but sometimes have a loam or, infrequently, a clay or silt component. They are usually derived from alluvium, but other substrates can occur, such as conglomerate, dune sand, rhyolite or sandstone.

The germination and abundance of *Chorizanthe rigida*, *Geraea canescens*, and related annual herbs vary among years depending on annual precipitation and temperature patterns. Their seeds can persist in seed banks for decades awaiting optimum fall and winter climate conditions. In El Niño years, their abundance can be substantial, covering desert pavement, bajadas, and hills in vibrant green and gold hues.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (13): 322Ab, 322Ad, 322Af, 322Ai, 322Ay Southeastern Great Basin (1): 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Death Valley, Eureka Valley, Owlshead Mtns; **LAKE:** Government Wash; **MOJA:** Cow Hole Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=14

LAKE (n=1): LAKE0188; DEVA (n=12): DEVA0178, DEVA0184, DEVA0381, DEVA9182, DEVA9291, DEVA9298, DEVA9447, DEVAD229, DEVAD230, DEVAS004, DEVAS008, DEVAS011; MOJA (n=1): MOJA9182; MOJN-Johnson (n=0)

References

VegCAMP and AIS 2013, Evens et al. 2012, NatureServe 2012, Thomas et al. 2004

NVC Association Code: CEG005770; **Alliance Code:** A3143

Association Concept

The *Peucephyllum schottii* – *Eucnide urens* – *Pleurocoronis pluriseta* Association forms a sparse to open herb layer, in which the herbaceous cover ranges from 0 to 10 percent cover. The tree layer is typically absent, and the shrub layer is sparse to open and ranges from 0.3 to 12 percent cover. Shrubs that are characteristically present include *Eucnide urens* and *Peucephyllum schottii*, and other shrubs often present include *Encelia farinosa*, *Eriogonum fasciculatum*, and *Pleurocoronis pluriseta*. Sometimes *Pleurocoronis pluriseta* is dominant with or without the other two indicator shrub species of this alliance, other instances *Peucephyllum* may be dominant or co-dominant. Herbs that are often to sometimes present include *Bromus rubens*, *Nicotiana obtusifolia*, *Pterostegia drymarioides*, and *Sphaeralcea ambigua*. Nonvascular plants sometimes occur including cryptogamic crust.

The association is found in Death Valley National Park, California, and Lake Mead National Recreation Area, Arizona and Nevada, in areas where bedrock and/or boulders are a dominating component of the surface cover. It is observed at low to upper elevations (ranging from approximately 150 to 1,300 meters, and averaging 619 meters). Slopes are gentle to abrupt (between 6 to 90 degrees). It is found primarily on channel walls or on steep and bouldery, high to mid slope positions with no aspect preference. Soils are typically clay loam, and are derived mostly from sedimentary substrates such as sandstone, limestone or dolostone (dolomite), but sometimes igneous types.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (10): 322Ad, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (8): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Cottonwood Mtns, Grapevine Mtns, Last Chance Range, Panamint Mtns; **LAKE:** Boulder City, Callville, Cottonwood Cove, Echo Bay, Parashant, Temple Bar, Willow Beach

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=18

LAKE (n=9): LAKE9106, LAKE9116, LAKE9123, LAKE9220, LAKE9358, LAKE9409, LAKE9437, LAKE9438, LAKE9527

DEVA (n=9): DEVA9472, DEVA9491, DEVA9823, DEVA9926, DEVAD061, DEVAD105, DEVAD227, DEVAS116, MOJC0925

MOJA (n=0): MOJN-Johnson (n=0):

References

Evens et al. 2012

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M093. Great Basin Saltbush Scrub Macrogroup

G300. Intermountain Shadscale - Saltbush Scrub Group

Atriplex confertifolia Scrub Alliance

Atriplex confertifolia – *Ambrosia dumosa* Association

NVC Association Code: CEG005739; **Alliance Code:** A0870

Association Concept

The *Atriplex confertifolia* – *Ambrosia dumosa* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 5 to 48 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 12 percent cover. *Ambrosia dumosa* and *Atriplex confertifolia* are co-dominant in the shrub canopy. Other shrubs often present include *Amphipappus fremontii*, *Echinocactus polycephalus*, *Larrea tridentata*, and *Opuntia basilaris*. Commonly associated herbs include *Eriogonum inflatum* and *Xylorhiza tortifolia*.

The association is found often in Death Valley National Park in California, from the northern Last Chance Range south to the Black Mountains and Panamint Range, sampled at low to upper elevations. It occurs on rocky slopes up to ridges and along gravelly upper bajadas. Elevation ranges from approximately 850 to 1,550 meters, and elevation averages 1,100 meters. It is found primarily on rock scree slopes, with slopes ranging from gentle to steep (0 to 36 degrees), and on variable aspects. Soils include clay and sandy loams, and they are derived from a variety of substrates though most often volcanic and dolostone (dolomite) / limestone sediments.

This association is found in the northern Mojave Desert and southern Great Basin on rocky bajadas and rocky erosional highlands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322Ab, 322Ad, 322Ae; Southeastern Great Basin (6): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Funeral Mtns, Grapevine Mtns, Last Chance Range, Last Chance Vly, Panamint Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G4? S4?

Surveys (with Sample Sizes) Used for Description

MOJN: N=15

LAKE (n=0):

DEVA (n=14): DEVA0648, DEVA9208, DEVA9424, DEVA9608, DEVAD187, DEVAS131, DEVAS188, MOJC0419, MOJC0460, MOJC0571, MOJC0595, MOJC0655, MOJC0690, MOJC0705

MOJA (n=0):

MOJN-Johnson (n=1): MOJJE615

References

Keeler-Wolf and Thomas 2000

Atriplex confertifolia – Lepidium fremontii Association

NVC Association Code: CEPP005796; **Alliance Code:** A0870

Association Concept

The *Atriplex confertifolia* – *Lepidium fremontii* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 5 to 43 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 0 to 14 percent cover. *Atriplex confertifolia* is co-dominant in the overstory along with characteristic shrubs *Lepidium fremontii* and *Echinocactus polycephalus*. Other shrubs often present include *Ambrosia dumosa*, *Eriogonum fasciculatum*, and *Stephanomeria pauciflora*. Commonly associated herbs include *Bromus rubens*, *Dasyochloa pulchella*, *Dedekera eurekaensis*, *Eriogonum inflatum*, *Sphaeralcea ambigua*, and *Xylorhiza tortifolia*. The shrub and herb layers are often species-rich. Nonvascular plants include cryptogamic crust.

The association is found in Death Valley National Park in California, and was sampled at mid to upper elevations, ranging from approximately 850 to 1,750 meters, and elevation averages 1,197 meters. It is found primarily on rock outcrops and bedrock canyon walls on slopes ranging from gentle to steep (1 to 34 degrees) on variable aspects. Soils include primarily clay loams as well as silty and sandy loams, and loamy sands. They are derived from a variety of substrates such as alluvium, limestone, rhyolite, dolostone (dolomite), and, most often sandstone.

This association is found in the northern Mojave Desert and southern Great Basin often on steep, rocky erosional slopes and canyon walls. The parent material is often nutrient-poor limestone/dolomite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Ad, 322Ae; Southeastern Great Basin (9): 341Fc, 341Fd, 341Fe

Park Sampling Zones: DEVA: Cottonwood Mtns, Funeral Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Nelson Range, Panamint Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3? S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=0):

DEVA (n=12): DEVA9230, DEVA9274, DEVA9439, DEVA9530, DEVA9547, DEVAS169, MOJC0059, MOJC0060, MOJC0064, MOJC0459, MOJC0703, MOJC0706

MOJA (n=0): ; MOJN-Johnson (n=0):

References

None

Atriplex confertifolia – Suaeda moquinii Association

NVC Association Code: CEPP005797; **Alliance Code:** A0870

Association Concept

The *Atriplex confertifolia* – *Suaeda moquinii* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 12 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 5 percent cover. *Atriplex confertifolia* is dominant in the shrub canopy along with *Suaeda moquinii*, which is co-dominant. Other shrubs often present include *Larrea tridentata*, *Lepidium fremontii*, and *Psoralea argemone*. Commonly associated herbs include *Descurainia pinnata*, *Eriogonum inflatum*, and *Schismus* spp. and those trees sometimes present include *Prosopis glandulosa*.

The association is uncommon and sampled around Rogers Wash to the lake area of Lake Mead National Recreation Area, and in the Corn Creek Wash area in Red Rock Canyon National Conservation Area in Nevada. It was sampled at low to mid elevations ranging from approximately 400 to 950 meters, with an elevation average of 706 meters. Limited sampling data exists for this plot, but all samples were on alluvium derived from sandstone substrate. Stands typically occur in alkaline/saline valley and wash terraces where the water table is usually close to the surface.

This association is found in lower lying areas around washes and valley bottoms in the Mojave Desert of Nevada. Stands are also likely in California in similar habitats.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Az

Park Sampling Zones: LAKE: Echo Bay

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 SNA

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=3): LAKE9299, LMJOA038, LMJOA039

DEVA (n=0): ; MOJA (n=0): ; MOJN-Johnson (n=0):

References

None

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M118. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Macrogroup

G570. Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Group

Ephedra spp. – *Leymus salinus* – *Eriogonum corymbosum* Badlands Cold Desert Sparse Vegetation Alliance

***Psorothamnus fremontii* / Cryptogamic Crust (Gypsum) Association**

NVC Association Code: CEPP006743; **Alliance Code:** A4052

Association Concept

The *Psorothamnus fremontii* / Cryptogamic Crust (Gypsum) Association forms both sparse shrub and herb layer, in which the shrub layer ranges from 0.4 to 7 percent cover and the herbaceous cover ranges from 1 to 4 percent cover. The emergent tree layer is sparse, if present, and is less than 2 percent cover. *Psorothamnus fremontii* is characteristically present and is usually dominant or co-dominant at sparse cover in the shrub layer, and those shrubs often present include *Acacia greggii*, *Ambrosia dumosa*, *Atriplex confertifolia*, *Ephedra torreyana*, *Larrea tridentata*, *Lepidium fremontii*, and *Stephanomeria pauciflora*. *Phacelia pulchella* is characteristically present in the herbaceous layer. Other commonly associated herbs include *Arctomecon californica*, *Enceliopsis argophylla*, *Eriogonum inflatum*, *Schismus* spp., *Sphaeralcea ambigua*. Those trees and shrubs sometimes adjacent to and/or on the edge of stands of this association include *Prosopis glandulosa* and *Suaeda moquinii*. Cryptogamic crust is characteristically present at variable cover (0.2 to 70 percent cover), and is often higher in cover than the vascular plants in this association.

The association is found uncommonly in Lake Mead National Recreation Area and also in surrounding areas that have gypsum-derived soils in Arizona and Nevada, occurring on upland landforms of undulating alluvial fans, hillocks, hill slopes, and related gypsum-sand areas. It occurs at mid to upper elevations (ranging from approximately 400 to 900 meters, averaging 553 meters). Stands are often small and occur at various aspects, and slopes are flat to steep (ranging from 0 to 45 degrees). Soils are specifically derived from sedimentary (gypsum) substrates, and they have a variety of textures including sand to clay loam.

The upland gypsum areas where this association occurs also specifically support a host of rare plants (e.g., ranked S1, S2 or S3 by the Arizona and/or Nevada State Natural Heritage Programs), including *Anulocaulis leiosolenus*, *Arctomecon californica*, *Camissonia multijuga*, and *Enceliopsis argophylla*. In the adjacent lower-level drainage ways of these gypsum areas are stands of *Prosopis glandulosa* and *Suaeda moquinii* shrubland associations.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (15): 322Av, 322Az

Park Sampling Zones: LAKE: Callville, Callville Bay, Echo Bay, Overton, Willow Beach

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=15

LAKE (n=15): ARCAGHav, ARCARDav, LAKE0196, LAKE0197, LAKE0294, LAKE0608, LAKE9185, LAKE9295, LAKE9313, LAKE9403, LAKE9511, LAKE9512, LAKE9515, LAKE9609, LAKE9610

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

Ericameria cuneata ssp. spathulata (provisional) Association

NVC Association Code: CEPP006704; **Alliance Code:** A4050

Association Concept

The *Ericameria cuneata* ssp. *spathulata* (provisional) Association has both open herb and shrub layers, in which the herbaceous cover ranges from 1 to 2 percent cover and the shrub layer ranges from 2 to 10 percent cover. The emergent tree layer is sparse, if present, and ranges from 0 to 0.2 percent cover. *Ericameria cuneata* ssp. *spathulata* is dominant or co-dominant with shrubs such as *Brickellia californica*, *Brickellia longifolia*, *Gutierrezia sarothrae*, and *Symphoricarpos* sp. Other shrubs that may be present include *Artemisia ludoviciana*, *Ericameria laricifolia*, *Eriogonum heermannii*, *Ferocactus cylindraceus*, *Fraxinus anomalus*, *Galium stellatum*, and *Rhus trilobata*. Various herbaceous species can occur in the association including *Achnatherum parishii*, *Allium* sp., *Arabis* sp., *Aristida purpurea*, *Bouteloua* spp., *Bromus rubens*, *Elymus elymoides*, *Melica frutescens*, *Poa fendleriana* ssp. *longiligula*, *Poa secunda*, *Sphaeralcea ambigua*, *Tragia ramosa* in the herbaceous layer. Emergent trees, if present, include *Pinus monophylla*, *Garrya flavescens*, and *Juniperus osteosperma*. Nonvascular plants are typically present including rock lichen and moss.

The association is found scattered in Death Valley National Park, Castle Mountains National Park, and Mojave National Preserve, California, sampled and observed at mid to upper elevations along extensive rock outcrops of varied parent material. Elevation ranges from approximately 1450 to 1500 meters, and averages 1492 meters. Slopes are steep to abrupt (ranging from 42 to 85 degrees). It is found from mid-slopes to ridges along various aspects. Soils are a minor component of the available growing surface, interspersed between large bedrock outcrops, and soil texture includes clay loam. Parent material includes variety of substrates such as rhyolite, sandstone, limestone/dolomite, and granite, in which the plants are often found growing right out of the rock crevices.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1), Southeastern Great Basin (1): 322Al, 341Fc

Park Sampling Zones: **DEVA:** Joshua Flat; **MOJA:** Castle Mtns, (Granite Mountains)

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=2

LAKE (n=0): DEVA (n=1): DEVA9138

MOJA (n=1): CAMO9127 MOJN-Johnson (n=0):

References

None

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M169. Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland Macrogroup

G302. Intermountain Mesic Tall Sagebrush Steppe & Shrubland Group

Purshia tridentata - *Artemisia tridentata* Mesic Steppe & Shrubland Alliance

Purshia glandulosa Association

NVC Association Code: CEPP006747; **Alliance Code:** A3179

Association Concept

The *Purshia glandulosa* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 19 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 2 to 16 percent cover. *Purshia glandulosa* is the dominant or co-dominant in the shrub canopy with other characteristic shrubs such as *Ephedra nevadensis*. Other shrubs often present include *Artemisia tridentata*, *Prunus fasciculata*, *Salvia dorrii*, and *Yucca baccata*. Commonly associated herbs include *Achnatherum hymenoides*, *Amsinckia* spp., and *Bromus rubens*. *Yucca brevifolia* is an often present tree in the overstory, and *Juniperus osteosperma* is sometimes present.

