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Mojave Desert Network

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

By

California Native Plant Society
2707 K Street, Suite 1
Sacramento, CA 95816

In partnership with the

National Park Service
Mojave Desert Network Inventory and Monitoring Program
601 Nevada Hwy
Boulder City, NV 89005

And

NatureServe
Western Regional Office
4001 Discovery, Suite 2110
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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

Common Name: Canyon Live Oak – California Black Oak Forest & Woodland
Group Assignment: G195; **Alliance Code:** A3349

Alliance Concept

The Canyon Live Oak – California Black Oak Forest & Woodland Alliance forms an open to continuous tree canopy with an open to intermittent shrub understory. The alliance has been found at mid to upper elevations in MOJA along protected rock-outcrops, canyons, and drainages and of the Granite, New York and Providence Mountains. It occurs on lowslopes to summits at all aspects, and elevations range from approximately 1400 to 1800 meters. Soils are derived from granodiorite, limestone, and sandstone substrates and textures are variable. *Quercus chrysolepis* is dominant or co-dominant in the overstory tree layer, and *Pinus monophylla* is characteristic. Commonly associated shrubs include *Rhamnus ilicifolia, Rhus trilobata, Brickellia californica, Ericameria linearifolia, and Yucca baccata.* Various herbs occur in the stands including *Artemisia ludoviciana, Bromus rubens, Elymus elymoides, Achnatherum speciosum, Arabis* spp., and *Bromus tectorum.*

Diagnostic Criteria: This alliance is characterized by an open to continuous tree canopy with *Quercus chrysolepis* dominant or co-dominant and ranging from 6 to 80 percent cover. The overall tree cover also ranges from 6 to 80 percent cover.

Alliance Distribution

The alliance is localized in MOJA at mid to upper elevations. It has been sampled in the Granite, New York, and Providence Mountains, and the Mid Hills.

States: CA
Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (9): 322Al
Park Sampling Zones: MOJA: Granite Mtns, Mid Hills, New York Mtns, Providence Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Quercus chrysolepis / Rhamnus ilicifolia [CEPP006750]	9	–	–	x	–

Association notes: The *Quercus chrysolepis / Rhamnus illicifolia* association is rare, covering less than 400 ha (Evens 2000).

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1576.3 m, Range 1413 – 1794 m
- Aspect: N (3), NE (3), E (1), SE (1), SW (1)
- Slope: Mean 17.6 degrees, Range 5 – 32 degrees
- Macro Topography: High level/summit (1), Lowslope (2), Midslope (2)
- Tree Cover: Mean 31.7%, Range 6 – 80%
- Shrub Cover: Mean 17.7%, Range 5.8 – 39%
- Herb Cover: Mean 4.9%, Range 1.5 – 12%
- Large Rock: Mean 47.1%, Range 15 – 77%
- Small Rock: Mean 18.5%, Range 5 – 29%
- Fines Cover: Mean 2.9%, Range 0.2 – 9.8%
- Litter Cover: Mean 29.5%, Range 2.5 – 61%
- Geology: granodiorite (5), limestone (3), sandstone (1)
- Soil Texture: Clay loam (1), Loamy sand (1), Medium sand (1), Medium to very fine loamy sand (2), Medium to very fine sandy loam (1), Muck (1), Sandy loam (2)

Environment: The alliance is localized in MOJA at mid to upper elevations along protected highslope granitic outcrops, canyons, and mountain drainages. Soils are derived from granodiorite, limestone, and sandstone substrates and textures are variable. The alliance appears to be found on lowslopes to summits at all aspects where ambient moisture appears higher than the surrounding uplands of *Pinus monophylla* woodlands and other assemblages.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous tree layer with a sparse to intermittent shrub layer and a sparse or open herbaceous understory.

Vegetation Floristics: *Quercus chrysolepis* is dominant or co-dominant in the overstory tree layer, and *Pinus monophylla* is characteristic. Shrubs that are characteristic or often present include *Rhamnus ilicifolia, Rhus trilobata*, *Brickellia californica, Ericameria linearifolia,* and *Yucca baccata.* Herbs that are characteristic or often present include *Artemisia ludoviciana, Bromus rubens, Elymus elymoides*, *Achnatherum speciosum, Arabis* spp., and *Bromus tectorum*.

Dynamics: *Quercus chrysolepis* is dominant or co-dominant with conifers and other hardwoods in the tree canopy. It is the most common and widespread hardwood in California. It grows on the east side of the Sierra Nevada and in the Mojave Desert in a few canyons and rocky slopes that have adequate moisture and are well-protected from fire.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S5

References

Buck-Diaz et al. 2012, Evens 2000, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in 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)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	***Quercus chrysolepis***	100	78	27	2	65	x	x	–	–
	Pinus monophylla	89	18	4	0.5	10	x	–	–	–
	Juniperus osteosperma	44	3.6	1	0.2	5	–	–	–	–
Shrub	*Rhamnus ilicifolia*	100	11	1.8	0.2	5.1	x	–	–	–
	Rhus trilobata	78	10	1.3	0.2	4.1	x	–	–	–
	Ericameria linearifolia	56	3.8	0.4	0.2	2	–	–	–	x
	Brickellia californica	56	2.3	0.4	0.2	1.6	–	–	–	x
	Yucca baccata	56	0.9	0.1	0.2	0.2	–	–	–	x
	Ericameria cuneata	44	4.7	0.4	0.2	2	–	–	–	–
	Gutierrezia sarothrae	44	1.6	0.4	0.2	2	–	–	–	–
	Ephedra viridis	44	3.5	0.4	0.2	1.1	–	–	–	–
	Prunus fasciculata	44	1.6	0.2	0.2	1	–	–	–	–
	Echinocereus mojavensis	44	0.9	0.1	0.2	0.2	–	–	–	–
	Baccharis sergiloides	33	14	2.9	1	15	–	–	–	–
	Garrya flavescens	33	10	2.3	3	13	–	–	–	–
	Eriogonum heermannii	33	1.1	0.1	0.2	0.5	–	–	–	–
	Artemisia tridentata	33	0.8	0.1	0.2	0.2	–	–	–	–
	Cercocarpus intricatus	33	0.5	0.1	0.2	0.2	–	–	–	–
	Erigeron utahensis	33	0.5	0.1	0.2	0.2	–	–	–	–
	Eriogonum wrightii	33	0.5	0.1	0.2	0.2	–	–	–	–
	Opuntia phaeacantha	33	0.5	0.1	0.2	0.2	–	–	–	–
	Opuntia polyacantha var. erinacea	33	0.5	0.1	0.2	0.2	–	–	–	–
	Thamnosma montana	33	0.7	0.1	0.2	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Elymus elymoides*	89	4.1	0.2	0.2	0.5	x	–	–	–
	Artemisia ludoviciana	89	4.1	0.4	0.2	1	x	–	–	–
	Bromus rubens	78	18	1.5	0.2	8	x	–	–	–
	Bromus tectorum	56	7.8	0.4	0.2	2	–	–	–	x
	Achnatherum speciosum	56	3.3	0.1	0.2	0.5	–	–	–	x
	Arabis	56	3	0.1	0.2	0.5	–	–	–	x
	Poa fendleriana	44	2.6	0.2	0.2	1	–	–	–	–
	Castilleja linariifolia	44	2	0.1	0.2	0.5	–	–	–	–
	Galium	44	2.7	0.1	0.2	0.5	–	–	–	–
	Penstemon palmeri	44	1.3	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	44	1.6	0.1	0.2	0.2	–	–	–	–
	Claytonia perfoliata	33	6.7	0.5	0.2	4	–	–	–	–
	Leymus salinus	33	4.2	0.4	0.2	3	–	–	–	–
	Arabis perennans	33	1.1	0.1	0.2	0.2	–	–	–	–
	Galium parishii	33	1.1	0.1	0.2	0.2	–	–	–	–
	Lomatium parryi	33	1.1	0.1	0.2	0.2	–	–	–	–
	Physalis hederifolia	33	1.1	0.1	0.2	0.2	–	–	–	–
	Silene verecunda	33	1	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Lichen	89	62	2.8	0.4	14	x	x	–	–
	Unknown Moss	67	17	0.3	0.2	2	–	–	–	x

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

Common Name: Intermountain Basins Limber Pine Forest & Woodland
Group Assignment: G224; **Alliance Code:** A2035

Alliance Concept

The Intermountain Basins Limber Pine Forest & Woodland forms an open tree canopy with an open to intermittent shrub understory. The alliance is found at high elevations in the Panamint and Inyo Mountains primarily on mid to highslopes at northwest and east aspects. Small stands are also likely found in the Grapevine Mountains. Soils are typically sandy loam derived from sandstone. Elevations range from approximately 2700 to 3100 meters. *Pinus flexilis* is dominant in the overstory tree layer. Commonly associated shrubs include *Artemisia tridentata, Chrysothamnus viscidiflorus, Eriogonum umbellatum,* and *Ribes cereum.* Commonly associated herbs include *Castilleja applegatei* and *Linanthus pungens.*

Diagnostic Criteria: This alliance is characterized by an open tree canopy dominated by *Pinus flexilis,* which ranges from 3 to 18 percent cover. The overall tree cover also ranges from 3 to 18 percent cover.