The association is uncommon in Death Valley National Park in California and Nevada, where it was sampled in the Grapevine Mountains and the Last Chance Range, and in the Mojave National Preserve in California, where it was sampled in the Mid Hills and the New York and Woods Mountains. It is found at upper elevations with an elevation range of approximately 1,500 to 1,800 meters and an elevation average of 1596. This association occurs often at mid-slope, with slopes falling between gentle to somewhat steep (1 to 20 degrees), and on variable aspects. Soils include loamy sand, sandy loam, and sandy clay, and are alluvium mixed with rocks derived from typically from igneous parent material such as granodiorite and pyroclastic tuff.

This association is found in the central Mojave Desert to the southern Great Basin, where it occurs in higher elevation rocky slopes to high valleys adjacent to hills and mountain slopes. Some stands have experience burning, where the *Purshia tridentata* var. *glandulosa* has resprouted favorably after fire, including within the Hackberry Fire Complex in the New York Mountains of California, where associated conifers such as *Juniperus osteosperma* and *Pinus monophylla* have not survived.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Ab, 322Al; Southeastern Great Basin (1): 341Fd

Park Sampling Zones: **DEVA:** Grapevine Mtns, Last Chance Range; **MOJA:** Mid Hills, New York Mtns, Woods Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G5? S4?

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=2): DEVA9212, DEVA9592

MOJA (n=3): MOJA9353, MOJA9671, MOJC0013

MOJN-Johnson (n=1): MOJJE433

References

None

Purshia glandulosa – Artemisia tridentata Association

NVC Association Code: CEPP006746; **Alliance Code:** A3179

Association Concept

The *Purshia glandulosa* – *Artemisia tridentata* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 21 to 50 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 5 to 20 percent cover. *Artemisia tridentata* is the dominant shrub and *Purshia glandulosa* is co-dominant. *Ephedra viridis* is characteristically occurring, and other shrubs often present include *Ericameria nauseosa* and *Prunus andersonii*. Commonly associated herbs include *Achnatherum hymenoides*, *Bromus tectorum*, *Camissonia pterosperma*, *Chorizanthe brevicornu*, *Elymus elymoides*, *Eriastrum* spp., *Layia glandulosa*, *Mentzelia albicaulis*, *Phacelia vallis-mortae*, and *Stephanomeria exigua*. *Yucca brevifolia* is often present and emergent in the tree canopy, and *Pinus monophylla* sometimes occurs.

The association is uncommon and occurs in the Cottonwood Mountains, Last Chance Range, and Nevada Triangle of Death Valley National Park in California and Nevada. It also occurs in the New York Mountains of the Mojave National Preserve, though the Hackberry Fire complex decimated most stands of this association and they have not yet recovered. It was sampled at upper elevations ranging from approximately 1,500 to 2,000 meters, with an average of 1,766 meters, and found on gentle to moderate slopes (2 to 14 degrees) on variable aspects. Soils include loamy sands and sandy loams, and they are derived from andesite and granodiorite.

This association is found in the southern Great Basin in southeastern California and central-western Nevada. Stands occur along high valleys with gravelly to fine soils to upper slopes and ridges.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (3): 341Fa, 341Fc, 341Fg; [Mojave Desert: 322Al]

Park Sampling Zones: **DEVA:** CottonWood Mtns, Last Chance Range, Nevada Triangle; [**MOJA:** New York Mtns]

Classification Confidence: Low

Rarity Rank (Global, State-CA): G4? S3?

Surveys (with Sample Sizes) Used for Description

MOJN: N=5

LAKE (n=0):

DEVA (n=3): DEVA0309, DEVA9237, DEVAD068

MOJA (n=0): MOJN-Johnson (n=2): MOJJE602, MOJJE604

References

Keeler-Wolf and Thomas 2000, cf. Keeler-Wolf et al. 2003 (for similar *Purshia tridentata* – *Artemisia tridentata* associations)

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M169. Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland Macrogroup

G303. Intermountain Dry Tall Sagebrush Steppe & Shrubland Group

Artemisia tridentata - Mixed Shrub Dry Steppe & Shrubland Alliance

Artemisia tridentata – *Chrysothamnus viscidiflorus* / (*Poa secunda*) Association

NVC Association Code: CEG000999; **Alliance Code:** A3198

Association Concept

The *Artemisia tridentata* – *Chrysothamnus viscidiflorus* / (*Poa secunda*) Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 53 percent cover. The emergent tree layer is sparse and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 1 to 12 percent cover. *Artemisia tridentata* is dominant in the overstory along with characteristic shrubs *Chrysothamnus viscidiflorus*. A diversity of other shrubs are often present including *Ephedra nevadensis*, *Ephedra viridis*, and *Opuntia polyacantha* var. *erinacea*. Commonly associated herbs include *Achnatherum hymenoides*, *Castilleja angustifolia*, *Elymus elymoides*, *Pleuraphis jamesii*, and *Sphaeralcea ambigua*, and those trees sometimes present and emergent include *Pinus monophylla* and *Yucca brevifolia*.

The association is uncommon in Death Valley National Park in California, where it was found in Joshua Flat, Panamint Mountains, and Last Chance and Nelson Ranges. It was sampled at upper elevations ranging from approximately 1,520 to 2,915 meters, with an elevation average of 2,139 meters. It is found on variable slope positions, on gentle to somewhat steep slopes (4 to 26 degrees), and on variable aspects. Soils include clays and loams, and they are derived from a variety of substrates such as granodiorite, limestone, sandstone, and shale.

Stands occur in the southern Great Basin along high-elevation valleys to upper slopes adjacent to *Pinus monophylla* woodlands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (8): 341Fb, 341Fc, 341Ff

Park Sampling Zones: DEVA: Joshua Flat, Last Chance Range, Nelson Range, Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G5? S3?

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=0):

DEVA (n=8): DEVA9147, DEVA9257, DEVA9672, DEVA9910, DEVAD108, DEVAD114,
DEVAD252, DEVAS235

MOJA (n=0): ; MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000, cf. NatureServe 2012 (for *Artemisia tridentata* – *Chrysothamnus viscidiflorus* / *Poa secunda* Association)

Artemisia tridentata – Ericameria teretifolia Association

NVC Association Code: CEPP005793; **Alliance Code:** A3198

Association Concept

The *Artemisia tridentata* – *Ericameria teretifolia* Association forms an open shrub canopy, in which the shrub cover ranges from 19 to 31 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 2 to 8 percent cover. *Artemisia tridentata* is dominant in the shrub canopy along with *Ericameria teretifolia*, which is characteristic. Other shrubs often present include *Coleogyne ramosissima*, *Ephedra viridis*, and *Menodora spinescens*. Commonly associated herbs at low cover but with high richness include *Achnatherum hymenoides*, *Bromus rubens*, *Calochortus kennedyi*, *Elymus elymoides*, *Eriogonum ovalifolium*, *Phlox stansburyi*, *Pleuraphis jamesii*, and *Sphaeralcea ambigua*.

The association is rare in Death Valley National Park in California, sampled at upper elevations of the Joshua Flat area in the southern Great Basin. Elevation ranges from approximately 1,790 to 2,340 meters, and elevation averages 1,986 meters. Due to a limited sample size, limited plot data exists, although all three plots are at an easterly aspect, and slopes range from gentle to somewhat steep (1 to 24 degrees). Soils include loams, and are derived from sandstone.

Stands occur in the southern Great Basin along intermittently flooded upper elevation washes to rocky erosional highlands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (3): 341Fb

Park Sampling Zones: DEVA: Joshua Flat

Classification Confidence: Low

Rarity Rank (Global, State-CA): GNR

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=0): ; DEVA (n=3): DEVA0133, DEVAS106, MOJC0605; MOJA (n=0): ; MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M169. Great Basin-Intermountain Tall Sagebrush Steppe & Shrubland Macrogroup

G304. Intermountain Mountain Big Sagebrush Steppe & Shrubland Group

Artemisia tridentata ssp. *vaseyana* - Mixed Shrubland Alliance

Artemisia tridentata ssp. *vaseyana* Association

NVC Association Code: CEPP005794; **Alliance Code:** A3208

Association Concept

The *Artemisia tridentata* ssp. *vaseyana* Association forms an open shrub canopy, in which the shrub cover ranges from 11 to 28 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 0 to 7 percent cover. *Artemisia tridentata* ssp. *vaseyana* is the dominant shrub in the overstory, and other shrubs often present include *Chrysothamnus viscidiflorus* and *Grayia spinosa*. Commonly associated herbs at relatively low cover include *Elymus elymoides*, *Phacelia vallis-mortae*, and *Phlox stansburyi*, and those trees sometimes present and emergent include *Yucca brevifolia*.

The association is uncommon in Death Valley National Park in California and Nevada, where it was sampled at upper elevations of the Last Chance Range, Nevada Triangle, and Panamint Mountains. Elevation ranges from approximately 1,515 to 2,885 meters, and elevation averages 2,007 meters. It is found on various slope positions, with gentle to steep slopes (1 to 35 degrees), and on variable aspects. Soils are also variable, and they are derived from different substrates such as alluvium, granodiorite, rhyolite, and sandstone.

This association is found in the southern Great Basin. Stands occur from interfluvies between mountains to upper slopes that transition to *Pinus monophylla* woodlands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (7): 341Fc, 341Fd, 341Ff, 341Fg

Park Sampling Zones: DEVA: Last Chance Range, Nevada Triangle, Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G4? S3?

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=0): ; DEVA (n=7): DEVA0579, DEVA9110, DEVA9164, DEVA9166, DEVA9223, DEVA9582, DEVA9827; MOJA (n=0): ; MOJN-Johnson (n=0):

References

Cheng 2004

Artemisia tridentata ssp. vaseyana – Ephedra viridis Association

NVC Association Code: CEPP006855; **Alliance Code:** A3208

Association Concept

The *Artemisia tridentata* ssp. *vaseyana* – *Ephedra viridis* Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 28 percent cover. The emergent tree layer is sparse and ranges from 0 to 3 percent cover, and the herb understory is variable and ranges from 0 to 17 percent cover. *Artemisia tridentata* ssp. *vaseyana* and *Ephedra viridis* are the characteristic shrubs that co-dominant in the shrub overstory. Other shrubs often present include *Eriogonum fasciculatum*. Commonly associated herbs include *Elymus elymoides*, and those trees sometimes present include *Pinus monophylla* and *Yucca brevifolia*.

The association is common on upper elevation slopes and ridges of Death Valley National Park, in both California and Nevada. Elevation ranges from approximately 1,510 to 2,920 meters, and elevation averages 1,866 meters. It is found primarily on the high and mid-slopes on primarily somewhat steep to steep slopes, though with a range of gentle to steep (2 to 39 degrees). Aspects are variable. Soils are usually shallow and include different types of clay, sand, and loam, and are derived from a variety of substrates but primarily granodiorite, rhyolite, and sandstone. Although fire is a natural component of this association's range, large or high-frequency fires are detrimental.

This association is found in the northern Mojave Desert to the southern Great Basin. Stands are on rocky erosional highlands along gentle upper slopes to steep ridgelines. This and the related *Artemisia tridentata* - *Ephedra* spp. Association appear to be the same association, where they need to be merged.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ac, 322Ad; Southeastern Great Basin (19): 341Fa, 341Fb, 341Fc, 341Fd, 341Ff, 341Fg

Park Sampling Zones: DEVA: Cottonwood Mtns, Funeral Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Nelson Range, Nevada Triangle, Owlshead Mtns, Panamint Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G5 S4

Surveys (with Sample Sizes) Used for Description

MOJN: N=24

LAKE (n=0); DEVA (n=24): DEVA0478, DEVA9167, DEVA9215, DEVA9219, DEVA9220, DEVA9221, DEVA9339, DEVA9340, DEVA9443, DEVA9456, DEVA9483, DEVA9484, DEVA9581, DEVA9593, DEVA9595, DEVA9662, DEVA9663, DEVA9829, DEVAS092, DEVAS099, DEVAS146, MOJC0633, MOJC1068, MOJC1072

MOJA (n=0); MOJN-Johnson (n=0)

References

cf. Keeler-Wolf and Thomas 2000 (for *Ephedra viridis* – *Artemisia tridentata* Association), cf. NatureServe 2012 (for *Artemisia tridentata* - *Ephedra* spp. Association [CEGL001003])

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M171. Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

G296. Mojave Mid-Elevation Mixed Desert Scrub Group

Amphipappus fremontii - *Salvia funerea* Shrubland Alliance

Amphipappus fremontii (limestone) Association

NVC Association Code: CEPP005791; **Alliance Code:** A4159

Association Concept

The *Amphipappus fremontii* (limestone) Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 19 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 10 percent cover. *Amphipappus fremontii* is co-dominant in the shrub canopy with characteristic shrubs *Atriplex confertifolia* and *Echinocactus polycephalus*. Other shrubs often present include *Ambrosia dumosa*, *Brickellia microphylla*, *Eriogonum fasciculatum*, and *Lepidium fremontii*, and commonly associated herbs include *Gilia* spp. and *Xylorhiza tortifolia*. Cryptogamic crust, lichen, and moss are often occurring non-vascular plants.

The association is found in limestone outcroppings and ridges of Death Valley National Park in California, and was sampled at mid to upper elevations. Elevation ranges from approximately 895 to 1530 meters, and elevation averages 1186 meters. It is found on lower to upper slopes, that are somewhat steep to steep slopes (15 to 38 degrees), and on variable aspects. Soils include clay loam, loamy sand, sand, and sandy loam, and they are calcareous, derived primarily from limestone and dolostone.