Alliance Distribution

The alliance is localized in DEVA with samples taken at upper elevations of the Panamint Mountains, and small stands are also likely found in the Grapevine Mountains.

States: CA

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

Park Sampling Zones: DEVA: Panamint Mtns; (Inyo Mtns, Grapevine Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pinus flexilis / Artemisia tridentata [CEPP009588]	5	–	x	–	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 2946.2 m, Range 2682 – 3107 m
- Aspect: E (1), NW (4)
- Slope: Mean 22.8 degrees, Range 15 – 29 degrees
- Macro Topography: Highslope (3), Midslope (2)
- Tree Cover: Mean 8.7%, Range 3 – 18.2%
- Shrub Cover: Mean 24%, Range 8.6 – 43.2%
- Herb Cover: Mean 1.2%, Range 1 – 2%
- Large Rock: Mean 12.4%, Range 0 – 40%
- Small Rock: Mean 58.4%, Range 30 – 89%
- Fines Cover: Mean 2.8%, Range 0 – 7%
- Litter Cover: Mean 15.6%, Range 6 – 22%
- Geology: sandstone (5)
- Soil Texture: Sandy loam (2)

Environment: The alliance is localized in DEVA with samples taken from upper elevation, mid to highslopes of the Panamint Mountains. It is primarily found on northwest and east aspects. Soils are typically sandy loam derived from sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an open tree layer with a sparse to intermittent shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: *Pinus flexilis* is dominant in the overstory tree layer. Shrubs that are characteristic include *Chrysothamnus viscidiflorus, Eriogonum umbellatum,* and *Ribes cereum.* Herbs that are often present include *Castilleja applegatei* and *Linanthus pungens*.

Dynamics: *Pinus flexilis* may occur alone or with *Pinus longaeva* in the tree canopy as disjunct relictual stands near timberline in the Great Basin, such as at high elevations in the Panamint Mountains of DEVA. It occurs on rocky, exposed soils and is shade intolerant. Stands have long intervals between fires, and most fires are ignited by lightning.

Classification Comments

Stands with *Pinus flexilis* currently occur in two groups, Intermountain Basins Subalpine Limber Pine – Bristlecone Pine Woodland Group (G224) and Rocky Mountain Subalpine-Montane Limber Pine – Bristlecone Pine Woodland Group (G221). These groups will likely be merged and the G224 retained.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S3

References

NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=5
LAKE (n=0)
DEVA (n=5): DEVA9165, DEVA9170, DEVAS046, DEVAS047, DEVAS052
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions).”x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus flexilis*	100	78	5.2	3	7	x	x	–	–
Shrub	*Eriogonum umbellatum*	100	0.8	0.1	0.1	0.2	x	–	–	–
	Artemisia tridentata	80	51	14	0.1	35	x	x	–	–
	Chrysothamnus viscidiflorus	80	14	3.6	0.1	10	x	–	–	–
	Ribes cereum	80	1.8	0.5	0.1	1	x	–	–	–
	Lupinus excubitus	40	0.9	0.2	0.2	1	–	–	–	–
	Holodiscus discolor	40	1.4	0.2	0.1	1	–	–	–	–
	Artemisia dracunculus	40	0.3	0.1	0.1	0.2	–	–	–	–
	Galium hilendiae	40	0.5	0.1	0.1	0.2	–	–	–	–
Herb	*Castilleja applegatei*	60	18	0.3	0.1	1	–	–	–	x
	Linanthus pungens	60	6	0.1	0.1	0.2	–	–	–	x
	Phlox stansburyi	40	17	0.2	0.2	1	–	–	–	–
	Elymus elymoides	40	2.7	0	0.1	0.1	–	–	–	–

Common Name: BristleCone Pine Forest and Woodland
Group Assignment: G224; **Alliance Code**: A0518

Alliance Concept

The Bristlecone Pine Forest and Woodland Alliance forms an open to intermittent tree canopy with a sparse to open shrub understory. The alliance is found in DEVA in the Last Chance Range and the Grapevine, Inyo and Panamint mountains. It is found primarily on mid to highslopes at variable aspects. Soils are typically loam or silt loam derived from nutrient-poor sandstone that is typically calcareous. Elevations range from approximately 3000 to 3500 meters. *Pinus longaeva* is dominant or co-dominant in the overstory tree layer and *Pinus flexilis* is often present. Commonly associated shrubs include *Ribes cereum, Artemisia dracunculus,and Chrysothamnus viscidiflorus.* A commonly associated herb is *Linanthus pungens.* Although the understory is typically sparse, it is usually diverse with natives including *Arenaria* spp.*, Astragalus kentrophyta, Cryptantha* spp., *Eriogonum ovalifolium, E. gracilipes,* and *Koeleria macrantha.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent tree canopy dominated or co-dominated by *Pinus longaeva,* which ranges from 5 to 35 percent cover. The overall tree cover also ranges from 5 to 35 percent cover.

Alliance Distribution

The alliance is localized in DEVA with samples taken at high elevation in Panamint Mountains and adjacent to the park on Mazourka Peak in the Inyo Mountains. It is also known from the Last Chance Range in DEVA.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (6): 341Fb, 341Ff, (341Fc)

Park Sampling Zones: DEVA: Mazourka Peak, Panamint Mtns, (Last Chance Range, Inyo Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pinus longaeva / (Ericameria discoidea, Ribes spp.) [CEGL005447]	6	–	**x**	–	–

Association notes: Currently, the *Pinus longaeva / (Ericameria discoidea, Ribes montigenum)* Woodland Association (CEGL005447) exists in the USNVC and will be updated to the association name as denoted in this description.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 3235.8 m, Range 2999 – 3353 m
- Aspect: NE (2), NW (2), SE (1), S (1)
- Slope: Mean 29.2 degrees, Range 14 – 42 degrees
- Macro Topography: Highslope (2), Midslope (3)
- Tree Cover: Mean 16%, Range 5.1 – 35%
- Shrub Cover: Mean 6.8%, Range 1.2– 14.4%
- Herb Cover: Mean 2.5%, Range 0.2 – 6%
- Large Rock: Mean 31%, Range 0 – 85%
- Small Rock: Mean 45.3%, Range 12.5 – 92%
- Fines Cover: Mean 1.5%, Range 0 – 3%
- Litter Cover: Mean 15%, Range 0.2 – 46%
- Geology: sandstone (6)
- Soil Texture: Loam (1), Silt loam (2)

Environment: The alliance is localized at upper elevations in DEVA on mid to highslopes at variable aspects with samples taken from the Panamint Mountains and on Mazourka Peak. Soils are typically loam or silt loam derived from nutrient-poor sandstone, typically calcareous.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent tree layer with a sparse to open shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: *Pinus longaeva* is dominant or co-dominant in the overstory tree layer. Trees that are characteristic or often present include *Pinus flexilis*. Shrubs that are characteristic or often present include *Ribes cereum*, *Artemisia dracunculus, Chrysothamnus viscidiflorus.* Herbs that are often present include *Linanthus pungens*.

Dynamics: *Pinus longaeva* is dominant in the tree canopy and can occur in pure stands or it is mixed with *Pinus flexilis* in the Great Basin. Stands are usually even-aged and open, with less than 20% cover. Stands are densest on north-facing slopes. *Pinus longaeva* is a long-lived, slow growing tree. It grows at high elevations with low-moisture, in nutrient-deficient soils, and has a very short growing season. It is a CNPS list 4 plant.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S2

References

NatureServe 2012, Sawyer et al. 2009, Schulz and Hall 2011, Taylor 1979

Surveys (with Sample Sizes) Used in Description

MOJN: N=6

LAKE (n=0)

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

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

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus longaeva*	100	83	15	2.1	35	x	x	–	–
	Pinus flexilis	50	17	1.4	0.2	5	–	–	–	x
Shrub	*Ribes cereum*	83	24	2	0.1	8	x	–	–	–
	Chrysothamnus viscidiflorus	50	17	1.3	1	4	–	–	–	x
	Artemisia dracunculus	50	11	1.2	0.2	5	–	–	–	x
	Ribes montigenum	33	9.1	0.5	1	2	–	–	–	–
	Chamaebatiaria millefolium	33	6.3	0.2	0.1	1	–	–	–	–
	Artemisia tridentata	33	2.6	0.1	0.2	0.5	–	–	–	–
Herb	*Linanthus pungens*	50	10	0.1	0.1	0.5	–	–	–	x
	Unknown Graminoid	33	20	2.1	0.3	12	–	–	–	–
	Elymus elymoides	33	11	0.1	0.1	0.5	–	–	–	–
	Heuchera	33	10	0.1	0.1	0.2	–	–	–	–
	Arenaria kingii	33	2.9	0	0.1	0.1	–	–	–	–
	Astragalus	33	2.9	0	0.1	0.1	–	–	–	–
	Koeleria macrantha	33	2.9	0	0.1	0.1	–	–	–	–