This association is found in the southern Great Basin and northern Mojave Desert, and have been observed in the central Mojave. Stands occur on steep slopes and ridges that are limestone-rich.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (14): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Eureka Valley, Grapevine Mtns, Joshua Flat, Last Chance Range, Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3G4 S3S4

Surveys (with Sample Sizes) Used for Description

MOJN: N=16

LAKE (n=0):

DEVA (n=16): DEVA0462, DEVA0552, DEVA0597, DEVA0901, DEVA9117, DEVA9119,
DEVA9243, DEVA9304, DEVA9360, DEVA9548, DEVA9555, DEVA9558, DEVA9822,
DEVA9924, DEVAS231, MOJC0061
MOJA (n=0): ; MOJN-Johnson (n=0):

References

cf. Keeler-Wolf and Thomas 2000

Salvia funerea Association

NVC Association Code: CEPP006754; **Alliance Code:** A4159

Association Concept

The *Salvia funerea* Association forms an open shrub canopy, in which the shrub cover ranges from 0.5 to 13 percent cover. The emergent tree layer is absent, and the herb understory is variable and ranges from 0 to 5 percent cover. *Salvia funerea* is the co-dominant shrub, and other shrubs often present include *Echinocactus polycephalus* and *Viguiera reticulata*. Commonly associated herbs include *Cheilanthes parryi* and *Eriogonum inflatum*, and nonvascular plants include cryptogamic crust.

The association is uncommon and found on steep rocky slopes in the low to mid elevations of the Cottonwood, Funeral, and Grapevine Mountains in Death Valley National Park in California. Elevation ranges from approximately 650 to 1,170 meters, and elevation averages 893 meters. It is found on variable slope positions, on steep to very steep slopes (29 to 53 degrees), and on variable aspects. Soils include loams and clay, and they are calcareous derived primarily from limestone and dolostone.

This association is found in the northern Mojave Desert and southern Great Basin. It is primarily on steep slopes to ridgelines that are limestone-rich.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Ad; Southeastern Great Basin (9): 341Fc, 341Fd

Park Sampling Zones: DEVA: CottonWood Mtns, Funeral Mtns, Grapevine Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G2? S2?

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0): ; DEVA (n=10): DEVA9427, DEVA9469, DEVA9471, DEVA9477, DEVA9488, DEVA9542, DEVA9914, DEVAS210, DEVAS212, MOJC0587

MOJA (n=0): ; MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

***Coleogyne ramosissima* – *Ephedra* spp. Association**

NVC Association Code: CEGJ005297; **Alliance Code:** A3144

Association Concept

The *Coleogyne ramosissima* – *Ephedra* spp. Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 29 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 1 to 14 percent cover.

Coleogyne ramosissima and *Ephedra nevadensis* are usually co-dominant, and *Lycium andersonii* characteristically occurs. Other shrubs often present include *Eriogonum fasciculatum* and *Thamnosma montana*. Commonly associated herbs include *Achnatherum speciosum*, *Amsinckia* spp., and *Bromus rubens*, and those trees sometimes present include *Yucca brevifolia*.

The association is commonly found in Death Valley National Park and Mojave National Preserve in California, sampled at mid to upper elevations that range from approximately 1,095 to 1,785 meters, and elevation averages 1,364 meters. It is found on variable slope positions, on gentle to steep slopes (0 to 29 degrees), and on variable aspects. Soils are diverse, though primarily loams or with a loam component. They are derived from a variety of substrates such as alluvium, dolostone (dolomite), granodiorite, quartz monzonite, rhyolite, and sandstone.

This association is found from the southern to northern Mojave into the Southern Great Basin. Stands are on gravelly and cobblely alluvial valleys and hillslopes at higher elevations, and upper slopes and ridgelines at lower elevations that transition to *Larrea tridentata* shrublands.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (16): 322Ad, 322Aj, 322Al; Southeastern Great Basin (9): 341Fb, 341Fc

Park Sampling Zones: **DEVA:** Black Mtns, Cottonwood Mtns, Funeral Mtns, Green Water Rng/Vlly, Joshua Flat; **MOJA:** Clark Mtn West, Kelso Mtns, Mescal Range, Mid Hills

Classification Confidence: High

Rarity Rank (Global, State-CA): G5 S5

Surveys (with Sample Sizes) Used for Description

MOJN: N=60

LAKE (n=0):

DEVA (n=21): DEVA9370, DEVA9371, DEVA9376, DEVA9377, DEVA9378, DEVA9403, DEVA9506, DEVA9609, DEVA9612, DEVAR140, DEVAS213, DEVAS228, MOJC0330, MOJC0331, MOJC0332, MOJC0448, MOJC0453, MOJC0454, MOJC0610, MOJC0612, MOJC0992

MOJA (n=5): MOJA0503, MOJA9344, MOJA9519, MOJA9609, MOJC1109

MOJN-Johnson (n=33): MOJJE008, MOJJE011, MOJJE025, MOJJE088, MOJJE136, MOJJE146, MOJJE152, MOJJE372, MOJJE422, MOJJE527, MOJJE618, MOJJE620, MOJJE622, MOJJE638,

MOJJE639, MOJJE647, MOJJE653, MOJJE654, MOJJE753, MOJJE757, MOJJE772, MOJJE820, MOJJE822, MOJJE823, MOJJE824, MOJJE825, MOJJE835, MOJJE838, MOJJE842, MOJJE850, MOJJE851, MOJJE902, MOJJE930

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Peterson 1984

Coleogyne ramosissima – Ericameria teretifolia Association

NVC Association Code: CEPP005999; **Alliance Code:** A3144

Association Concept

The *Coleogyne ramosissima* – *Ericameria teretifolia* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 8 to 39 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 1 to 9 percent cover. *Coleogyne ramosissima*, *Ericameria teretifolia*, and *Eriogonum fasciculatum* are all characteristic in the shrub canopy.

The association is uncommon and was sampled at upper elevations in the Cottonwood, Owlshead, and Panamint Mountain ranges, as well as Green Water Valley, in Death Valley National Park in California, and on Clark Mountain in the Mojave National Preserve, also in California. Elevation ranges from approximately 1,250 to 1,690 meters, and elevation averages 1,490 meters. It is found on variable slope positions, on moderate to steep slopes (8 to 27 degrees), and on variable aspects. Limited soil data is available for this association but substrates include alluvium, gneiss, granodiorite, and rhyolite.

Stands occur from the central to northern Mojave Desert and into the southern Great Basin. They are along slopes that appear to have past disturbance whether from fire, mining, or road cuts where the *Ericameria teretifolia* is adaptable to disturbance and stabilizes soils.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ad, 322Af, 322Aj; Southeastern Great Basin (3): 341Fc, 341Ff

Park Sampling Zones: **DEVA:** Cottonwood Mtns, Green Water Rng/Vlly, Owlshead Mtns, Panamint Mtns; **MOJA:** Clark Mtn

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=0):

DEVA (n=7): DEVA9197, DEVAD118, DEVAD157, DEVAR062, DEVAR107, DEVAR126, DEVAS119, MOJC0333

MOJA (n=1): MOJA9342

MOJN-Johnson (n=0):

References

None

Coleogyne ramosissima – Lycium andersonii Association

NVC Association Code: CEG005746; **Alliance Code:** A3144

Association Concept

The *Coleogyne ramosissima* – *Lycium andersonii* Association forms an open shrub canopy, in which the shrub cover ranges from 5 to 31 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 0 to 24 percent cover.

Coleogyne ramosissima is co-dominant in the overstory with characteristically occurring shrubs *Ephedra nevadensis* and *Lycium andersonii*. Other shrubs often present include *Acamptopappus shockleyi*, *Eriogonum fasciculatum*, *Grayia spinosa*, and *Psoralea polydenia*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Eriogonum inflatum*, *Sphaeralcea ambigua*, and *Xylorhiza tortifolia*.

The association is found in the Cottonwood Mountains, Green Water Valley, Last Chance Range, and Panamint Mountains of Death Valley National Park in California. It was sampled at mid to upper elevations that range from approximately 1,125 to 1,830 meters, and average 1,510 meters. It is found on variable slope positions, on flat to steep slopes (0 to 29 degrees), and on variable aspects. Soils include clay, silty, and sandy loams, and they are derived from a variety of substrates including basalt, sandstone, and metamorphic rocks.

Stands are found in the northern Mojave Desert to the southern Great Basin. They are found on gravelly and cobbled alluvial fans and rolling hillslopes at upper elevations.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ad; Southeastern Great Basin (16): 341Fc, 341Ff

Park Sampling Zones: DEVA: Cottonwood Mtns, Green Water Rng/Vlly, Last Chance Range, Panamint Mtns

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G4 S4

Surveys (with Sample Sizes) Used for Description

MOJN: N=23

LAKE (n=0):

DEVA (n=17): DEVA0113, DEVA9101, DEVA9174, DEVA9351, DEVA9361, DEVA9377, DEVA9402, DEVA9458, DEVAR036, DEVAS055, MOJC0338, MOJC0339, MOJC0340, MOJC0341, MOJC0472, MOJC0473, MOJC0474

MOJA (n=0):

MOJN-Johnson (n=6): MOJJE207, MOJJE619, MOJJE705, MOJJE738, MOJJE739, MOJJE929

References

Keeler-Wolf and Thomas 2000

Cylindropuntia acanthocarpa var. coloradensis Association

NVC Association Code: CEPP006729; **Alliance Code:** A4156

Association Concept

The *Cylindropuntia acanthocarpa* var. *coloradensis* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 11 to 35 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.5 percent cover, and the herb understory is variable and ranges from 3 to 24 percent cover. *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*) is typically dominant and *Echinocereus engelmannii*, *Ephedra nevadensis*, *Ferocactus cylindraceus*, and *Krameria erecta* are characteristically present shrubs. Other shrubs often present include *Ambrosia dumosa*, *Encelia farinosa*, *Larrea tridentata*, *Viguiera parishii*, and *Yucca schidigera*. Stands often have a variety of cacti species, including the characteristic *Cylindropuntia acanthocarpa*, *Echinocereus engelmannii*, and *Ferocactus cylindraceus* as well as *Opuntia basilaris*, *Opuntia polyacantha* var. *erinacea*, and *Mammillaria tetrancistra*. Commonly associated herbs include *Bromus rubens*, *Eriogonum inflatum*, *Erodium cicutarium*, *Pleuraphis rigida*, *Porophyllum gracile*, and *Sphaeralcea ambigua*, and those trees sometimes present include *Yucca brevifolia*.

The association is found scattered across the Mojave Desert including the Temple Bar region of Lake Mead National Recreation Area, Arizona, and in the Mojave National Preserve, California. It occurs at mid to upper elevations ranging from approximately 650 to 1,450 meters, and averages at 1,146 meters. Slopes range from gentle to somewhat steep (between 2 to 26 degrees). This association is found primarily on high to mid-slopes at southerly aspects. Soils are typically clay loam or a mix of sand and loam, and are derived usually from alluvium or schist. Stands appear to occur on thin-soiled, exposed bedrock areas and gravelly and cobbled bajadas, and they sometimes may be impacted by historical and/or current livestock grazing.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Aj, 322Al, 322Av

Park Sampling Zones: LAKE: Temple Bar; MOJA: Fenner Vlly West, Ivanpah Mtns, Lanfair Vlly, Piute Range, Providence Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=13

LAKE (n=2): LAKE0367, LAKE0449; DEVA (n=0):

MOJA (n=5): MOJA0213, MOJA9584, MOJA9636, MOJC1174, MOJC1222

MOJN-Johnson (n=6): MOJJE086, MOJJE091, MOJJE097, MOJJE116, MOJJE247, MOJJE250

References

None

Pleuraphis rigida / (Acamptopappus sphaerocephalus – Ericameria cooperi) Association

NVC Association Code: CEPP006733; **Alliance Code:** A4156

Association Concept

The *Pleuraphis rigida* / (*Acamptopappus sphaerocephalus* – *Ericameria cooperi*) Association forms an open shrub canopy, in which the shrub cover ranges from 0.5 to 12 percent cover. The herb layer is variable and ranges from 8 to 12 percent cover, and the emergent tree layer, if present, is sparse and ranges from 0 to 0.2 percent cover. *Acamptopappus sphaerocephalus* and *Ericameria cooperi* are characteristically present to co-dominant at variable cover in the shrub layer (from trace to open), while *Pleuraphis rigida* is typically the dominant herb (with open to intermitten cover); however, other herbs such as *Muhlenbergia porteri* may be similar in cover. Other shrubs often or characteristically present include *Coleogyne ramosissima*, *Cylindropuntia acanthocarpa*, *Cylindropuntia ramosissima*, *Ephedra* spp., *Grusonia parishii*, *Hymenoclea salsola*, *Lycium andersonii*, and *Senna armata*. Commonly associated herbs with significant cover include *Amsinckia*, *Bromus rubens*, *Eriogonum deflexum*, *Erodium cicutarium*, *Gilia* spp., *Muhlenbergia porteri* and *Schismus* spp., and those trees sometimes present include *Yucca brevifolia*. Nonvascular plants include cryptogamic crust.

The association is found in the Mojave Desert including the Pearce Ferry region of Lake Mead National Recreation Area, Arizona, and the Hackberry/Vontrigger, Lanfair Valley, and Mid Hills areas of Mojave National Preserve, California. It occurs at mid to upper elevations from approximately 800 to 1,600 meters, and averaging at 1,230 meters. Slopes range from flat to moderate (between 0 to 6 degrees). This association is found from valley bottoms to mid-slopes and mesas at neutral to cool, northwesterly to southeasterly, aspects. Soils are typically loamy, and are derived from sedimentary or igneous substrates such as alluvium or rhyolite. Stands often are an artifact of recent or past grazing, clearing, and/or fire disturbance, where the shrub layer is recovering with sparse to low cover and can be rich in species composition.

Additional representation of this vegetation is summarized by McAuliffe (2016).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Al, 322Ak, 322Av

Park Sampling Zones: LAKE: Pearce Ferry; MOJA: Hackberry/Vontrigger, Lanfair Vlly, Mid Hills

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=28

LAKE (n=1): LAKE0177; DEVA (n=0); MOJA (n=6): MOJA0159, MOJA9616, MOJA9617, MOJA9627, MOJC0202, MOJC0205; MOJN-Johnson (n=21): MOJJE431, MOJJE530, MOJJE534, MOJJE536, MOJJE545, MOJJE553, MOJJE555, MOJJE557, MOJJE558, MOJJE634, MOJJE635,

MOJJE649, MOJJE651, MOJJE652, MOJJE667, MOJJE689, MOJJE690, MOJJE702, MOJJE744,
MOJJE892, MOJJE897

References

cf. Keeler-Wolf and Thomas 2000, McAuliffe 2016

Ephedra funerea Association

NVC Association Code: CEGJ005750; **Alliance Code:** A4157

Association Concept

The *Ephedra funerea* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 4 to 38 percent cover. The emergent tree layer is sparse, and the herb understory is variable and ranges from 0 to 11 percent cover. *Ephedra funerea* is the co-dominant shrub in the overstory. Other shrubs often present include *Ambrosia dumosa* and *Atriplex confertifolia*, and commonly associated herbs include *Eriogonum inflatum*, *Bromus rubens*, and *Xylorhiza tortifolia*.