1. Forest & Woodland Class

1.B.2. Cool Temperate Forest & Woodland Formation

1.B.2.Nb. Rocky Mountain Cool Temperate Forest Division

M022. Southern Rocky Mountain Lower Montane Forest Macrogroup

G226. Southern Rocky Mountain White Fir- Douglas-fir Dry Forest Group

Abies concolor Dry Forest & Woodland Alliance

Common Name: White Fir Dry Forest & Woodland
Group Assignment: G226; **Alliance Code:** A3420

Alliance Concept

The White Fir Dry Forest & Woodland forms an intermittent tree canopy with an open shrub understory. The alliance occurs as small groves in MOJA on Clark and Kingston Mountains along sheltered draws and high slopes. Adjacent alliances are pinyon and juniper woodlands. It was sampled once in the study area on a highslope with a northeast aspect. Soil is derived from sandstone, but can be derived from a variety of parent materials and textures are highly variable. Elevation is 2000 meters. *Abies concolor* is dominant or co-dominant with *Pinus monophylla* in the overstory tree layer, and *Juniperus osteosperma* is characteristic or often present. Associated shrubs include *Amelanchier utahensis, Chrysothamnus depressus, Eriogonum umbellatum, Opuntia polyacantha* var. *erinacea, Purshia stansburiana,* and *Symphoricarpos* sp. Associated herbs include *Achnatherum hymenoides, Elymus elymoides, Eriogonum* sp., *Galium* sp., *Hymenoxys cooperi, Penstemon* spp.,and *Poa secunda.*

Diagnostic Criteria: This alliance is characterized by an open tree canopy that is dominated or co-dominated by *Abies concolor*, which had 24 percent cover in the stand sampled. The overall tree cover is 38 percent.

Alliance Distribution

The alliance was sampled once in MOJA, occurring at high elevation as relictual stands on Clark Mountain. It was only sampled once in the study area. It also occurs in the Kingston Mountains and in the New York Mountains.

States: CA
Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Aj
Park Sampling Zones: MOJA: Clark Mtn, (New York Mtns and Kingston Mtns)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Abies concolor Dry (alliance)	1	–	–	**x**	–

Association Notes: The only sample of the White Fir Dry Forest Alliance was classified to alliance level only; not enough data enabled association-level determination.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2007 m
- Aspect: NE (1)
- Slope: 15 degrees
- Macro Topography: Highslope (1)
- Tree Cover: 38%
- Shrub Cover: 8.2%
- Herb Cover: 1%
- Large Rock: 9%
- Small Rock: 50%
- Fines Cover: 5%
- Litter Cover: 36%
- Geology: sandstone (1)
- Soil Texture: (unknown)

Environment: The alliance was sampled in MOJA on a highslope in a canyon below ridgeline on Clark Mountain. It was found on a protected bowl with a northerly aspect and sedimentary soils. Botanical collections denote white fir also rarely occurring in the New York Mountains on north-facing slopes and draws at high elevations.

Vegetation Description

Vegetation Structure: The Alliance forms an intermittent tree layer with a sparse to open shrub layer and sparse herbaceous understory.

Vegetation Floristics: The dominant to co-dominant tree is *Abies concolor* occurring with *Pinus monophylla* in the overstory, and *Juniperus osteosperma* is characteristic. Shrubs that are characteristic or often present include *Chrysothamnus depressus, Eriogonum umbellatum, Opuntia polyacantha* var. *erinacea, Purshia stansburiana, Symphoricarpos* spp. Herbs that are characteristic or often present include *Achnatherum hymenoides, Apiaceae* spp., *Elymus elymoides, Eriogonum* spp., *Galium* spp., *Hymenoxys cooperi, Penstemon* spp., and *Poa secunda*.

Dynamics: *Abies conocolor* stands are susceptible to fire especially when young because fir takes longer to develop fire-resistant bark than do pines. Small groves of *Abies concolor* var. *concolor* (the Rocky Mountain race) occur in sheltered draws and slopes and are found adjacent to the pinyon-juniper woodland alliance as relictual stands in the highest elevations of MOJA. In the one mature conifer stand sampled is quite a bit of dead, downed trees; it is likely due to drought stress and natural thinning.

Classification Comments

Abies concolor associations are currently placed in the Rocky Mountain Douglas-fir – White Fir – Blue Spruce Mesic Forest (G225), Southern Rocky Mountain White Fir – Douglas-fir Dry Forest (G226), and California Montane Conifer Forest & Woodland (G344) groups of the USNVC hierarchy. For this Mojave Desert Network classification, we have placed the alliance in the G226 group, and we recommend that G225 and G226 be merged into one alliance that includes the Rocky Mountain race of *A. concolor*.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S3

References

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

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=0)
DEVA (n=0)
MOJA (n=1): MOJA0262
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Abies concolor*	100	63	24	24	24	x	x	–	–
	Pinus monophylla	100	32	12	12	12	x	–	x	–
	Juniperus osteosperma	100	5.3	2	2	2	x	–	–	–
Shrub	*Amelanchier utahensis*	100	61	5	5	5	x	x	–	–
	Purshia stansburiana	100	12	1	1	1	x	–	–	–
	Symphoricarpos	100	12	1	1	1	x	–	–	–
	Chrysothamnus depressus	100	6.1	0.5	0.5	0.5	x	–	–	–
	Opuntia polyacantha var. erinacea	100	6.1	0.5	0.5	0.5	x	–	–	–
	Eriogonum umbellatum	100	2.4	0.2	0.2	0.2	x	–	–	–
Herb	*Apiaceae*	100	20	0.4	0.4	0.4	x	–	–	–
	Eriogonum	100	20	0.4	0.4	0.4	x	–	–	–
	Achnatherum hymenoides	100	10	0.2	0.2	0.2	x	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Elymus elymoides*	100	10	0.2	0.2	0.2	x	–	–	–
	Galium	100	10	0.2	0.2	0.2	x	–	–	–
	Hymenoxys cooperi	100	10	0.2	0.2	0.2	x	–	–	–
	Penstemon	100	10	0.2	0.2	0.2	x	–	–	–
	Poa secunda	100	10	0.2	0.2	0.2	x	–	–	–
Non-vascular	Unknown Lichen	100	45	1	1	1	x	–	x	–
	Unknown Moss	100	45	1	1	1	x	–	x	–
	Cryptogamic crust	100	9.1	0.2	0.2	0.2	x	–	–	–

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

Common Name: Utah Juniper / Shrub Understory Woodland
Group Assignment: G246; **Alliance Code:** A3496

Alliance Concept

The Utah Juniper / Shrub Understory Woodland forms a sparse to open tree canopy with an open shrub understory. It is found on rocky channel beds, canyon walls, and lowslopes to summits at all aspects. Soils are derived from a variety of substrates and textures are variable. It is found in the Panamint Mountains in DEVA and scattered throughout MOJA. Elevations range from approximately 1200 to 1900 meters. The dominant tree is *Juniperus osteosperma,* and *Yucca brevifolia* is often present. Commonly associated shrubs include *Cylindropuntia acanthocarpa, Ephedra nevadensis, Opuntia polyacantha* var. *erinacea, Ericameria linearifolia, Eriogonum fasciculatum,* and *Yucca baccata*. Commonly associated herbs include *Achnatherum speciosum, Bromus rubens, Pleuraphis jamesii, Bouteloua eriopoda, Erodium cicutarium,* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by a sparse to open tree canopy dominated by *Juniperus osteosperma,* which ranges from 1 to 22 percent cover. The overall tree cover also ranges from 1 to 22 percent cover.

Alliance Distribution

The alliance is well-defined through sampling at mid to upper elevations of two Parks: in the Panamint Mountains of DEVA and scattered throughout MOJA.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (22): 322Aj, 322Al; Southeastern Great Basin (2): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns, (Inyo Mtns)**; MOJA:** (Castle Mtns), Cima Dome SE, Clark Mtn, Ivanpah Mtns, Lanfair Vlly, New York Mtns, Van Winkle Mtn, (Kingston Range)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Juniperus osteosperma / Artemisia tridentata ssp. *tridentata* [CEGL002360]	4	–	–	x	x
Juniperus osteosperma / Coleogyne ramosissima [CEGL002909]	17	–	x	x	x
Juniperus osteosperma / Eriogonum fasciculatum–Yucca baccata [CEGL005754]	20	–	–	x	x
Juniperus osteosperma–Yucca brevifolia / Bouteloua eriopoda [CEPP006716]	2	–	–	x	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1586.6 m, Range 1219 – 1897 m
- Aspect: (2), N (5), NE (6), E (6), NW (3), SE (6), SW (3), W (1), SW (5), S (4)
- Slope: Mean 13.2 degrees, Range 0 – 38 degrees
- Macro Topography: Channel bed (1), Channel wall (1), High level/summit (1), Highslope (2), Lowslope (5), Midslope (6)
- Tree Cover: Mean 5.5%, Range 1 – 22.5%
- Shrub Cover: Mean 15%, Range 3.7 – 24.5%
- Herb Cover: Mean 7.4%, Range 2 – 22%
- Large Rock: Mean 14.3%, Range 0 – 100%
- Small Rock: Mean 60%, Range 0 – 93%
- Fines Cover: Mean 18.4%, Range 0 – 75%
- Litter Cover: Mean 4.4%, Range 0.2 – 30%
- Geology: alluvium (7), gneiss (5), granodiorite (5), limestone (1), rhyolite (2), sandstone (4)
- Soil Texture: Clay (1), Clay loam (2), Coarse sand (2), Loamy sand (2), Medium sand (1), Medium silt (2), Medium silt loam (1), Medium to very fine sandy loam (2), Sandy clay (2), Sandy loam (9)

Environment: The alliance has been found along channel beds and low to midslopes of the Panamint Mountains in DEVA on sandy loam soils derived from mixed alluvium. The alliance is scattered throughout MOJA at mid to upper elevations on soils derived from a variety of substrates. The alliance is found at all aspects.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to open tree layer with a sparse to open shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: The dominant tree is *Juniperus osteosperma,* and *Yucca brevifolia* is often present. Commonly associated shrubs include *Cylindropuntia acanthocarpa, Ephedra nevadensis, Opuntia polyacantha* var. *erinacea, Ericameria linearifolia, Eriogonum fasciculatum,* and *Yucca baccata*. Commonly associated herbs include *Achnatherum speciosum, Bromus rubens, Pleuraphis jamesii, Bouteloua eriopoda, Erodium cicutarium,* and *Sphaeralcea ambigua.*

Dynamics: *Juniperus osteosperma* stands typically form a band between pinyon-juniper woodlands and *Artemesia tridentata* shrublands. Stands with similar cover in *J. osteosperma* and *Pinus monophylla* are placed in the *Pinus monophylla* alliance. The *Juniperus californicus* alliance typically occurs at lower elevations than the *Juniperus osteosperma* alliance distribution but they can overlap, and the identification of the two species can be difficult.

Classification Comments

Juniperus osteosperma associations have been placed in one main group (Colorado Plateau-Great Basin Juniper Open Woodland Group (G246)), which have recently been re-assigned to two other groups (Great Basin Pinyon - Juniper Woodland Group (G899) and Colorado Plateau Pinyon - Juniper Woodland Group (G900)) in the USNVC hierarchy. They concomitantly occur in more than one alliance (e.g., *Juniperus osteosperma* / Shrub Understory Woodland Alliance (A3496) and *Juniperus osteosperma* / Herbaceous Understory Woodland & Savanna Alliance (A3497) in G246, and now *Juniperus osteosperma* Great Basin Shrubby Woodland Alliance (A4370) in G899 and *Juniperus osteosperma* Grassy Open Woodland Alliance (A3497) in G900). For this Mojave Desert Network classification, we recognize this one alliance (A3496) in the G246 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S3

References

Keeler-Wolf and Thomas 2000, NatureServe 2010, NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=43 [+12]
LAKE (n=0)
DEVA (n=2): DEVA0276, DEVA9160
MOJA (n=24): MOJA0108, MOJA0577, MOJA9111, MOJA9133, MOJA9245, MOJA9249, MOJA9274, MOJA9276, MOJA9277, MOJA9278, MOJA9286, MOJA9343, MOJA9354, MOJA9355, MOJA9580, MOJA9598, MOJC0951, MOJC0952, MOJC0953, MOJC1144, MOJC1151, MOJC1152, MOJC1177, MOJC1178
MOJN-Johnson (n=17): MOJJE003, MOJJE079, MOJJE081, MOJJE208, MOJJE245, MOJJE438, MOJJE605, MOJJE607, MOJJE609, MOJJE684, MOJJE762, MOJJE852, MOJJE853, MOJJE854, MOJJE856, MOJJE858, MOJJE860

[CAMO (n=2): CAMO0101, CAMO9126]; [MOJA-McAuliffe (n=10: MOJAA030, MOJAA033, MOJAA035, MOJAA036, MOJAA037, MOJAA038, MOJAA040, MOJAA043, MOJAA044, MOJAA079]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Juniperus osteosperma*	100	88	4.9	1	20.5	x	x	–	–
	Yucca brevifolia	62.5	11	0.5	0.2	3	–	–	–	x
Shrub	*Ephedra nevadensis*	75	3.3	0.4	0.2	2	x	–	–	–
	Yucca baccata	70.8	8.9	1.1	0.2	3.5	–	–	–	x
	Cylindropuntia acanthocarpa	66.7	4.3	0.6	0.2	4	–	–	–	x
	Opuntia polyacantha var. erinacea	62.5	2.3	0.3	0.2	2	–	–	–	x
	Ericameria linearifolia	58.3	4.5	0.6	0.2	4	–	–	–	x
	Eriogonum fasciculatum	54.2	5.4	0.8	0.2	4	–	–	–	x
	Gutierrezia microcephala	45.8	5.6	0.6	0.2	6	–	–	–	–
	Echinocereus engelmannii	45.8	1.3	0.1	0.2	0.5	–	–	–	–
	Gutierrezia sarothrae	41.7	4.4	0.5	0.2	4	–	–	–	–
	Ephedra viridis	41.7	2.5	0.4	0.2	2	–	–	–	–
	Coleogyne ramosissima	37.5	14	2.8	0.2	20	–	–	–	–
	Salvia dorrii	37.5	1.6	0.2	0.2	2	–	–	–	–
	Atriplex canescens	37.5	1.3	0.1	0.2	1	–	–	–	–
	Thamnosma montana	37.5	0.8	0.1	0.2	0.5	–	–	–	–
	Opuntia basilaris	33.3	0.7	0.1	0.2	0.5	–	–	–	–
	Prunus fasciculata	29.2	1.6	0.2	0.2	1.5	–	–	–	–
	Menodora spinescens	29.2	1.2	0.2	0.2	1.5	–	–	–	–
	Yucca schidigera	25	2.4	0.4	0.5	2.5	–	–	–	–
	Rhus trilobata	25	0.9	0.2	0.2	1.5	–	–	–	–
	Stephanomeria pauciflora	25	0.7	0.1	0.2	0.5	–	–	–	–
	Krameria erecta	25	0.6	0.1	0.2	0.5	–	–	–	–
Herb	*Bromus rubens*	87.5	11	0.7	0.2	3	x	–	–	–
	Achnatherum speciosum	87.5	8.5	0.6	0.2	2	x	–	–	–
	Sphaeralcea ambigua	75	3.3	0.3	0.2	0.5	x	–	–	–
	Pleuraphis jamesii	58.3	7.7	0.9	0.2	10	–	–	–	x
	Bouteloua eriopoda	50	11	1.4	0.2	8	–	–	–	x
	Erodium cicutarium	50	6.5	0.6	0.2	8	–	–	–	x
	Cryptantha	45.8	6.1	0.4	0.6	1.5	–	–	–	–
	Aristida purpurea	45.8	3.7	0.3	0.2	1.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Achnatherum hymenoides*	45.8	1.4	0.1	0.2	0.5	–	–	–	–
	Muhlenbergia porteri	29.2	1.9	0.2	0.2	1	–	–	–	–
	Elymus elymoides	29.2	1	0.1	0.2	0.2	–	–	–	–
	Artemisia ludoviciana	25	1	0.1	0.2	0.5	–	–	–	–
	Chaetopappa ericoides	25	1	0.1	0.2	1	–	–	–	–
	Mirabilis multiflora	25	1.2	0.1	0.2	0.5	–	–	–	–
Non-vascular	Unknown Lichen	33.3	29	0.4	0.4	4	–	–	–	–
	Unknown Moss	25	11	0.1	0.2	0.2	–	–	–	–

1. Forest & Woodland Class

1.B.2. Cool Temperate Forest & Woodland Formation

1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub Division

M026. Intermountain Singleleaf Pinyon - Juniper Woodland Macrogroup

G247. Great Basin Pinyon - Juniper Woodland Group

Pinus monophylla – Juniperus osteosperma / Shrub Understory Woodland Alliance

Common Name: Singleleaf Pinyon – Utah Juniper Woodland
Group Assignment: G247, **Alliance Code**: A2108

Alliance Concept

The Singleleaf Pinyon – Utah Juniper Woodland Alliance forms a sparse to continuous tree canopy with a sparse to intermittent shrub understory. Stands are wide spread in DEVA and MOJA at mid to high elevations, and localized in LAKE at high elevations. It is found from toeslopes and canyon beds to summits at all aspects, and elevations range from approximately 1160 to 2900 meters. Soils are derived from a variety of substrates and textures are variable. *Pinus monophylla* is either dominant or co-dominant in the overstory tree canopy with plants such as *Juniperus osteosperma* or *J. californica*. A commonly associated shrub is *Ephedra viridis.* Other shrubs sometimes present are *Artemisia tridentata, Echinocereus mojavensis, Ericameria linearifolia, Gutierrezia sarothrae, Opuntia polyacantha* var. *erinacea, Prunus fasciculata, Purshia stansburiana, Rhus trilobata, Thamnosma montana,* and *Yucca baccata. Bromus rubens* is a commonly associated herb.