The association is found across various mountain ranges in Death Valley National Park such as the Panamint, Black and Funeral Mountains, and it is more rarely in the Mojave National Preserve in California. It was sampled at mid to upper elevations ranging from approximately 915 to 1,755 meters, and averaging 1,318 meters. It is found on variable slope positions, on slopes ranging from from gentle to steep (1 to 37 degrees), and often on south- or west-facing aspects. Soils include loam, loamy sand, and sandy clay, and they are derived from a typically from calcareous substrates such as dolostone (dolomite), and less commonly on quartz monzonite, rhyolite, and basalt.

This association is found from the central to northern Mojave Desert into the southern Great Basin. Stands are found typically along skeletal, steep rocky slopes and ridges.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (12): 322Ad, 322Af, 322Aj; Southeastern Great Basin (5): 341Fc, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Funeral Mtns, Last Chance Range, Owlshead Mtns, Panamint Mtns; **MOJA:** Baker-Halloran, Cinder Cones

Classification Confidence: Moderate

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=21

LAKE (n=0):

DEVA (n=15): DEVA9610, DEVAD004, DEVAD005, DEVAD006, DEVAD046, DEVAD049, DEVAD056, DEVAS057, DEVAS086, DEVAS152, DEVAS154, DEVAS171, MOJC0922, MOJC0923, MOJC0924

MOJA (n=2): MOJA9544, MOJA9545

MOJN-Johnson (n=4): MOJJE391, MOJJE393, MOJJE396, MOJJE770

References

Keeler-Wolf and Thomas 2000 for alliance

Eriogonum fasciculatum Desert Wash Shrubland Association

NVC Association Code: CEPP006706; **Alliance Code:** A3150

Association Concept

The *Eriogonum fasciculatum* (wash) Association forms an open shrub canopy, in which the shrub cover ranges from 14 to 20 percent cover. The tree layer is usually absent, and the herb understory is variable and ranges from 5 to 13 percent cover. *Eriogonum fasciculatum* is the dominant shrub with *Ephedra nevadensis*, *Ericameria cooperi*, *Larrea tridentata*, and *Salazaria mexicana* being characteristically present. Other shrubs with significant cover include *Acamptopappus sphaerocephalus*, *Brickellia californica*, *Ephedra viridis*, *Keckiella antirrhinoides*, *Krameria erecta*, *Lycium andersonii*, *Salvia dorrii*, and *Senna armata*. Characteristically associated herbs include *Bromus rubens*, *Amsinckia* spp., *Eriogonum inflatum*, and *Sphaeralcea ambigua*, and those trees sometimes present include *Yucca brevifolia*. Nonvascular plants might include lichen and moss.

The association is found across the Mojave Desert such as in the Death Valley National Park, Nevada, including the Grapevine Mountains, and in Mojave National Preserve, California, in the Cinder Cone. It also is found in and near Joshua Tree National Park. It occurs in rocky and gravelly washes at mid to upper elevation (ranges from approximately 1,100 to 1,450 meters, and averages 1,233 meters). Slopes are gentle to somewhat steep (between 3 to 22 degrees). This association is found in drainages with variable aspect, though often with southerly trending aspect. Soils are typically sandy loam, and are derived from igneous substrates such as basalt or rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ac, 322Aj

Park Sampling Zones: DEVA: Grapevine Mtns MOJA: Cinder Cones

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=0):

DEVA (n=1): DEVA9476

MOJA (n=1): MOJA9180

MOJN-Johnson (n=6): MOJJE106, MOJJE176, MOJJE568, MOJJE736, MOJJE882, MOJJE895

References

Keeler-Wolf and Thomas 2000

Eriogonum fasciculatum – Ericameria (laricifolia, linearifolia) Association

NVC Association Code: CEPP006705; **Alliance Code:** A3150

Association Concept

The *Eriogonum fasciculatum* – *Ericameria (laricifolia, linearifolia)* Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 29 percent cover. The emergent tree layer is absent to sparse and ranges from 0 to 1.5 percent cover, and the herb understory is variable and ranges from 1 to 20 percent cover. *Eriogonum fasciculatum* along with *Ericameria laricifolia* or *Ericameria linearifolia* are characteristically present shrubs that are either dominant and/or co-dominant. The overall shrub composition is typically species-rich, and other shrubs often present include *Ephedra nevadensis*, *Ephedra viridis* and *Stephanomeria pauciflora*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Gilia* spp., and *Sphaeralcea ambigua*. Trees that are sometimes present include *Pinus monophylla*, *Juniperus osteosperma*, and *Yucca brevifolia*. Nonvascular plants include lichen.

The association is found in upland rocky areas with characteristically high colluvial disturbance, erosion, water gullies, or other disturbances scattered across the Mojave Desert into the southern Great Basin including in Death Valley National Park in both California and Nevada, and Mojave National Preserve, California. It occurs at mid to upper elevations primarily on eroding/scree hill slopes and mountains, steep rocky ridge tops, or drainage channels with no aspect preference. Elevation ranges from approximately 1,000 to 1,900 meters, and elevation averages 1,466 meters. Slopes range from gentle to steep (between 2 to 40 degrees). Soils are typically composed of sand and loam, but occasionally include clay and silt textures. They are derived predominantly from rhyolite or sandstone, though sometimes granodiorite or shale.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (13): 322Ac, 322Ad, 322Al Southeastern Great Basin (15): 341Fa, 341Fb, 341Fc, 341Fd, 341Ff

Park Sampling Zones: **DEVA:** Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Nelson Range, Owlshead Mtns, Panamint Mtns; **MOJA:** Mid Hills, New York Mtns, Providence Mtns, Woods Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=35

LAKE (n=0):

DEVA (n=19): DEVA0102, DEVA0342, DEVA0474, DEVA9107, DEVA9198, DEVA9218, DEVA9268, DEVA9296, DEVA9305, DEVA9404, DEVA9475, DEVA9482, DEVA9487, DEVA9490, DEVA9523, DEVA9638, DEVA9911, DEVA9923, MOJC0634

MOJA (n=7): MOJA0571, MOJA0696, MOJA9290, MOJA9319, MOJA9320, MOJA9380, MOJA9675

MOJN-Johnson (n=9): MOJJE096, MOJJE109, MOJJE120, MOJJE249, MOJJE297, MOJJE414, MOJJE423, MOJJE533, MOJJE603

References

None

Viguiera parishii – Eriogonum fasciculatum Association

NVC Association Code: CEG005775; **Alliance Code:** A3150

Association Concept

The *Viguiera parishii* – *Eriogonum fasciculatum* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 4 to 41 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is highly variable and ranges from 2 to 90 percent cover. *Eriogonum fasciculatum* and *Viguiera parishii* are the dominant and/or characteristic shrub. The overall shrub composition is typically species-rich, and other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Ambrosia dumosa*, *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, *Ferocactus cylindraceus*, *Krameria erecta*, *Larrea tridentata*, *Stephanomeria pauciflora*, and *Yucca schidigera*. Commonly associated herbs include *Amsinckia* spp., *Erodium cicutarium*, *Mirabilis laevis*, and *Sphaeralcea ambigua*, and those trees sometimes present include *Juniperus californica* and *Pinus monophylla*.

The association is often found on rocky, granitic uplands across the Mojave Desert, including in the Newberry Mountains and near the Colorado River and Lake Mojave areas of Lake Mead National Recreation Area, Arizona and Nevada. It is also scattered across the Mojave National Preserve, California on granite outcrops or other igneous material. It occurs at mid to upper elevations primarily on dry, rocky hill slopes to steep ridges that experience colluvial disturbance and/or erosion from water gullies, and is sometimes found in washes with no aspect preference. Elevation ranges from approximately 700 to 1,450 meters, and elevation averages 1,013 meters. Slopes range from gentle to steep (between 0 to 31 degrees). Soils usually range in composition from clay loam to loamy sand, though sometimes just sand. They are derived mostly from alkali-granite (alaskite) substrates, but occasionally other igneous types such as rhyolite and basalt or gneiss.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (38): 322Aj, 322Ak, 322Al, 322Am, 322Av, 322Az

Park Sampling Zones: **LAKE:** Boulder City, Bridge Canyon, Cottonwood Cove, Juniper Mine, Katherine, Temple Bar, Willow Beach; **MOJA:** Fenner Vly, Granite Mtns, HackberryVntrigger, Ivanpah Mtns, Kelso-Cima, Marl Mtns, Mid Hills, Piute Range, Providence Mtns, Van Winkle Mtn, Woods Mtns

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=42

LAKE (n=22): LAKE0115, LAKE0121, LAKE0398, LAKE0432, LAKE0521, LAKE9345, LAKE9517, LAKE9519, LAMEN042, LAMEN044, LAMEN045, LAMEN049, LAMEN050, LAMEN062, LAMEN077, LAMEN091, LAMEN092, LAMEN106, LMJOA049, LMJOA050, LMJOA051, LMJOA055; DEVA (n=0);

MOJA (n=16): MOJA9212, MOJA9283, MOJA9367, MOJA9404, MOJA9427, MOJA9451, MOJA9635, MOJA9687, MOJA9688, MOJA9902, MOJA9913, MOJC0095, MOJC0190,

MOJC0206, MOJC0208, MOJC1221; MOJN-Johnson (n=4): MOJJE048, MOJJE056, MOJJE113, MOJJE140

References

Evens and San 2005, Keeler-Wolf et al. 1998, Keeler-Wolf and Thomas 2000

(*Buddleja utahensis* – *Eriogonum heermannii*) – *Gutierrezia* spp. Limestone Association

NVC Association Code: CEPP005784; **Alliance Code:** A4167

Association Concept

The (*Buddleja utahensis* – *Eriogonum heermannii*) – *Gutierrezia* spp. Limestone Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 13 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.5 percent cover, and the herb understory is variable and ranges from 0.2 to 9 percent cover. *Eriogonum fasciculatum* is a characteristically present shrub, while *Buddleja utahensis*, *Eriogonum heermannii*, and *Gutierrezia microcephala* are sometimes dominant and/or co-dominant. Other shrubs often or sometimes present include *Brickellia microphylla*, *Echinocactus polycephalus*, *Prunus fasciculata*, and *Scopulophila rixfordii*. Commonly associated herbs include *Achnatherum speciosum*, *Aristida purpurea*, and *Bromus rubens*, and those trees sometimes present include *Yucca brevifolia*. Nonvascular plants often include cryptogamic crust and moss.

The association is found scattered along steep, calcareous bedrock areas of central Death Valley National Park, California. It occurs at mid to upper elevation (ranging from approximately 950 to 1,900 meters, and averaging 1,323 meters). Slopes range from somewhat steep to very steep (between 17 to 65 degrees). This association is found primarily on mid slopes at north-westerly to easterly aspects. Soils are usually a mixture of sand and loam, and are derived from sedimentary substrates, such as limestone and dolomite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (11): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Cottonwood Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Panamint Mtns

Classification Confidence: Low

Rarity Rank (Global, State-CA): G3 S3

Surveys (with Sample Sizes) Used for Description

MOJN: N=11

LAKE (n=0):

DEVA (n=11): DEVA0157, DEVA9131, DEVA9437, DEVA9438, DEVA9454, DEVA9468, DEVA9651, DEVA9670, DEVA9903, DEVAS196, DEVAS232

MOJA (n=0):

MOJN-Johnson (n=0):

References

None; cf. NatureServe for similar types on limestone

Hecastocleis shockleyi Shrubland Association

NVC Association Code: CEG005467; **Alliance Code:** A4167

Association Concept

The *Hecastocleis shockleyi* Shrubland Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 16 percent cover. An emergent tree layer is typically not present, and the herb understory is sparse to open and ranges from 0 to 6 percent cover. *Hecastocleis shockleyi* is a characteristically present dominant or co-dominant shrub, while *Atriplex confertifolia*, *Eriogonum fasciculatum*, and/or *Tetradymia axillaris* are characteristically present and often co-dominant. Other shrubs often or sometimes present include *Ericameria* spp., *Ephedra nevadensis*, *Ephedra viridis*, *Eriogonum heermannii*, *Lepidium fremontii*, and *Scopulophila rixfordii*. Herbs that are often present include *Achnatherum hymenoides*, *Bromus rubens*, *Claytonia perfoliata*, *Cryptantha utahensis*, *Delphinium parishii*, *Gilia* spp., *Phacelia fremontii*, *Phacelia vallis-mortae*, and *Poa secunda*. Commonly associated nonvascular plants include cryptogamic crust, lichen, and moss.

This rare association is often found localized in calcareous, north-facing rocky slopes and bedrock outcrops within northern Death Valley National Park, California, such as in the Last Chance Range, Grapevine, and Inyo Mountains and also is found further north of the park such as in the Sylvania Mountains and White Mountains. It may also occur further south in the Mojave Desert, such as in the Kingston Range on dolomite outcrops. It occurs at mid to upper elevation (ranging from approximately 1,200 to 1,700 meters, and averaging 1,500 meters). Slopes are somewhat steep to steep (between 24 to 34 degrees). The association is found primarily on rocky, lower to upper slopes to ridges with northly trending aspects, which can experience colluvial disturbance. Soils are variable in texture from loamy sand to clay loam, and are derived from on highly alkaline, sedimentary substrates, such as limestone, dolomite, and shale.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (11): 341Fc, 341Fd (

Park Sampling Zones: DEVA: Grapevine Mtns, Joshua Flat, Last Chance Range

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=11): DEVA0442, DEVA9481, DEVA9554, DEVA9587, DEVA9588, DEVAS234

MOJA (n=0):

MOJN-Johnson (n=0):

References

Jepson Flora Project 2016

***Juniperus californica* / *Coleogyne ramosissima* Association**

Association Code: CEPP006713; **Alliance Code:** A0502

Association Concept

The *Juniperus californica* / *Coleogyne ramosissima* Association forms an open tree canopy, in which tree cover ranges from 4 to 19 percent cover. The shrub layer is variable and ranges from 16 to 29 percent cover, and the herb understory is also variable and ranges from 2 to 6 percent cover.

Juniperus californica is the dominant and characteristic tree, and *Pinus monophylla* or *Yucca brevifolia* may be present though at lower cover. The shrub layer is dominated or co-dominated by *Coleogyne ramosissima*. Other characteristically associated shrubs include *Echinocereus engelmannii*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, and *Yucca schidigera*, while other often occurring shrubs include *Cylindropuntia acanthocarpa*, *Cylindropuntia echinocarpa*, *Ephedra viridis*, *Ferocactus cylindraceus*, *Larrea tridentata*, *Opuntia polyacantha* var. *erinacea*, *Quercus turbinella*, *Stephanomeria pauciflora*, and *Thamnosma montana*. Commonly associated herbs include *Achnatherum speciosum*, *Amsinckia tessellata*, *Bromus rubens*, *Bromus tectorum*, *Chorizanthe brevicornu*, *Erodium cicutarium*, *Pectocarya recurvata*, *Pectocarya setosa*, *Pleuraphis rigida*, and *Salvia columbariae*. Nonvascular plants include cryptogamic crust.

The association is uncommon in the Newberry Mountains within and adjacent to Lake Mead National Recreation Area, Nevada, and is more common in Joshua Tree National Park and Mojave National Preserve, in California. Its habitats include upper portions of bajadas near the base of mountains, and rocky slopes. Sites include mid to upper elevations primarily on mid-slope to summit positions at eastern and southern aspects. Elevation ranges from approximately 1,110 to 1,440 meters, and elevation averages 1,276 meters. Slopes range from moderate to somewhat steep (from 10 to 18 degrees). Soils include sand or sandy loam, which are derived primarily from granite / alkali-granite and alluvium.

Ecoregion Sections and Subsection Codes: Mojave Desert (4): 322Al, 322Am

Park Sampling Zones: LAKE: Katherine, Spirit Mountain; MOJA: (Granite Mountains), Van Winkle Mtn

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=4

LAKE (n=3): LAKE0516, LAMEN097, LAMEN098

DEVA (n=0):

MOJA (n=1): MOJA9909

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005

Juniperus californica / Nolina bigelovii (provisional) Association

Association Code: CEPP006714; Alliance Code: A0502

Association Concept

The *Juniperus californica* / *Nolina bigelovii* (provisional) Association forms an open tree canopy, in which tree cover ranges from 1 to 3 percent cover. The shrub layer is variable and ranges from 18 to 20 percent cover, and the herb understory is also variable and ranges from 4 to 13 percent cover.

Juniperus californica is the dominant and/or characteristic tree in the overstory. The understory shrub layer usually has dominance or co-dominance of *Nolina bigelovii*. Other commonly associated shrubs include *Acacia greggii* (= *Senegalia greggii*), *Coleogyne ramosissima*, *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, *Ferocactus cylindraceus*, *Echinocereus engelmannii*, *Galium stellatum*, *Gutierrezia sarothrae*, *Krameria erecta*, *Lotus rigidus*, *Viguiera parishii*, and *Yucca schidigera*, and commonly associated herbs include *Porophyllum gracile*, *Achnatherum speciosum*, and *Pleuraphis rigida*.

The association is found only rarely within the Newberry Mountains in Lake Mead National Recreation Area, Nevada, and adjacent lands, which are moderate to somewhat steep, rocky and gravelly, mid-elevation mountain sites. The association is found at primarily on mid to top-slopes with north to westerly aspects. Elevation ranges from approximately 894 to 1,191 meters, and elevation averages 1,064 meters. Slopes range from moderate to somewhat steep (from 10 to 20 degrees). Soils include sand to sandy loam, and are derived from granite/alkali-granite substrates.

Ecoregion Sections and Subsection Codes: Mojave Desert (3): 322Am

Park Sampling Zones: LAKE: Juniper Mine

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=3): LAMEN074, LAMEN079, LAMEN089

DEVA (n=0):

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

Juniperus californica / Yucca schidigera / Pleuraphis rigida Association

Association Code: CEPP006715; **Alliance Code:** A0502

Association Concept

The *Juniperus californica* / *Yucca schidigera* / *Pleuraphis rigida* Association forms an open tree canopy, in which tree cover ranges from 3 to 5 percent cover. The shrub layer is variable and ranges from 12 to 25 percent cover, and the herb understory is also variable and ranges from 5 to 13 percent cover. *Juniperus californica* is the dominant and/or characteristic tree in the overstory, while other trees often or sometimes present include *Yucca brevifolia*. The understory shrub layer usually has dominance or co-dominance of *Eriogonum fasciculatum* and/or *Yucca schidigera*. Other commonly associated shrubs include *Cylindropuntia acanthocarpa*, *Cylindropuntia echinocarpa*, *Ephedra nevadensis*, *Echinocereus engelmannii*, *Opuntia polyacantha* var. *erinacea*, and *Salazaria mexicana*. Characteristic herbs include *Achnatherum speciosum*, *Bromus rubens*, and *Pleuraphis rigida* at varying cover. Other commonly associated herbs include *Amaranthus fimbriatus*, *Bouteloua barbata*, *Bouteloua eriopoda*, *Mirabilis laevis* var. *villosa*, *Porophyllum gracile*, and *Sphaeralcea ambigua*. Stands may sometimes be lacking *Pleuraphis rigida*, but have *Eriogonum fasciculatum* and usually *Yucca schidigera*, suggest a distinctive phase while other environmental conditions are similar to this association.

The association is found rarely in Lake Mead National Recreation Area, in Nevada, and more commonly at Joshua Tree National Park and Mojave National Preserve, in California. Its habitats are mid to upper elevation, lower rocky slopes and upper alluvial fans that are on rocky highlands and upland, mixed alluvial deposits. Elevation ranges from approximately 970 to 1,580 meters, and elevation averages 1,374 meters. Slopes vary from gentle to steep (3 to 30 degrees), and they are often easterly-facing. Soils include coarse loamy sand or sandy loam, and they are derived from a variety of substrates such as alkali-granite (alaskite), gneiss, granitoid, and rhyolite.

Ecoregion Sections and Subsection Codes: Mojave Desert (3): 322A1, 322Am

Park Sampling Zones: LAKE: Katherine; MOJA: New York Mtns

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=1): LAKE0613

DEVA (n=0):

MOJA (n=2): MOJC1095, MOJC1150

MOJN-Johnson (n=0):

References

Evens et al. 2012

***Menodora spinescens* – *Atriplex confertifolia* Association**

NVC Association Code: CEG005769; **Alliance Code:** A2515

Association Concept

The *Menodora spinescens* – *Atriplex confertifolia* Association forms an open shrub canopy, in which the shrub cover ranges from 7 to 22 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.5 percent cover, and the herb understory is variable and ranges from 0.1 to 14 percent cover. *Menodora spinescens* is dominant or co-dominant in the shrub layer, and *Atriplex confertifolia* and *Lycium andersonii* are characteristically present as sub- to co-dominant shrubs. Other shrubs often present at low cover include *Ephedra nevadensis*, *Hymenoclea salsola*, *Krascheninnikovia lanata*, and *Psoralea arborescens*. Commonly associated herbs include *Sphaeralcea ambigua* and *Eriogonum inflatum*, and those trees sometimes present include *Yucca brevifolia*.

The association is typically found along gravelly, low to mid slopes into intermountain valleys of the Funeral Mountains and northwestern regions of Death Valley National Park, California. It occurs at upper to high elevations, ranging from approximately 1,500 to 1,950 meters, and averaging at 1,618 meters. Slopes range from flat to somewhat steep (between 0 to 17 degrees). The association is found on various upland surfaces including toe slopes to midslopes and out onto the upper alluvial fans at variable aspects. Soils are usually sand or sandy loams, but at times are silty clay or clay loam. They are most often derived from sedimentary and metamorphic substrates such as alluvium, sandstone, and limestone, but occasionally granodiorite and rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Ad; Southeastern Great Basin (10): 341Fb, 341Fc, 341Fe

Park Sampling Zones: DEVA: Funeral Mtns, Joshua Flat, Last Chance Range, Nelson Range

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=11

LAKE (n=0):

DEVA (n=11): DEVA0140, DEVA9250, DEVA9262, DEVAS098, DEVAS100, DEVAS122, DEVAS233, MOJC0174, MOJC0337, MOJC0835, MOJC0836

MOJA (n=0):

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

Menodora spinescens – (Ephedra nevadensis) Association

NVC Association Code: CEG002767; **Alliance Code:** A2515

Association Concept

The *Menodora spinescens* – (*Ephedra nevadensis*) Association forms an open to intermittent shrub canopy, in which shrub cover ranges from 8 to 45 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.2 percent cover; the herb understory is variable and ranges from 0 to 26 percent cover. *Menodora spinescens* is dominant or co-dominant in the shrub layer with *Ephedra nevadensis* and *Lycium andersonii* characteristically present. The overall shrub composition is typically species-rich, and other shrubs often present include *Ericameria cooperi*, *Grayia spinosa*, *Eriogonum fasciculatum*, *Hymenoclea salsola*, and *Krascheninnikovia lanata*. Commonly associated herbs include *Bromus rubens*, *Achnatherum speciosum*, *Sphaeralcea ambigua*, and *Xylorhiza tortifolia*, and those trees sometimes present include *Yucca brevifolia*.

The association is often found scattered at mid to upper elevations across the northern Mojave Desert and southern Great Basin including in Death Valley National Park in California and Nevada. Elevation ranges from approximately 1,050 to 1,900 meters, and elevation averages 1,382 meters. Slopes range from gentle to somewhat steep (between 1 to 23 degrees). This association can form stands covering large areas including upper alluvial fans to rolling hillslopes up to ridgetops without regard to landscape position or aspect. Soils range from sand to loam, though sometimes clay loam or silty clay. They are usually derived from sedimentary substrates such as mixed alluvium and sandstone, but also sometimes rhyolite, and occasionally conglomerate, granodiorite, or limestone.

Various phases of this association occur in the region, whereby *Grayia spinosa* may be co-dominant with *Menodora spinescens* often with *Ephedra nevadensis* as another co-dominant. Stands have been previously classified as *Grayia spinosa* – *Menodora spinescens* Association (CEGL001349) and *Menodora spinescens* Association (CEGL002767) are now merged into this more general association defined here.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (18): 322Ac, 322Ad; Southeastern Great Basin (15): 341Fa, 341Fb, 341Fc, 341Fd, 341Fe, 341Fg

Park Sampling Zones: DEVA: Black Mtns, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Nelson Range, Nevada Triangle

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=60

LAKE (n=0); DEVA (n=34): DEVA0205, DEVA0389, DEVA0508, DEVA0577, DEVA0586, DEVA0611, DEVA0912, DEVA9196, DEVA9199, DEVA9335, DEVA9343, DEVA9345, DEVA9346, DEVA9372, DEVA9398, DEVA9507, DEVA9510, DEVA9521, DEVA9522, DEVA9549, DEVA9578, DEVA9585, DEVA9659, DEVAD156, DEVAS068, DEVAS082, DEVAS111, DEVAS112, DEVAS161, MOJC0043, MOJC0173, MOJC0335, MOJC1077,

MOJC1078; MOJA (n=0); MOJN-Johnson (n=26): MOJJE021, MOJJE376, MOJJE377, MOJJE379, MOJJE387, MOJJE453, MOJJE501, MOJJE564, MOJJE567, MOJJE628, MOJJE631, MOJJE644, MOJJE645, MOJJE648, MOJJE657, MOJJE658, MOJJE665, MOJJE677, MOJJE699, MOJJE703, MOJJE723, MOJJE752, MOJJE754, MOJJE774, MOJJE873, MOJJE908

References

Keeler-Wolf and Thomas 2000

***Purshia stansburiana* – *Agave utahensis* Association**

NVC Association Code: CEPP006748; **Alliance Code:** A0833

Association Concept

The *Purshia stansburiana* – *Agave utahensis* Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 17 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 2 to 22 percent cover. *Agave utahensis* and *Purshia stansburiana* are the dominant and/or co-dominant shrubs with *Echinocereus engelmannii*, *Ephedra viridis*, *Gutierrezia sarothrae*, and *Thamnosma montana* being characteristically present. Other shrubs often present include *Coleogyne ramosissima*, *Echinocereus mojavensis*, *Eriogonum heermannii*, *Ferocactus cylindraceus*, *Viguiera parishii*, *Yucca baccata*, and *Yucca schidigera*. Commonly associated herbs include *Aristida purpurea*, *Bromus rubens*, *Erodium cicutarium*, *Thymophylla pentachaeta* var. *belenidium*, *Achnatherum speciosum*, *Astrolepis cochisensis*, *Muhlenbergia porteri*, and *Sphaeralcea ambigua*, and those trees at times present include *Yucca brevifolia*, *Juniperus osteosperma*, and *Pinus monophylla*. Nonvascular plants include cryptogamic crust, lichen and moss.

The association is found uncommonly along upper elevation, limestone and dolomite bedrock slopes and ridges in the Mojave Desert such as in the Mojave National Preserve in the Clark and Ivanpah Mountains and the Mescal Range. It also has been observed further northwest in the Kingston Range. Elevation ranges from approximately 1,400 to 1,650 meters, and elevation averages 1,505 meters. Slopes and ridges range from moderate to steep (between 9 to 33 degrees). This association is found primarily on predominantly warm, southerly to westerly aspects with no slope position preference. Soils are usually clay loam or sandy loam, and are derived from nutrient-poor, sedimentary substrates such as limestone or dolomite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322Aj

Park Sampling Zones: MOJA: Clark Mountain, Ivanpah Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=8

LAKE (n=0); DEVA (n=0); MOJA (n=8): MOJA0248, MOJA0324, MOJA9105, MOJA9140, MOJA9259, MOJA9349, MOJC0942, MOJC0949; MOJN-Johnson (n=0)

References

Keeler-Wolf and Thomas 2000

Purshia stansburiana – Artemisia tridentata Association

NVC Association Code: CEPP006749; **Alliance Code:** A0833

Association Concept

The *Purshia stansburiana* – *Artemisia tridentata* Association forms an open shrub canopy, in which the shrub cover ranges from 11 to 21 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.5 percent cover, and the herb understory is variable and ranges from 2 to 10 percent cover. *Purshia stansburiana*, *Artemisia tridentata*, and *Ephedra viridis* are the dominant and/or co-dominant shrubs with *Ericameria nauseosa*, *Eriogonum heermannii*, and *Gutierrezia microcephala* being characteristically present. Other shrubs often present include *Atriplex confertifolia*, *Brickellia microphylla*, *Eriogonum fasciculatum*, *Krascheninnikovia lanata*, *Lepidium fremontii*, *Stephanomeria pauciflora*, and *Symphoricarpos* spp. Commonly associated herbs include *Bromus rubens*, *Poa secunda*, *Achnatherum speciosum*, *Achnatherum pinetorum*, *Castilleja angustifolia*, *Cryptantha confertiflora*, *Elymus elymoides*, *Linanthus pungens*, *Mirabilis laevis*, and *Sphaeralcea ambigua*, and those trees sometimes present include *Juniperus osteosperma*. Nonvascular plants include cryptogamic crust, lichen, and moss.