Diagnostic Criteria: This alliance is characterized by a sparse to continuous tree canopy dominated or co-dominated by *Pinus monophylla,* which ranges from 1 to 81 percent cover. The overall tree cover ranges from 1 to 81 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout DEVA and MOJA at mid to upper elevations and in LAKE in the Newberry Mountains at mid to high elevations.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (96): 322Ai, 322Aj, 322Al, 322Am; Southeastern Great Basin (67): 341Fa, 341Fb, 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Mazourka Peak, Nelson Range, Owlshead Mtns, Panamint Mtns**; LAKE:** Katherine, Spirit Mountain**; MOJA:** Clark Mtn, Granite Mtns, Ivanpah Mtns, Ivanpah Vlly, Lanfair Vlly, Mid Hills, New York Mtns, Providence Mtns, Van Winkle Mtn, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pinus monophylla–Juniperus osteosperma / Shrub (alliance)	7	–	x	x	x
Pinus monophylla / Eriogonum fasciculatum [CEPP006732]	14	–	–	x	x
Pinus monophylla / Garrya flavescens [CEGL005771]	12	–	–	x	–
Pinus monophylla / Prunus facisculata–Rhus trilobata [CEGL005772]	27	–	–	x	x
Pinus monophylla / Ribes velutinum [CEGL003153]	9	–	x	–	–
Pinus monophylla–(Juniperus osteosperma) / Artemisia tridentata [CEGL000832]	46	–	x	x	x
Pinus monophylla–(Juniperus osteosperma) / Cercocarpus intricatus [CEGL005437]	7	–	x	x	–
Pinus monophylla–Juniperus osteosperma / Cercocarpus ledifolius [CEGL000828]	3	–	x	–	–
Pinus monophylla–Juniperus osteosperma / Quercus turbinella [CEGL002941]	16	x	–	x	x
Pinus monophylla–Juniperus osteosperma / Artemisia nova [CEGL000831]	12	–	x	–	–
Pinus monophylla–Juniperus osteosperma / Coleogyne ramosissima [CEGL002971]	14	–	–	x	x
Pinus monophylla–Juniperus osteosperma / Purshia stansburiana [CEGL005397]	6	–	–	x	–
Pinus monophylla–Juniperus osteosperma / Sparse Understory [CEGL000829]	2	–	–	x	–

Association notes: Seven samples were classified to alliance level, including four stands with *Eriogonum fasciculatum* and *Ericameria* spp. in the understory, suggesting further variation within the alliance.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1841.8 m, Range 1158 – 2864 m
- Aspect: N (45), NE (23), E (18), NW (20), SE (12), SW (9), W (8), SW (19), S (19)
- Slope: Mean 18.8 degrees, Range 1 – 45 degrees
- Macro Topography: Backslope (1), Channel bed (2), Entire slope (2), High level/summit (14), Highslope (28), Low level/bottom (2), Lowslope (14), Midslope (33), Midslope to ridgetop (1), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 14.9%, Range 1.1 – 81. 2%
- Shrub Cover: Mean 17.7%, Range 1.7 – 61.3%
- Herb Cover: Mean 5.1%, Range 0 – 23%
- Large Rock: Mean 24.9%, Range 0 – 96%
- Small Rock: Mean 48.1%, Range 0 – 97.5%

- Fines Cover: Mean 8.6%, Range 0 – 80%
- Litter Cover: Mean 13.4%, Range 0 – 80%
- Geology: alkali-granite (alaskite) (3), alluvium (10), conglomerate (1), dolostone (dolomite) (1), gneiss (7), granodiorite (43), limestone (20), plutonic rock (phaneritic) (2), rhyolite (16), sandstone (60), schist (1), shale (2)
- Soil Texture: Clay (1), Clay loam (16), Coarse sand (9), Fine silty clay (1), Loam (14), Loamy sand (20), Medium sand (9), Medium silt loam (3), Medium to very fine sandy loam (16), Moderately coarse sandy loam (1), Moderately fine sandy clay loam (1), Moderately fine silty clay loam (3), Sand (2), Sandy clay (4), Sandy loam (27), Silt loam (5), Silty clay (4)

Environment: The alliance is scattered throughout DEVA and MOJA at mid to upper elevations and in LAKE at high elevations in the Newberry Mountains. It is found at all aspects from toeslopes and canyon channel beds to summits. Soils are derived from a variety of substrates and textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to continuous tree layer with a sparse to intermittent shrub layer and sparse or continuous herbaceous understory.

Vegetation Floristics: *Pinus monophylla* is either dominant or co-dominant in the overstory tree canopy with plants such as *Juniperus osteosperma* or *Juniperus californica*. A commonly associated shrub is *Ephedra viridis* and a commonly associated herb is *Bromus rubens.*

Dynamics: *Pinus monophylla* is a common dominant to co-dominant tree at mid to higher elevations in the desert mountains of the West. Stands in California's desert and on the eastern side of the Sierra Nevada appear as relicts from past climates. Fossil packrat middens suggest that much of the Mojave Desert ecoregion contained pinyon-juniper woodlands as recently as 7500 years ago, with recent aridity restricting its range to higher elevations in the desert.

Classification Comments

This *Pinus monophylla – Juniperus osteosperma* / Shrub Understory Woodland Alliance (A2108) and the related *Pinus monophylla - Juniperus osteosperma* / Herbaceous Understory Open Woodland Alliance (A2109) have been placed in this Group (G247), yet now they have been re-assigned with a revised *Juniperus osteosperma* Great Basin Shrubby Woodland Alliance (A4370) in the Great Basin Pinyon - Juniper Woodland Group (G899). We recognize this one alliance (A2108) in this G246 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Evens et al. 2012, NatureServe 2012, Sawyer et al. 2009, Schulz and Hall 2011, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=175
LAKE (n=3): LAKE9528, LAMEN096, LAMEN116
DEVA (n=68): DEVA0206, DEVA8010, DEVA9112, DEVA9116, DEVA9132, DEVA9151, DEVA9158, DEVA9161, DEVA9216, DEVA9239, DEVA9244, DEVA9245, DEVA9247, DEVA9248, DEVA9270, DEVA9444, DEVA9480, DEVA9485, DEVA9486, DEVA9660, DEVA9661, DEVA9820, DEVA9828, DEVAD011, DEVAD014, DEVAD060, DEVAD112, DEVAD134, DEVAD142, DEVAD149, DEVAS041, DEVAS043, DEVAS044, DEVAS049, DEVAS050, DEVAS083, DEVAS084, DEVAS085, DEVAS208, DEVAS214, DEVAS215, DEVAS256, MOJC0427, MOJC0428, MOJC0429, MOJC0430, MOJC0432, MOJC0433, MOJC0434, MOJC0435, MOJC0436, MOJC0437, MOJC0438, MOJC0439, MOJC0440, MOJC0441, MOJC0475, MOJC0476, MOJC0477, MOJC0478, MOJC0479, MOJC0480, MOJC0632, MOJC0638, MOJC0639, MOJC0640, MOJC1071, MOJC1073
MOJA (n=91): MOJA0110, MOJA0141, MOJA0148, MOJA0220, MOJA0223, MOJA0231, MOJA0232, MOJA0263, MOJA9113, MOJA9114, MOJA9126, MOJA9136, MOJA9138, MOJA9142, MOJA9149, MOJA9151, MOJA9221, MOJA9224, MOJA9225, MOJA9227, MOJA9229, MOJA9256, MOJA9260, MOJA9261, MOJA9272, MOJA9287, MOJA9332, MOJA9350, MOJA9390, MOJA9392, MOJA9410, MOJA9414, MOJA9423, MOJA9425, MOJA9426, MOJA9432, MOJA9434, MOJA9435, MOJA9436, MOJA9439, MOJA9441, MOJA9442, MOJA9445, MOJA9446, MOJA9450, MOJA9456, MOJA9458, MOJA9459, MOJA9575, MOJA9588, MOJA9589, MOJA9684, MOJA9693, MOJA9695, MOJA9901, MOJA9907, MOJA9911, MOJAE001, MOJAE036, MOJAE037, MOJAE038, MOJAE039, MOJAE040, MOJAE041, MOJAE042, MOJAE043, MOJAE045, MOJAE046, MOJAE104, MOJAE105, MOJAE106, MOJAE107, MOJAE164, MOJAE165, MOJAE233, MOJAE234, MOJAE235, MOJAE236, MOJC0017, MOJC0212, MOJC0213, MOJC0947, MOJC1108, MOJC1110, MOJC1111, MOJC1112, MOJC1113, MOJC1148, MOJC1157, MOJC1158, MOJC1159
MOJN-Johnson (n=13): MOJJE045, MOJJE046, MOJJE047, MOJJE077, MOJJE085, MOJJE095, MOJJE179, MOJJE206, MOJJE420, MOJJE445, MOJJE750, MOJJE755, MOJJE935