The association is found in the upper elevation, limestone and dolomite bedrock slopes and ridges in the southern Great Basin, such as in the Cottonwood and Panamint Mountains of Death Valley National Park, California. Elevation ranges from approximately 1,500 to 1,800 meters, and elevation averages 1,637 meters. Slopes are usually very steep (ranging between 2 to 51 degrees). This association is found primarily on bedrock cliffs and canyon walls with colluvial disturbance, and rarely in rocky channel beds, along northerly and easterly aspects. Soils are typically sandy loams, and are derived from nutrient poor, dolostone (dolomite) or limestone substrates.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (6): 341Fc, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Panamint Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=6

LAKE (n=0):

DEVA (n=6): DEVA9401, MOJC0527, MOJC0528, MOJC1046, MOJC1047, MOJC1048

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

***Yucca brevifolia* / (*Artemisia tridentata* – *Atriplex confertifolia*) Association**

Association Code: CEPP006854; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / (*Artemisia tridentata* – *Atriplex confertifolia*) Association forms an open tree canopy, in which tree cover ranges from 1 to 8 percent cover. The shrub layer is variable and ranges from 5 to 24 percent cover, and the herb understory is also variable and ranges from 0.1 to 13 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory. The shrub understory is typically dominated or co-dominated by *Artemisia tridentata* and/or *Atriplex confertifolia*. Other commonly associated shrubs include *Ephedra nevadensis*, *Krascheninnikovia lanata*, *Lycium andersonii*, *Menodora spinescens*, and *Picrothamnus desertorum*, and commonly associated herbs include *Sphaeralcea ambigua*, *Achnatherum hymenoides*, *Astragalus*, *Bromus rubens*, *Erigeron aphanactis*, and *Eriogonum inflatum*.

The association is often found in Death Valley National Park, in California, at upper elevations primarily on rocky mountain slopes above the bajadas, valleys, and drainage channels that drain off of the slopes, or along draws between ridges of mountains within the southeastern Great Basin ecoregion. Elevation ranges from approximately 1,410 to 2,150 meters, and elevation averages 1,842 meters. Slopes vary from gentle to steep (from 3 to 28 degrees). Soils range from sandy clay to sandy loams, and are derived from a variety of substrates such as alluvium, granodiorite, sandstone, and shale.

Ecoregion Sections and Subsection Codes: Southeastern Great Basin (10): 341Fb, 341Fc, 341Fe

Park Sampling Zones: DEVA: Cottonwood Mtns, Joshua Flat, Last Chance Range, Nelson Range

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=0):

DEVA (n=12): DEVA9121, DEVA9135, DEVA9145, DEVA9263, DEVA9265, DEVA9323, DEVA9324, DEVAS070, DEVAS091, MOJC0065, MOJC1069, MOJC1070

MOJA (n=0):

MOJN-Johnson (n=0):

References

cf. Keeler-Wolf and Thomas 2000

Yucca brevifolia / Cyllindropuntia acanthocarpa Association

Association Code: CEG005779; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / *Cyllindropuntia acanthocarpa* Association forms an open tree canopy, in which tree cover ranges from 1 to 19 percent cover. The shrub layer is variable and ranges from 10 to 28 percent cover, and the herb understory is open and ranges from 1 to 8 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory. The shrub understory is typically dominated or co-dominated by *Cyllindropuntia acanthocarpa*. Other commonly associated shrubs include *Ephedra nevadensis*, *Opuntia polyacantha* var. *erinacea*, *Yucca baccata*, *Yucca schidigera*, *Echinocereus engelmannii*, *Ericameria cooperi*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Hymenoclea salsola*, *Lycium andersonii*, *Salazaria mexicana*, and *Thamnosma montana*, and commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Sphaeralcea ambigua*, *Achnatherum speciosum*, *Bouteloua eriopoda*, *Dasyochloa pulchella*, and *Muhlenbergia porteri*.

The association is often found in the Mojave National Preserve, California, found at upper elevations, primarily on high to mid-slopes with no aspect preference. Its habitats are usually upper bajadas at bases of mountains, high slopes of valleys, and volcanic dome highlands (e.g., Cima Dome area) within the Mojave Desert ecoregion. Soils include various combinations, usually with a component of sand, and are derived from a variety of substrates such as alluvium, granodiorite, and rhyolite. Elevation ranges from approximately 1,320 to 1,660 meters, and elevation averages 1,440 meters. Slopes vary from gentle to somewhat steep (from 1 to 18 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (12): 322Aj, 322Ak, 322Al

Park Sampling Zones: MOJA: Cima Dome SE, Hart Peak, Ivanpah Villy, Lanfair Villy, Marl Mtns, New York Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=12

LAKE (n=0):

DEVA (n=0):

MOJA (n=12): MOJA9238, MOJA9243, MOJA9364, MOJA9399, MOJC0974, MOJC0976, MOJC1001, MOJC1002, MOJC1080, MOJC1082, MOJC1180, MOJC1181

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

Yucca brevifolia / Larrea tridentata – Yucca schidigera / Pleuraphis rigida Association

Association Code: CEG005777; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / *Larrea tridentata* – *Yucca schidigera* / *Pleuraphis rigida* Association forms an open tree canopy, in which tree cover ranges from 1 to 5 percent cover. The shrub layer is variable and ranges from 8 to 28 percent cover, and the herb understory ranges from 0.5 to 25 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory. The shrub understory is typically dominated or co-dominated by *Larrea tridentata* and/or *Yucca schidigera* in varying mixtures. Other commonly associated shrubs include *Acamptopappus sphaerocephalus*, *Ambrosia dumosa*, *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, *Echinocereus engelmannii*, and *Krameria erecta*. Commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Eriogonum inflatum*, *Muhlenbergia porteri*, *Pleuraphis rigida*, *Pleuraphis jamesii*, and *Sphaeralcea ambigua*.

The association is often found across the Mojave National Preserve, California, but rarely in Lake Mead National Recreation Area, Arizona. It also is found in Joshua Tree National Park, in California. Its habitats typically are upper bajadas, undulating toe-slopes, and bottoms of mountain slopes at mid to upper elevations within the Mojave Desert ecoregion, which often have southern to westerly aspects. Elevation ranges from approximately 810 to 1,440 meters, and elevation averages 1,173 meters. Slopes vary from gentle to somewhat steep (from 1 to 18 degrees). Soils include various texture combinations from coarse sand to moderately fine sandy clay loam, and are derived mostly from alluvium as well as a variety of other substrates such as granodiorite, rhyolite, sandstone, and tephrite.

Ecoregion Sections and Subsection Codes: Mojave Desert (15): 322Aj, 322Ak, 322Al, 322Av

Park Sampling Zones: **LAKE:** Pearce Ferry; **MOJA:** Baker-Halloran, Castle Mtns, Cima Dome NW, Cima Dome SE, Cinder Cones, Clark Mtn West, Ivanpah Mtns, Piute Range, Solomons Knob

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=18

LAKE (n=1): LAKE0429

DEVA (n=0):

MOJA (n=14): CAMO9103, CAMO9130, MOJA9146, MOJA9174, MOJA9214, MOJA9295, MOJA9325, MOJA9327, MOJA9328, MOJA9341, MOJC0006, MOJC0074, MOJC0075, MOJC0080

MOJN-Johnson (n=3): MOJJE670, MOJJE566, , MOJJE881

References

Evens et al. 2012, cf. Keeler-Wolf and Thomas 2000

Yucca brevifolia / Lycium andersonii – Ephedra nevadensis Association

Association Code: CEG005778; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / *Lycium andersonii* – *Ephedra nevadensis* Association forms an open tree canopy, in which tree cover ranges from 0.5 to 11 percent cover. The shrub layer is variable and ranges from 6 to 29 percent cover, and the herb understory is also variable and ranges from 0.2 to 24 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory. The shrub understory is typically characterized by *Ephedra nevadensis*, *Krascheninnikovia lanata*, and/or *Lycium andersonii* which usually co-dominate in this shrub layer. Other commonly associated shrubs include *Cylindropuntia echinocarpa* and *Menodora spinescens*, and commonly associated herbs include *Bromus rubens*, *Eriogonum inflatum*, *Pleuraphis rigida*, and *Sphaeralcea ambigua*. Nonvascular plants include cryptogamic crust.

The association is often found at mid to upper elevations in Death Valley National Park and Mojave National Preserve in California, but only rarely in Lake Mead National Recreation Area, Arizona in both the Mojave Desert and southeastern Great Basin ecoregions. Habitats include foothill slopes that grade from mountains down to inter-mountain valleys, and intermittent drainages may intersect these lower slopes into the valleys and drainage channels below. Elevation ranges from approximately 800 to 1,850 meters, and elevation averages 1,429 meters. Slopes vary from flat to somewhat steep (ranging from 0 to 22 degrees) and aspect is variable in these sites. Soils primarily range between loam and sand, and are derived from a variety of substrates such as alluvium, basalt, conglomerate, granodiorite, limestone/dolostone, rhyolite, sandstone, and tephrite.

Ecoregion Sections and Subsection Codes: Mojave Desert (10): 322Aj, 322Av; Southeastern Great Basin (12): 341Fc, 341Fe

Park Sampling Zones: **DEVA:** Cottonwood Mtns, Last Chance Range, Last Chance Vlly, Nelson Range; **LAKE:** Pearce Ferry; **MOJA:** Cima Dome NW, Cima Dome SE, Cinder Cones

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=32

LAKE (n=3): LAKE0270, LAKE0423, LAKE0427

DEVA (n=12): DEVA0144, DEVA9227, DEVA9241, DEVA9326, DEVA9453, DEVA9568, DEVA9907, DEVAS054, DEVAS058, DEVAS090, DEVAS124, MOJC0598

MOJA (n=8): MOJA0298, MOJA0339, MOJA9242, MOJA9395, MOJA9396, MOJC0194, MOJC0995, MOJC1146

MOJN-Johnson (n=9): MOJJE385, MOJJE456, MOJJE548, MOJJE630, MOJJE632, MOJJE633, MOJJE668, MOJJE681, MOJJE883

References

Keeler-Wolf and Thomas 2000

Yucca brevifolia / (Prunus fasciculata – Salazaria mexicana) Association

Association Code: CEG005776; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / (*Prunus fasciculata* – *Salazaria mexicana*) Association forms an open tree canopy, in which tree cover ranges from 1 to 4 percent cover. The shrub layer is variable and ranges from 10 to 35 percent cover, and the herb understory is also variable and ranges from 2 to 16 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory. The shrub understory is typically characterized by wash-associated species including *Prunus fasciculata*, *Hymenoclea salsola*, *Salazaria mexicana*, and *Salvia dorrii*. Other commonly associated shrubs include *Cylindropuntia acanthocarpa*, *Cylindropuntia ramosissima*, *Cylindropuntia echinocarpa*, *Ephedra nevadensis*, *Ericameria cooperi*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Lycium andersonii*, *Lycium cooperi*, and *Thamnosma montana*, and commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Muhlenbergia porteri*, *Achnatherum speciosum*, and *Adenophyllum cooperi*.

The association is often found in Mojave National Preserve and in Joshua Tree National Park, in California, along upper bajadas that either have intermittent drainage channels or that have been recently disturbed, or are along washes that flow directly from adjacent hill slopes in the Mojave Desert ecoregion. Sites are upper elevations with gently to moderately steep slopes that often have southerly aspects. Soils primarily range between loam and sand, and are derived mostly from alluvium as well as a variety of other substrates such as gneiss, granodiorite, and tephrite/volcanic. Elevation ranges from approximately 1,300 to 1,730 meters, and elevation averages 1,433 meters. Slopes vary from gentle to somewhat steep (from 1 to 23 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (10): 322Aj, 322Ak, 322Al

Park Sampling Zones: MOJA: Cima Dome NW, Cima Dome SE, Ivanpah Mtns, Lanfair Vly, New York Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=10

LAKE (n=0):

DEVA (n=0):

MOJA (n=10): MOJA0228, MOJA9109, MOJA9219, MOJA9579, MOJC0975, MOJC0998, MOJC1079, MOJC1083, MOJC1084, MOJC1085

MOJN-Johnson (n=0):

References

cf. Evens et al. 2012, Keeler-Wolf et al. 2005, Keeler-Wolf and Thomas 2000

Yucca brevifolia / (Yucca baccata) / Pleuraphis jamesii – Bouteloua eriopoda Association

Association Code: CEPP006862; **Alliance Code:** A3148

Association Concept

The *Yucca brevifolia* / (*Yucca baccata*) / *Pleuraphis jamesii* – *Bouteloua eriopoda* Association forms an open tree canopy, in which tree cover ranges from 1 to 6 percent cover. The shrub layer is variable, ranging from 3 to 7 percent cover, and the herb understory ranging from 7 to 36 percent cover. *Yucca brevifolia* is the dominant and/or characteristic tree in the overstory, while other trees often or sometimes present include *Juniperus osteosperma*. The understory is typically diverse, with *Pleuraphis jamesii* and/or *Bouteloua eriopoda* typically dominant or co-dominant with other herbs. *Yucca baccata* is typically present in the shrub layer at variable cover along with a mixture of shrubs such as *Ephedra nevadensis* and *Cylindropuntia acanthocarpa*. Other commonly associated shrubs include *Eriogonum fasciculatum*, *Echinocereus engelmannii*, *Gutierrezia sarothrae*, *Krameria erecta*, *Psilostrophe cooperi*, and *Salazaria mexicana*. Other commonly associated herbs include *Achnatherum speciosum*, *Bromus rubens*, *Bouteloua curtipendula*, *Dasyochloa pulchella*, *Erodium cicutarium*, *Sphaeralcea ambigua*, *Eriogonum inflatum*, and *Muhlenbergia porteri*.

The association is often found in the northern and eastern Mojave National Preserve, California such as in the Ivanpah Mountains south to Ivanpah Valley. It occurs along mid to upper elevations from upper bajadas near mountain slopes, volcanic domes, rolling hill slopes, to elevated mesa tops and upper slopes and ridges with no aspect preference. Soils typically range between sand and loam, and are derived from a variety of substrates such as alluvium, gneiss, granodiorite, rhyolite, and sand. Elevation ranges from approximately 810 to 1,820 meters, and elevation averages 1,408 meters. Slopes vary from gentle to somewhat steep (from 1 to 21 degrees).

Ecoregion Sections and Subsection Codes: Mojave Desert (23): 322Aj, 322Ak, 322Al

Park Sampling Zones: MOJA: Castle Mtns, Cima Dome SE, Hart Peak, Ivanpah Mtns, Ivanpah Vlly, Lanfair Vlly, New York Mtns

Classification Confidence: High

Surveys (with Sample Sizes) Used for Description

MOJN: N=26

LAKE (n=0):

DEVA (n=0):

MOJA (n=20): CAMO8104, CAMO9124, MOJA0131, MOJA0233, MOJA0318, MOJA9112, MOJA9128, MOJA9129, MOJA9134, MOJA9240, MOJA9279, MOJA9321, MOJA9356, MOJA9358, MOJA9578, MOJC1000, MOJC1094, MOJC1097, MOJC1145, MOJC1176

MOJN-Johnson (n=6): MOJJE241, MOJJE244, MOJJE248, MOJJE686, MOJJE756, MOJJE759

References

cf. Keeler-Wolf and Thomas 2000, cf. Evens et al. 2012, McAuliffe 2016, cf. NatureServe 2012

***Yucca schidigera* – *Coleogyne ramosissima* Association**

NVC Association Code: CEG005780; **Alliance Code:** A3147

Association Concept

The *Yucca schidigera* – *Coleogyne ramosissima* Association forms an open shrub canopy, in which the shrub cover ranges from 13 to 32 percent cover. The emergent tree layer, if present, is sparse and ranges from 0 to 0.2 percent cover, and the herb understory is typically open and ranges from 0 to 17 percent cover. *Yucca schidigera* and *Coleogyne ramosissima* are the dominant and/or co-dominant shrubs along with *Cylindropuntia acanthocarpa*, *Echinocereus engelmannii*, *Eriogonum fasciculatum*, *Krameria erecta*, and *Viguiera parishii* being characteristically present. Other shrubs often present include *Acacia greggii* (= *Senegalia greggii*), *Ephedra nevadensis*, *Ericameria cooperi*, *Ferocactus cylindraceus*, *Larrea tridentata*, *Salazaria mexicana*, and *Thamnosma montana*. Commonly associated herbs include *Bromus rubens* and *Erodium cicutarium*, and those trees sometimes present include *Pinus monophylla* and *Yucca brevifolia*.

The association is found scattered across central and southern Mojave Desert including in the Mojave National Preserve, California, occurring at mid to upper elevation uplands ranging from approximately 1,000 to 1,550 meters, and averaging at 1,242 meters. It also is found in Joshua Tree National Park along mid to upper elevation, erosional highlands. Slopes range from gentle to steep (between 3 to 32 degrees). The association occurs at variable aspects on upper bajadas to rolling hill slopes of gravel or cobble and high slopes and ridges of bedrock. Soils usually range from clay loams to sandy loams, and are derived from a variety of substrates such as alluvium, gneiss, and limestone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (17): 322Ai, 322Aj, 322Ak, 322Al

Park Sampling Zones: MOJA: Cima Dome SE, Clark Mountain, Clipper Villy, Ivanpah Mtns, Kelso-Cima, Mineral Hill, Providence Mtns, Vulcan Mine

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=17

LAKE (n=0):

DEVA (n=0):

MOJA (n=17): MOJA0103, MOJA9253, MOJA9301, MOJA9333, MOJA9336, MOJA9337, MOJA9338, MOJA9415, MOJA9422, MOJA9429, MOJA9668, MOJA9905, MOJC0353, MOJC0354, MOJC0981, MOJC0982, MOJC1074

MOJN-Johnson (n=0):

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000

***Yucca schidigera* – *Cylindropuntia acanthocarpa* Association**

NVC Association Code: CEG005783; **Alliance Code:** A3147

Association Concept

The *Yucca schidigera* – *Cylindropuntia acanthocarpa* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 9 to 44 percent cover. The emergent tree layer is sparse and ranges from 0 to 1 percent cover, and the herb understory is variable and ranges from 2 to 22 percent cover. *Yucca schidigera* and *Cylindropuntia acanthocarpa* (= *Opuntia acanthocarpa*) are the dominant and/or co-dominant shrubs with *Acacia greggii* (= *Senegalia greggii*), *Echinocereus engelmannii*, *Ephedra nevadensis*, *Eriogonum fasciculatum*, *Ferocactus cylindraceus*, and *Viguiera parishii* being characteristically present. Other shrubs often present include *Gutierrezia sarothrae*, *Krameria erecta*, *Larrea tridentata*, and *Thamnosma montana*. Commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Eriogonum inflatum*, *Pleuraphis rigida*, and *Sphaeralcea ambigua*, and those trees sometimes present include *Pinus monophylla*. Nonvascular plants include lichen.

The association is found at mid to upper elevations scattered across the central Mojave Desert including the Mojave National Preserve, California. Elevation ranges from approximately 850 to 1,400 meters, and elevation averages 1,183 meters. Slopes range from gentle to steep (between 2 to 35 degrees). This association is found primarily on low to mid-slopes at south to southwesterly aspects. Soils are variable, but most often include silty clay, clay loam, and sandy loam, and are derived from a variety of substrates, but predominantly alluvium, gneiss, granodiorite, limestone/dolostone (dolomite), basalt, and rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (17): 322Ai, 322Aj, 322Al

Park Sampling Zones: MOJA: Clark Mtn, Clipper Vly, Granite Mtns, HackberryVntrigger, Kelso-Cima, Mid Hills, New York Mtns, Piute Range, Providence Mtns, Van Winkle Mtn, Vulcan Mine

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=17

LAKE (n=0):

DEVA (n=0):

MOJA (n=17): MOJA0251, MOJA9125, MOJA9252, MOJA9373, MOJA9419, MOJA9420, MOJA9457, MOJA9461, MOJA9568, MOJA9576, MOJA9582, MOJA9585, MOJA9622, MOJA9632, MOJA9904, MOJC0352, MOJC1076

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

Yucca schidigera – *Eriogonum fasciculatum* Association

NVC Association Code: CEG005781; **Alliance Code:** A3147

Association Concept

The *Yucca schidigera* – *Eriogonum fasciculatum* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 13 to 41 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 1 to 19 percent cover. *Yucca schidigera* and *Eriogonum fasciculatum* are the dominant and/or co-dominant shrubs with *Acacia greggii* (= *Senegalia greggii*), *Cylindropuntia acanthocarpa*, and *Ephedra nevadensis* being characteristically present. Other shrubs often present include *Echinocereus engelmannii*, *Ferocactus cylindraceus*, *Krameria erecta*, *Larrea tridentata*, *Salazaria mexicana*, *Stephanomeria pauciflora*, and *Viguiera parishii*. Commonly associated herbs include *Bromus rubens*, *Erodium cicutarium*, *Achnatherum speciosum*, *Amsinckia* spp., and *Sphaeralcea ambigua*, and those trees sometimes present include *Yucca brevifolia*, *Juniperus californica*, and *Pinus monophylla*.

The association is found in the central to eastern Mojave Desert including in and near the Newberry Mountains of Lake Mead National Recreation Area, Nevada, and at mid to upper elevations scattered across Mojave National Preserve, California. Elevation ranges from approximately 900 to 1,850 meters, and elevation averages 1,203 meters. Slopes range from gentle to steep (between 2 to 29 degrees). This association is found primarily on rolling, low to mid-slopes to steeper bedrocky ridges at easterly to southwesterly aspects. Soils are most commonly a loam with either a sand or clay component, and are derived from a variety of substrates usually granodiorite, rhyolite, alkali-granite (alaskite), alluvium, or gneiss.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (34): 322Ai, 322Aj, 322Ak, 322Al, 322Am

Park Sampling Zones: **LAKE:** Katherine; **MOJA:** Baker-Halloran, Castle Mtns, Cima Dome NW, Fenner Vlly West, Granite Mtns, HackberryVontraigger, Ivanpah Mtns, Ivanpah Vlly, Kelso-Cima, Lanfair Vlly, Marl Mtns, New York Mtns, Piute Range, Providence Mtns, Woods Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=34

LAKE (n=5): LAKE0618, LAKE0621, LAKE0623, LAKE9614, LAKE9615

DEVA (n=0):

MOJA (n=29): CAMO9105, CAMO9107, MOJA9153, MOJA9179, MOJA9254, MOJA9255, MOJA9284, MOJA9313, MOJA9315, MOJA9330, MOJA9362, MOJA9437, MOJA9500, MOJA9532, MOJA9533, MOJA9538, MOJA9592, MOJA9623, MOJA9634, MOJA9903, MOJA9918, MOJC0094, MOJC0097, MOJC0098, MOJC0189, MOJC0191, MOJC0211, MOJC0997, MOJC1154

MOJN-Johnson (n=0):

References

Keeler-Wolf and Thomas 2000

Yucca schidigera – Larrea tridentata – Ephedra nevadensis Association

NVC Association Code: CEG005782; **Alliance Code:** A3147

Association Concept

The *Yucca schidigera* – *Larrea tridentata* – *Ephedra nevadensis* Association forms an open shrub canopy, in which the shrub cover ranges from 9 to 32 percent cover. The emergent tree layer is sparse and ranges from 0 to 1.5 percent cover, and the herb understory is variable and ranges from 1 to 10 percent cover. *Yucca schidigera*, *Larrea tridentata*, and *Ephedra nevadensis* are the dominant and/or co-dominant shrubs with *Krameria erecta* and *Lycium andersonii* characteristically present. Other shrubs often present include *Acamptopappus sphaerocephalus*, *Ambrosia dumosa*, *Cylindropuntia ramosissima*, *Echinocereus engelmannii*, *Ferocactus cylindraceus*, *Opuntia basilaris* and *Thamnosma montana*. Characteristically present herbs include *Bromus rubens*, *Erodium cicutarium*, and *Xylorhiza tortifolia*, and other commonly associated herbs include *Achnatherum speciosum*, *Amsinckia* spp., *Dasyochloa pulchella*, *Eriogonum inflatum*, *Schismus* spp., and *Sphaeralcea ambigua*. Those trees often present include *Yucca brevifolia*, and nonvascular plants include cryptogamic crust and lichen.

The association is found at mid to upper elevations in the central Mojave Desert including the northern and eastern half of Mojave National Preserve to the Castle Mountains, in California. Elevation ranges from approximately 1,050 to 1,400 meters, and elevation averages 1,259 meters. Slopes range from gentle to steep (between 1 to 27 degrees). This association is found primarily on rocky, mid- to high-slopes that often have southwesterly aspects though sometimes northerly aspects. Soils are usually a mixture of loam and sand with occasionally a clay component, and are typically derived from igneous substrates such as granodiorite, basalt, rhyolite, or tephrite (basanite).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Aj, 322Al

Park Sampling Zones: MOJA: Baker-Halloran, Castle Mtns, Cima Dome NW, Cinder Cones, Hart Peak, Kelso Mtns, Marl Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=15

LAKE (n=0):

DEVA (n=0):

MOJA (n=14): CAMO9104, CAMO9131, CAMO9133, MOJA0154, MOJA0340, MOJA9296, MOJA9397, MOJA9523, MOJA9608, MOJA9641, MOJC0195, MOJC1081, MOJC1211, MOJC1212

MOJN-Johnson (n=1): MOJJE700

References

Keeler-Wolf and Thomas 2000, cf. Keeler-Wolf et al. 1998

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M171. Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

G310. Intermountain Semi-Desert Steppe & Shrubland Group

Ericameria nauseosa Steppe & Shrubland Alliance

Lepidospartum latisquamum Association

NVC Association Code: CEPP006725; **Alliance Code:** A3196

Association Concept

The *Lepidospartum latisquamum* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 22 percent cover. The emergent tree layer is sparse and ranges from 0.2 to 1.2 percent cover, and the herb understory is variable and ranges from 0 to 1 percent cover.

Lepidospartum latisquamum is the dominant and/or co-dominant shrub with *Artemisia tridentata* ssp. *vaseyana*, *Ephedra viridis*, *Eriogonum heermannii*, and *Purshia stansburiana* being characteristically present. Other shrubs often present include *Ericameria nauseosa*, *Menodora spinescens*, *Prunus fasciculata*, and *Symphoricarpos* spp. Commonly associated herbs include *Chaenactis* spp. and *Elymus elymoides*. *Yucca brevifolia* is characteristically present in the tree layer, and those sometimes present are *Juniperus osteosperma* and *Pinus monophylla*. These wash stands are diverse in shrub composition and appear adjacent to upland stands of *Artemisia tridentata* ssp. *vaseyana*.

The association is found rarely along gravelly, upper elevation washes in the southern Great Basin such as in the Cottonwood Mountains, Inyo Mountains, and Last Chance Range in Death Valley National Park, California. It also appears to occur further southwest in the Transverse Ranges of California, such as in the San Gabriel Mountains San Bernardino Mountains, as well as further north in the White Mountains, based on details of plant specimen records in desert and desert-transition mountains of California. Elevation ranges from approximately 1,850 to 1,950 meters, and elevation averages 1,894 meters. Slopes are gentle (between 3 to 4 degrees). This association is found primarily in intermittently flooded channel beds with variable aspect. Soils include clay loam, loamy sand, and silty clay, and are derived from sedimentary, mixed alluvium substrates including sandstone, dolomite, limestone, and shale rocks.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (3): 341Fc

Park Sampling Zones: DEVA: CottonWood Mtns, Last Chance Range

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=0); DEVA (n=3): DEVA9445, DEVA9571, DEVA9574; MOJA (n=0); MOJN-Johnson (n=0)

References:

Jepson Flora Project 2016

***Gutierrezia sarothrae* / *Pleuraphis rigida* – *Sphaeralcea ambigua* Association**

NVC Association Code: CEG001543; **Alliance Code:** A3203

Association Concept

The *Gutierrezia sarothrae* / *Pleuraphis rigida* – *Sphaeralcea ambigua* Association forms an open shrub canopy, in which the shrub cover ranges from 6 to 10 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.6 percent cover, and the herb understory is variable and ranges from 0 to 35 percent cover. *Gutierrezia sarothrae* is the dominant shrub with *Sphaeralcea ambigua* and *Bromus rubens* possibly dominating or co-dominating in the herb layer. Other shrubs sometimes present include *Larrea tridentata* and *Opuntia polyacantha* var. *erinacea*. Commonly associated herbs include *Achnatherum speciosum*, *Bromus tectorum*, *Elymus elymoides*, *Erodium cicutarium*, and *Pleuraphis rigida*. Those trees sometimes present include *Juniperus osteosperma* and *Yucca brevifolia*, and nonvascular plants sometimes include lichen.