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	99	77	12	1	74	x	x	–	–
	Juniperus osteosperma	57	15	2.1	0.01	20	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ephedra viridis*	75	7.9	1.1	0.1	14	–	–	–	x
	Opuntia polyacantha var. erinacea	48	1.3	0.2	0.1	4	–	–	–	–
	Yucca baccata	44	2.9	0.5	0.2	6.5	–	–	–	–
	Artemisia tridentata	42	16	2.4	0.2	42	–	–	–	–
	Purshia stansburiana	35	3.3	0.6	0.1	9	–	–	–	–
	Rhus trilobata	33	2.9	0.4	0.01	7.1	–	–	–	–
	Gutierrezia sarothrae	33	1.4	0.2	0.04	4	–	–	–	–
	Echinocereus mojavensis	32	0.4	0.1	0.2	1	–	–	–	–
	Prunus fasciculata	31	3.5	0.7	0.2	10	–	–	–	–
	Ericameria linearifolia	28	1.3	0.2	0.2	4	–	–	–	–
	Thamnosma montana	27	0.7	0.1	0.1	2	–	–	–	–
Herb	*Bromus rubens*	60	11.5	0.9	0.1	15	–	–	–	x
	Elymus elymoides	50	4.5	0.2	0.03	2	–	–	–	–
	Achnatherum speciosum	45	5.3	0.3	0.1	6	–	–	–	–
	Sphaeralcea ambigua	35	2.0	0.1	0.2	2	–	–	–	–
	Bromus tectorum	30	7.1	0.8	0.2	35	–	–	–	–
Non-vascular	Unknown Lichen	43	36	1.2	0.4	40	–	–	–	–
	Unknown Moss	33	9.5	0.1	0.2	1	–	–	–	–

1. Forest & Woodland Class

1.B.2. Cool Temperate Forest & Woodland Formation

1.B.2.Nc. Western North American Cool Temperate Woodland & Shrubland Division

M026. Intermountain Singleleaf Pinyon - Juniper Woodland Macrogroup

G249. Intermountain Basins Curl-leaf Mountain-mahogany Woodland & Scrub Group

Cercocarpus ledifolius / Shrub Understory Woodland Alliance

Common Name: Curl-leaf Mountain Mahogany / Shrub Understory Woodland
Group Assignment: G249; **Alliance Code:** A0586

Alliance Concept

The Curl-leaf Mountain Mahogany / Shrub Understory Woodland Alliance forms an intermittent to continuous shrub layer from two samples in the study area. An emergent tree layer is typically not present, and when present, sparse, and the herbaceous layer is sparse to open. The alliance is found at high elevations in DEVA and environs, including Panamint Mountains and adjacent Inyo Mountains, along lower to upper slopes with southeastern and western aspects. Soils are typically calcareous and derived from limestone and dolostone. Elevations range from approximately 2900 to 3050 meters. The dominant and characteristic shrub is *Cercocarpus ledifolius,* and those shrubs often present include *Artemisia tridentata, Chrysothamnus viscidiflorus,* and *Eriogonum umbellatum.* Various herbs occur in the stands including *Castilleja applegatei, Cryptantha* spp., *Elymus elymoides, Eriogonum* spp. and *Phlox* spp. These shrub stands are typically adjacent to stands with *Pinus flexilis, Pinus monophylla* and *Juniperus osteosperma*.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous shrub layer with *Cercocarpus ledifolius* dominant. The overall shrub cover ranges from 43 to 71 percent.

Alliance Distribution

The alliance is scattered at upper elevations in DEVA and adjacent environs, with observations and samples of stands in the Panamint Mountains and adjacent Inyo Mountains.

States: CA

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

Park Sampling Zones: DEVA: Mazourka Peak; (and Panamint Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Cercocarpus ledifolius–Artemisia tridentata [CEGL000960]	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 2979 m, Range 2909 – 3049 m
- Aspect: SE (1), W (1)
- Slope: Mean 11 degrees, Range 3 – 19 degrees
- Macro Topography: High slope (1), Lowslope (1)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 57.3%, Range 43.3 – 71.2%
- Herb Cover: Mean 2%, Range 1 – 3%
- Large Rock: Mean 7.6%, Range 0.1 – 15%
- Small Rock: Mean 20%, Range 5 – 35%
- Fines Cover: no data
- Litter Cover: Mean 30%, Range 5 – 55%
- Geology: dolostone (dolomite) (2)
- Soil Texture: no data

Environment: The alliance was sampled from lower to upper slope at high elevations at southeastern and western aspects. Soils are typically calcareous and derived from limestone and dolostone.

Vegetation Description

Vegetation Structure: The Alliance forms an intermittent to continuous shrub layer and the overall shrub cover ranges from 43 to 71 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Cercocarpus ledifolius,* and those that are often present include *Artemisia tridentata, Chrysothamnus viscidiflorus,* and *Eriogonum umbellatum.* Various herbs were observed in the two stands sampled, including *Castilleja applegateii, Cryptantha* spp., *Elymus elymoides, Eriogonum* spp., and *Phlox* spp.

Dynamics: *Cercocarpus ledifolius* occurs as a dominant shrub with few/no overstory conifer trees in high desert mountains when sites are too steep, dry, nutrient-poor, and/or rocky for conifer establishment.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5
State (California): S4

References

Keeler-Wolf and Thomas 2000, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2

LAKE (n=0); DEVA (n=2): DEVAS257, DEVAS277; MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Cercocarpus ledifolius*	100	66	41	20	61	x	x	–	–
	Artemisia tridentata	100	15	7.5	5	10	x	–	–	–
	Chrysothamnus viscidiflorus	100	7	4	3	5	x	–	–	–
	Eriogonum umbellatum	100	0.2	0.1	0.11	0.11	x	–	–	–
	Artemisia nova	50	12	5	10	10	–	–	–	x
	Eriogonum microthecum	50	0.1	0.1	0.11	0.11	–	–	–	x
	Galium hilendiae	50	0.1	0.1	0.11	0.11	–	–	–	x
	Opuntia	50	0.1	0.1	0.11	0.11	–	–	–	x
	Tetradymia canescens	50	0.1	0.1	0.11	0.11	–	–	–	x
Herb	*Castilleja applegatei*	50	14	0.5	1	1	–	–	–	x
	Elymus elymoides	50	14	0.5	1	1	–	–	–	x
	Eriogonum	50	4.7	0.1	0.22	0.22	–	–	–	x
	Lupinus meionanthus	50	22	0.5	1	1	–	–	–	x
	Mentzelia	50	4.7	0.1	0.22	0.22	–	–	–	x
	Abronia nana	50	1.6	0.1	0.11	0.11	–	–	–	x
	Achnatherum hymenoides	50	1.6	0.1	0.11	0.11	–	–	–	x
	Arabis	50	2.4	0.1	0.11	0.11	–	–	–	x
	Arenaria kingii	50	1.6	0.1	0.11	0.11	–	–	–	x
	Chenopodium	50	2.4	0.1	0.11	0.11	–	–	–	x
	Cryptantha circumscissa	50	2.4	0.1	0.11	0.11	–	–	–	x
	Cryptantha flavoculata	50	1.6	0.1	0.11	0.11	–	–	–	x
	Descurainia californica	50	2.4	0.1	0.11	0.11	–	–	–	x
	Eriogonum cernuum var. cernuum	50	1.6	0.1	0.11	0.11	–	–	–	x
	Frasera puberulenta	50	1.6	0.1	0.11	0.11	–	–	–	x
	Ipomopsis congesta	50	1.6	0.1	0.11	0.11	–	–	–	x
	Koeleria macrantha	50	1.6	0.1	0.11	0.11	–	–	–	x
	Leptosiphon nuttallii	50	2.4	0.1	0.11	0.11	–	–	–	x
	Lesquerella kingii	50	1.6	0.1	0.11	0.11	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Linum*	50	1.6	0.1	0.11	0.11	–	–	–	x
	Lomatium foeniculaceum ssp. inyoense	50	1.6	0.1	0.11	0.11	–	–	–	x
	Machaeranthera canescens	50	1.6	0.1	0.11	0.11	–	–	–	x
	Phacelia hastata	50	2.4	0.1	0.11	0.11	–	–	–	x
	Phlox diffusa	50	2.4	0.1	0.11	0.11	–	–	–	x
	Phlox stansburyi	50	1.6	0.1	0.11	0.11	–	–	–	x
	Stenotus acaulis	50	1.6	0.1	0.11	0.11	–	–	–	x
	Stephanomeria	50	2.4	0.1	0.11	0.11	–	–	–	x

1. Forest & Woodland Class

1.B.2. Cool Temperate Forest & Woodland Formation

1.B.2.Nc. Western North American Cool Temperate Woodland & Scrub Division

M027. Southern Rocky Mountain-Colorado Plateau Two-needle Pinyon - Juniper Woodland Macrogroup

G250. Colorado Plateau Pinyon - Juniper Woodland Group

Pinus edulis – Juniperus osteosperma / Shrub Understory Colorado Plateau Woodland & Scrub Alliance

Common Name: Colorado Plateau Two-needle Pinyon - Utah Juniper Woodland & Scrub
Group Assignment: G250; **Alliance Code**: A3573, A3571, A3472

Alliance Concept

The Foothill & Lower Montane Dry-Mesic Two-needle Pinyon – Utah Juniper / Shrub Woodland forms an open tree canopy with an open shrub understory. The alliance occurs primarily in the Colorado Plateau of the southwestern United States. Californian stands of this alliance are at the western edge of its distribution. It is found in the New York Mountains and the Mid Hills in MOJA. Elevations range from approximately 1300 to 2000 meters. Soils are medium to coarse sand and clay loam derived granodiorite. *Pinus edulis* is dominant or co-dominant in the overstory tree layer, and *Juniperus osteosperma* is characteristic. Commonly associated shrubs include *Quercus turbinella, Eriogonum wrightii, Fallugia paradoxa, Gutierrezia sarothrae, Rhus trilobata, Yucca baccata, Brickellia californica, Echinocereus mojavensis,* and *Ericameria linearifolia. C*ommonly associated herbs include *Artemisia ludoviciana, Bromus rubens, Elymus elymoides, Galium munzii, Pellaea* spp. *mucronata, Poa fendleriana, Arabis perennans, Asclepias asperula, Astragalus nutans, Bouteloua curtipendula, Bromus tectorum, Castilleja linariifolia, Galium parishii, Silene* spp. *verecunda,* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open tree canopy dominated or co-dominated by *Pinus edulis,* which ranges from 3 to 26 percent cover. The overall tree cover also ranges from 3 to 26 percent cover.

Alliance Distribution

The alliance is localized in MOJA at upper elevations. It has been sampled in the New York Mountains and is also found in the Mid Hills.

States: CA

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

Park Sampling Zones: MOJA: New York Mtns, (and Mid Hills)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pinus edulis–Juniperus osteosperma / Quercus turbinella [CEGL004007]	8	–	–	x	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1586 m, Range 1330 – 2020 m
- Aspect: N (3), NE (2), NW (2), SW (1)
- Slope: Mean 13.4 degrees, Range 7 – 32 degrees
- Macro Topography: Midslope (1)
- Tree Cover: Mean 9.3%, Range 3 – 26%
- Shrub Cover: Mean 15.6%, Range 3.8 – 21%
- Herb Cover: Mean 2.8%, Range 1 – 5
- Large Rock: Mean 63.9%, Range 22 – 78%
- Small Rock: Mean 19.5%, Range 10 – 30%
- Fines Cover: Mean 4.4%, Range 2 – 10%
- Litter Cover: Mean 10.6%, Range 3 – 38%
- Geology: granodiorite (8)
- Soil Texture: Clay loam (1), Coarse sand (6), Medium sand (1)

Environment: The alliance has been sampled in MOJA at upper elevations on midslopes of the New York Mountains at all aspects. Soils are typically medium to coarse sand and clay loam derived from granodiorite.

Vegetation Description

Vegetation Structure: The Alliance forms an open tree layer with a sparse to open shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: *Pinus edulis* is dominant or co-dominant in the overstory tree layer, and *Juniperus osteosperma* is characteristic. Shrubs that are characteristic or often present include *Eriogonum wrightii, Fallugia paradoxa, Gutierrezia sarothrae, Rhus trilobata, Yucca baccata*, *Brickellia californica, Echinocereus mojavensis,* and *Ericameria linearifolia.* Herbs that are characteristic or often present include *Artemisia ludoviciana, Bromus rubens, Elymus elymoides, Galium munzii, Pellaea mucronata, Poa fendleriana*, *Arabis perennans, Asclepias asperula, Astragalus nutans, Bouteloua curtipendula, Bromus tectorum, Castilleja linariifolia, Galium parishii, Silene verecunda,* and *Sphaeralcea ambigua*.

Dynamics: Californian populations of the *Pinus edulis* alliance are at the western edge of its distribution, occurring in mountains where summer rainfall occurs. *P. edulis* is recognized as a CNPS

list 3.3 plant. *Pinus edulis* often occurs co-dominant with *Juniperus osteosperma* and/or *Quercus turbinella* (which appears similar in stature to the trees).

Classification Comments

Pinus edulis associations in the western United States are currently placed in the Colorado Plateau Pinyon – Juniper Woodland Group (G250) and Southern Rocky Mountain Pinyon – Juniper Woodland Group (G253) of the USNVC hierarchy. The association sampled in the Mojave Desert is placed within the G250 group. Within this G250 group, three alliances with *Pinus edulis* have been denoted by the USNVC, including A3571 *Pinus edulis – Juniperus osteosperma* / Shrub Understory Foothill & Lower Montane Dry-Mesic Woodland Alliance and A3573 *Pinus edulis – Juniperus osteosperma* / Shrub Understory Colorado Plateau Woodland & Scrub Alliance. The MOJA association has been placed in the latter alliance. However, these alliances are very similar in ecology and species composition, and more review is needed to determine if they should be merged.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S2?