The association is found in the central and northern Mojave Desert such as at mid elevations in the Panamint Mountains of Death Valley National Park and at high elevations in the eastern half of Mojave National Preserve, California. Stands appear to occur in recently burned areas and along steep, erosional bedrock cliffs. Elevation ranges from approximately 850 to 2,050 meters, and elevation averages 1,428 meters. Slopes range from gentle to very steep (between 3 to 49 degrees). The association is found from valleys to low-slopes and ridges often at northerly and easterly aspects. Soils include various mixtures of loam, and are derived predominantly from igneous substrates such as granodiorite and rhyolite, but occasionally some sedimentary types.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Af, 322Aj, 322Ak, 322Al

Park Sampling Zones: **DEVA:** Panamint Mtns; **MOJA:** Clark Mtn, HackberryVntrigger, Mid Hills, New York Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=0):

DEVA (n=1): DEVA9280

MOJA (n=6): MOJA0111, MOJA0322, MOJA9268, MOJA9269, MOJA9614, MOJA9615

MOJN-Johnson (n=0):

References

NatureServe 2016

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M171. Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

G311. Intermountain Semi-Desert Grassland Group

Achnatherum hymenoides – *Pseudoroegneria spicata* – *Muhlenbergia pungens* Grassland Alliance

Achnatherum hymenoides – *Oenothera deltoides* Association

NVC Association Code: CEPP006710; **Alliance Code:** A1262

Association Concept

The *Achnatherum hymenoides* – *Oenothera deltoides* Association forms an open to intermittent herb layer, in which the herbaceous cover ranges from 2 to 34 percent cover. The emergent tree layer is typically absent, and the shrub layer is sparse and ranges from 0 to 2 percent cover. *Achnatherum hymenoides* is characteristically present with other herbs such as *Sphaeralcea ambigua*, *Oenothera deltoides*, and/or *Salsola tragus*. The *Salsola*, which is an invasive non-native herb that occurs in various habitats across the West, is sometimes higher in cover than the native herbs. Shrubs that are sometimes present include *Psoralea* spp.

The association is found uncommonly in Death Valley National Park, Lake Mead National Recreation Area, and Mojave National Preserve in California, sampled and observed at mid elevations along sand dunes, sand sheets, and edges of playas such as within the Eureka Dunes. Elevation ranges from approximately 914 to 930 meters, and averages 921 meters. Slopes are gentle (e.g., 1 degrees). It is sampled on northerly aspects. Soils include fine to medium sand, and they are derived from aeolian sand deposits and alluvium.

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (3): 341Fc

Park Sampling Zones: DEVA: Eureka Valley

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=3

LAKE (n=0):

DEVA (n=3): MOJC0626, MOJC0627, MOJC1238

MOJA (n=0):

MOJN-Johnson (n=0):

References

cf. Keeler-Wolf and Thomas 2000

***Scleropogon brevifolius* – *Pleuraphis jamesii* – *Bouteloua eriopoda* Association**

NVC Association Code: CEG006755; **Alliance Code:** A1287

Association Concept

The *Scleropogon brevifolius* – *Pleuraphis jamesii* – *Bouteloua eriopoda* Association forms an open to intermittent herb layer, with herbaceous cover 21 to 25 percent cover. The emergent tree layer is sparse (1 percent cover), and the shrub layer is also sparse (1 to 2 percent cover). *Scleropogon brevifolius*, *Pleuraphis jamesii*, and *Bouteloua eriopoda* are characteristically present and co-dominant perennial grasses in the herbaceous layer. Other commonly associated herbs include perennials such as *Achnatherum hymenoides*, *Dasyochloa pulchella*, *Muhlenbergia porteri*, *Sporobolus cryptandrus*, and annuals such as *Amsinckia tessellata*, *Erodium cicutarium*, *Eriogonum deflexum*, and *Lepidium lasiocarpum*. Shrubs present include *Cylindropuntia acanthocarpa*, *Ephedra nevadensis*, *Ericameria cooperi*, *Gutierrezia microcephala*, *Gutierrezia sarothrae*, *Krascheninnikovia lanata*, *Lycium andersonii*, *Opuntia polyacantha* var. *erinacea*, and *Yucca baccata*. Emergent trees present include *Yucca brevifolia*.

This perennial grassland association is known rarely from Mojave National Preserve and Castle Mountains National Monument, California. It has been sampled twice in high intermountain plains and alluvial flats of the Castle Mountains and in adjacent land of the Preserve. It is found along mid-elevation (approximately 1,300 to 1,400 meters), gentle slopes (e.g., 1 degree) at a low level position with westerly aspect. The soil consists of silty or sandy loam, and is derived from gravelly alluvium.

This association is similar to *Bouteloua eriopoda* – *Pleuraphis jamesii* Association (CEG001751) while the *Scleropogon brevifolius* in this association occurs in largely intact, clumping patches amongst a broader landscape of the other two perennial grass species with *Yucca brevifolia* woodlands in this southeastern edge of California. Past grazing may be a factor in this grass being present as a localized codominant grass in California, since other grassland stands with *Scleropogon brevifolius* occur in southwestern North America (east to New Mexico and Texas), generally being more abundant in areas with past heavy grazing or other disturbance (NatureServe 2016).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322A1

Park Sampling Zones: MOJA: Castle Mtns, Lanfair Vly

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=2

LAKE (n=0): ; DEVA (n=0): ; MOJA (n=2): CAMO0116, CAMO0117 ; MOJN-Johnson (n=0):

References

NatureServe 2016

Sphaeralcea ambigua Dry Meadow Association

NVC Association Code: CEPP009532; **Alliance Code:** A4216

Association Concept

The *Sphaeralcea ambigua* (post-burn) Association forms an open herb layer, in which the herbaceous cover ranges from 0.2 to 15 percent cover. The emergent tree layer is sparse, when present, and ranges from 0 to 0.5 percent cover, and the shrub layer is sparse and ranges from 0.2 to 2 percent cover. *Sphaeralcea ambigua* is characteristically present and dominant or co-dominant with *Bromus rubens*, *Erodium cicutarium*, and/or other herbs in the herbaceous layer. Other herbs that are sometimes present include *Achnatherum speciosum*, *Antheropeas* spp. *Cryptantha* spp., *Eriogonum inflatum*, *Eriogonum nidularium*, and *Salvia columbariae*. Shrubs that are often present include *Lycium andersonii* and *Thamnosma montana*. Those trees rarely present can include *Juniperus osteosperma*, *Pinus monophylla*, *Quercus chrysolepis*, or *Yucca brevifolia*.

The association is found in the post-burn areas of the Mojave Desert such as in the Black and Panamint Mountains of Death Valley National Park, and in various areas of the Mojave National Preserve in California, sampled at mid to upper elevations. Elevation ranges from approximately 750 to 1,850 meters, and averages 1,380 meters. Slopes are gentle to somewhat steep (ranging from 1 to 25 degrees). It is found primarily on low to midslopes at northeasterly to southerly aspects. Soils typically range between loam and sand, and are usually derived from igneous substrates such as granodiorite or rhyolite, but also sandstone.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (11): 322Ad, 322Aj, 322Al Southeastern Great Basin (1): 341Ff

Park Sampling Zones: **DEVA:** Black Mtns, Panamint Mtns; **MOJA:** Baker-Halloran, Mid Hills, New York Mtns, Piute Range, Woods Mtns

Classification Confidence: Moderate

Surveys (with Sample Sizes) Used for Description

MOJN: N=13

LAKE (n=0):

DEVA (n=5): DEVAS135, DEVAS136, DEVAS138, DEVAS139, DEVAS147

MOJA (n=7): MOJA9108, MOJA9160, MOJA9175, MOJA9294, MOJA9512, MOJC1099, MOJC1100

MOJN-Johnson (n=1): MOJJE278

References

None

3. Desert & Semi-Desert Class

3.B.1 Cool Semi-Desert Scrub & Grassland Formation

3.B.1.Ne Western North American Cool Semi-Desert Scrub & Grassland Division

M171. Great Basin-Intermountain Dry Shrubland & Grassland Macrogroup

G312. Colorado Plateau Blackbrush - Mormon-tea Shrubland Group

Ephedra viridis Colorado Plateau Shrubland Alliance

Ephedra viridis (provisional) Association

NVC Association Code: CEPP006703; **Alliance Code:** A3201

Association Concept

The *Ephedra viridis* (provisional) Association forms an open shrub canopy, in which the shrub cover ranges from 3 to 15 percent cover. The emergent tree layer is sparse and ranges from 0 to 0.2 percent cover, and the herb understory is variable and ranges from 0 to 5 percent cover. *Ephedra viridis* is the dominant or co-dominant shrub with *Gutierrezia sarothrae* often present. Commonly associated herbs include *Achnatherum speciosum* and *Bromus rubens*, and those trees sometimes present include *Yucca brevifolia*. Nonvascular plants include lichen.

The association is found in the rocky hills and bedrock slopes and cliffs at upper elevations of the central to eastern Mojave Desert such as in the Ivanpah Mountains in Mojave National Preserve, California, the upper to high elevations of Death Valley National Park, California, and in the Wilson Ridge and Pinto Valley areas of Lake Mead National Recreation Area, in Nevada and Arizona. Elevation ranges from approximately 600 to 2,150 meters, and elevation averages 1,506 meters. Slopes range from moderate to steep (between 11 to 38 degrees). This association is found primarily on low- to mid-slopes to ridges often with cool, northerly aspects. Soils are typically clay loam, and are derived from both igneous and sedimentary substrates such as granodiorite, rhyolite, claystone, limestone, or shale.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (4): 322Ad, 322Aj, 322Av, 322Ay; Southeastern Great Basin (3): 341Fc

Park Sampling Zones: **DEVA:** CottonWood Mtns, Green Water Rng/Vlly, Joshua Flat; **LAKE:** Callville, Willow Beach; **MOJA:** Ivanpah Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=7

LAKE (n=2): LAKE9199, LAKE9450

DEVA (n=4): DEVA9379, DEVA9650, DEVA9656, DEVAS197

MOJA (n=1): MOJA0109

MOJN-Johnson (n=0):

References

Buck-Diaz et al. 2012

Ephedra viridis – Purshia glandulosa Association

NVC Association Code: CEPP006702; **Alliance Code:** A3201

Association Concept

The *Ephedra viridis* – *Purshia glandulosa* Association forms an open to intermittent shrub canopy, in which the shrub cover ranges from 5 to 35 percent cover. The emergent tree layer is sparse and ranges from 0 to 2 percent cover, and the herb understory is variable and ranges from 0 to 22 percent cover. *Ephedra viridis* and *Purshia glandulosa* are the dominant and/or co-dominant shrubs. Other shrubs often present include *Ericameria nauseosa*, *Eriogonum fasciculatum*, *Artemisia tridentata* ssp. *vaseyana*, and *Grayia spinosa*. Commonly associated herbs include *Bromus tectorum*, *Achnatherum speciosum*, and *Mentzelia* spp., and those trees sometimes present include *Pinus monophylla* and *Yucca brevifolia*. Nonvascular plants sometimes include lichen and moss. Stands of this association are often found adjacent to *Artemisia tridentata* ssp. *vaseyana* stands.

The association is found at upper elevations scattered across the northern Mojave Desert and southern Great Basin including in Death Valley National Park, in California and Nevada. Elevation ranges from approximately 1,450 to 2,150 meters, and elevation averages 1,751 meters. Slopes are typically somewhat steep to steep, though they range from gentle to steep (between 2 to 31 degrees). The association is found primarily on mid- to high-slopes up to ridges with variable aspect that may have colluvial, post-fire, and/or intermittent wash disturbance. Soils are usually mixtures of sand and loam, and are typically derived from igneous substrates such as granodiorite or rhyolite.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Ac
Southeastern Great Basin (10): 341Fc, 341Fd, 341Ff, 341Fg

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Nelson Range, Nevada
Triangle, Owlshead Mtns

Classification Confidence: Low

Surveys (with Sample Sizes) Used for Description

MOJN: N=11

LAKE (n=0):

DEVA (n=11): DEVA0664, DEVA9295, DEVA9479, DEVA9580, DEVA9594, DEVAS059,
DEVAS121, DEVAS199, DEVAS200, MOJC0463, MOJC0464

MOJA (n=0):

MOJN-Johnson (n=0):

References

None

7. Agricultural & Developed Vegetation Class

7.C.1., 7.C.2. Lawn, Garden & Recreational Formation and Other Developed Vegetation Formation

CSF21, CSF22. Horticultural Garden Division and Other Developed Vegetation Division

CGR037, CGR040, and CGR039. Temperate Tree Garden Macrogroup; Tree Developed Vegetation Macrogroup and Shrub & Herb Developed Vegetation Macrogroup

CSG043, CSG047, and CSG045. Temperate Tree Garden Group; Temperate Tree Developed Vegetation Group and Temperate Shrub & Herb Developed Vegetation Group

North American Desert Tree Garden Cultural Type

Tamarix aphylla Planted Association

NVC Association Code: CST006759; **Alliance Code:** CTY022

Association Concept

The *Tamarix aphylla* Planted Association forms an intermittent to continuous tree canopy ranging from 63 to 81 percent cover. *Tamarix aphylla* dominates in the tree overstory. Commonly associated shrubs include *Larrea tridentata* and *Nerium oleander* in a sparse to open shrub understory.

The association was sampled at low to mid elevations in Death Valley National Park in California, including at Panamint, Warm, Shoot me up, and Ratatat Springs, and it also was mapped as individuals and stands at the Travertine Springs complex (Thomas 2006). It also has been observed as planted stands in ornamental settings, such as at Kelso in the Mojave National Preserve and around developed areas of Lake Mead National Recreation Area in Arizona and Nevada. Elevations range from approximately 200 to 750 meters, and elevation averages 573 meters.

Tamarix aphylla is an introduced, fast-growing tree and is tolerant of alkaline and saline soils. It mainly reproduces through vegetative re-sprouting on-site, as most of the seeds are sterile. It has been planted as windbreaks and for shade in various locations within the Mojave Desert, including in MOJA, where it does not appear to be invasively spreading. However, it occurs localized as individuals and small stands in DEVA, including at the Travertine Springs complex where it has been mapped with least 15 point locations and 6 polygons, and it has been removed from some locations in that area (Thomas 2006). It also has been found along saline portions of the lower Colorado River (Tesky 1992).

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3): 322Ab, 322Af, (322Ak); Southeastern Great Basin (1): 341Fe

Park Sampling Zones: **DEVA:** Death Valley, Nelson Range, Panamint Mtns; **MOJA:** (Kelso-Cima); **LAKE:** (Various zones)

Classification Confidence: Low

Surveys (with Sample Sizes) Used in Description

MOJN: N=4

LAKE (n=0); DEVA (n=4): DEVA8001, DEVA8002, DEVA8003, DEVA9348; MOJA (n=0);
MOJN-Johnson (n=0)

References

cf. Sawyer et al. 2009, Thomas 2006, Tesky 1992

Literature Cited

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