References

Evens 2000, Nixon 2002, Reid et al. 1999, Sawyer et al. 2009, Thomas et al. 2004

Surveys (with Sample Sizes) Used in Description

MOJN: N=8

LAKE (n=0); DEVA (n=0); MOJA (n=8): MOJA9150, MOJAE134, MOJAE135, MOJAE136, MOJAE137, MOJAE138, MOJAE139, MOJAE142; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus edulis*	100	68	5.9	2	18	x	x	–	–
	Juniperus osteosperma	75	22	1.6	1	3	x	–	–	–
	Quercus chrysolepis	38	9.2	1.5	0.2	9	–	–	–	–
Shrub	*Quercus turbinella*	100	39	6.3	0.5	10	x	–	x	–
	Fallugia paradoxa	100	13	2.3	0.2	8	x	–	–	–
	Gutierrezia sarothrae	100	6.5	0.5	0.2	1.5	x	–	–	–
	Rhus trilobata	88	14	2.3	1	4.1	x	–	–	–
	Eriogonum wrightii	88	1	0.2	0.2	0.2	x	–	–	–
	Yucca baccata	75	1.5	0.3	0.2	1	x	–	–	–
	Echinocereus mojavensis	62	1.3	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Brickellia californica*	50	0.7	0.1	0.2	0.2	–	–	–	x
	Ericameria linearifolia	50	0.6	0.1	0.2	0.2	–	–	–	x
	Baccharis sergiloides	38	8.4	1.5	1.1	7.1	–	–	–	–
	Rhamnus ilicifolia	38	2.4	0.4	0.2	2.1	–	–	–	–
	Chrysothamnus depressus	38	3.5	0.2	0.2	1	–	–	–	–
	Ericameria cuneata	38	0.5	0.1	0.2	0.2	–	–	–	–
	Ribes velutinum	25	0.9	0.2	0.2	1	–	–	–	–
	Ageratina herbacea	25	0.4	0.1	0.2	0.2	–	–	–	–
	Lotus rigidus	25	0.3	0.1	0.2	0.2	–	–	–	–
	Prunus fasciculata	25	0.2	0.1	0.2	0.2	–	–	–	–
	Purshia tridentata	25	0.3	0.1	0.2	0.2	–	–	–	–
Herb	*Elymus elymoides*	100	8.6	0.2	0.2	0.2	x	–	–	–
	Artemisia ludoviciana	88	8.9	0.4	0.2	1.1	x	–	–	–
	Bromus rubens	88	8.9	0.4	0.2	1	x	–	–	–
	Poa fendleriana	88	7.3	0.3	0.2	1	x	–	–	–
	Galium munzii	88	4.4	0.2	0.2	0.2	x	–	–	–
	Pellaea mucronata	75	3.7	0.2	0.2	0.2	x	–	–	–
	Arabis perennans	62	3.3	0.1	0.2	0.2	–	–	–	x
	Astragalus nutans	62	3.3	0.1	0.2	0.2	–	–	–	x
	Castilleja linariifolia	62	3	0.1	0.2	0.2	–	–	–	x
	Galium parishii	62	3	0.1	0.2	0.2	–	–	–	x
	Sphaeralcea ambigua	62	6.7	0.1	0.2	0.2	–	–	–	x
	Bromus tectorum	50	4.6	0.2	0.2	1	–	–	–	x
	Asclepias asperula	50	2.4	0.1	0.2	0.2	–	–	–	x
	Bouteloua curtipendula	50	2.6	0.1	0.2	0.2	–	–	–	x
	Silene verecunda	50	2.5	0.1	0.2	0.2	–	–	–	x
	Achnatherum parishii	38	1.9	0.1	0.2	0.2	–	–	–	–
	Cirsium neomexicanum	38	1.8	0.1	0.2	0.2	–	–	–	–
	Erigeron concinnus	38	2	0.1	0.2	0.2	–	–	–	–
	Penstemon eatonii	38	2	0.1	0.2	0.2	–	–	–	–
	Physalis hederifolia	38	1.8	0.1	0.2	0.2	–	–	–	–
	Polypogon viridis	38	1.7	0.1	0.2	0.2	–	–	–	–
	Woodsia	38	1.8	0.1	0.2	0.2	–	–	–	–
	Asteraceae	25	5.6	0.3	1	1	–	–	–	–
	Bromus diandrus	25	1.3	0.1	0.2	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Epilobium*	25	1.3	0.1	0.2	0.2	–	–	–	–
	Heuchera	25	1.2	0.1	0.2	0.2	–	–	–	–
	Mirabilis coccinea	25	1.2	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Lichen	100	71	0.4	0.4	0.4	x	x	–	–
	Unknown Moss	88	29	0.2	0.2	0.2	x	–	–	–

1. Forest & Woodland Class

1.B.2. Cool Temperate Forest & Woodland Formation

1.B.2.Nd. Vancouverian Forest & Woodland Division

M025. Vancouverian Subalpine Forest Macrogroup

G243. Sierra-Cascade Cold-Dry Subalpine Woodland Group

Juniperus occidentalis var. australis – Pinus albicaulis Woodland Alliance

Common Name: Sierra Western Juniper – Whitebark Pine Woodland
Group Assignment: G243; **Alliance Code:** A3622

Alliance Concept

The Sierra Western Juniper – Whitebark Pine Woodland forms an intermittent tree canopy with an open shrub understory. The alliance occurs as small stands in the Inyo and Panamint Mountains. It is found on canyon slopes, steep and rocky escarpments, and glaciated bedrock. It was sampled once just adjacent to DEVA on a lowslope with a north east aspect. Soil is derived from sandstone. Elevation is 2159 meters. The dominant tree is *Juniperus grandis (=Juniperus occidentalis* var. *australis*), and *Pinus monophylla* is also present. Commonly associated shrubs include *Artemisia tridentata* ssp. *vaseyana, Chrysothamnus viscidiflorus,* and *Symphoricarpos* sp. Associated herbs include *Achnatherum hymenoides, Astragalus oophorus, Castilleja* sp.*, Caulanthus crassicaulis, Erigeron eatonii, Eriogonum* sp.*, Phacelia* sp.*,* and *Phlox stansburyi.*

Diagnostic Criteria: This alliance is characterized by an intermittent tree canopy dominated by *Juniperus grandis,* which had 27 percent cover in the stand sampled. The overall tree cover is 35 percent cover.

Alliance Distribution

The alliance was sampled at high elevation north of Waucoba Mountain just adjacent to DEVA. It was only sampled once in the study area, though it is known regionally from the Inyo and Panamint Mountains.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Fb

Park Sampling Zones: DEVA: Waucoba Spring, (Inyo Mtns, and Panamint Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Juniperus occidentalis var. australis / Artemisia tridentate [CEGL003151]	1	–	x	–	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2159 m
- Aspect: NE (1)
- Slope: 22 degrees
- Macro Topography: Lowslope (1)
- Tree Cover: 35.2%
- Shrub Cover: 25.2%
- Herb Cover1.1%
- Large Rock: 5%
- Small Rock: 40%
- Fines Cover:
- Litter Cover: 11%
- Geology: sandstone (1)
- Soil Texture: (unknown)

Environment: The alliance was sampled once, adjacent to DEVA, on a lowslope with a north east aspect north of Waucoba Mountain. Soils are derived from sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an intermittent tree layer with a sparse to open shrub layer and sparse herbaceous understory.

Vegetation Floristics: The dominant tree is *Juniperus grandis* in the overstory. *Pinus monophylla* is characteristic or often present in the tree layer. Shrubs that are characteristic or often present include *Chrysothamnus viscidiflorus,* and *Symphoricarpos* sp. Herbs that are characteristic or often present include *Achnatherum hymenoides, Astragalus oophorus, Castilleja* sp.*, Caulanthus crassicaulis, Erigeron eatonii, Eriogonum* sp.*, Phacelia* sp.*,* and *Phlox stansburyi*.

Dynamics: *Juniperus grandis* has been previously named *J. occidentalis* var. *australis* and may be classified in other classifications in the *Juniperus occidentalis* alliance. Both species, *J. grandis* and *J. occidentalis,* are constituents of extensive Great Basin Woodlands; stands of *J. grandis* in California occur as small enclaves in the Inyo and Panamint Mountains as well as in the Sierra Nevada along expanses of glaciated rock outcrops.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S4

References

Keeler-Wolf et al. 2003b, NatureServe 2012, Potter 1998, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=0)
DEVA (n=1): DEVAS252
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Juniperus grandis*	100	77	27	27.1	27	x	x	–	–
	Pinus monophylla	100	23	8.1	8.1	8.1	x	–	–	–
Shrub	*Artemisia tridentata ssp. vaseyana*	100	99	25	25	25	x	x	–	–
	Chrysothamnus viscidiflorus	100	0.4	0.1	0.1	0.1	x	–	–	–
	Symphoricarpos	100	0.4	0.1	0.1	0.1	x	–	–	–
Herb	*Eriogonum*	100	20	0.2	0.2	0.2	x	–	–	–
	Phacelia	100	20	0.2	0.2	0.2	x	–	–	–
	Achnatherum hymenoides	100	10	0.1	0.1	0.1	x	–	–	–
	Astragalus oophorus	100	10	0.1	0.1	0.1	x	–	–	–
	Castilleja	100	10	0.1	0.1	0.1	x	–	–	–
	Caulanthus crassicaulis	100	10	0.1	0.1	0.1	x	–	–	–
	Erigeron eatonii	100	10	0.1	0.1	0.1	x	–	–	–
	Phlox stansburyi	100	10	0.1	0.1	0.1	x	–	–	–

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

Common Name: Fremont Cottonwood – Velvet Ash – Goodding's Willow Flooded Forest & Woodland
Group Assignment: G797; **Alliance Code:** A3803, cf. A0644

Alliance Concept

The Fremont Cottonwood – Velvet Ash – Goodding's Willow Flooded Forest & Woodland Alliance forms an open to continuous tree canopy with a sparse to continuous shrub understory. The alliance is found throughout the study area in seasonally flooded streams and springs in lower canyons, and alluvial fans and valleys with dependable sub-surface water supply during the growing season. It is found primarily on channel beds, bottoms, and lowslopes at all aspects. Soils are derived from a variety of substrates with variable textures. Elevations range from approximately 300 to 1600 meters. *Populus fremontii* is dominant or co-dominant in the tree layer, and it often occurs with *Salix* spp. and *Prosopis* spp. Commonly associated shrubs include *Baccharis sergiloides,* and herbs often present include *Artemisia ludoviciana*, *Bromus rubens,* and *Typha* sp.

Diagnostic Criteria: This alliance is characterized by an open to continuous tree canopy dominated or co-dominated by *Populus fremontii,* which ranges from 9 to 100 percent cover. The overall tree cover also ranges from 9 to 100 percent cover.

Alliance Distribution

The alliance was sampled at all three Parks. It is scattered throughout DEVA at low to upper elevations and in MOJA on the Granite and New York Mountains at upper elevations. It is in LAKE east of the Newberry Mountains at mid elevations.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322Ab, 322Ae, 322Al, 322Am; Southeastern Great Basin (4): 341Fc, 341Fe

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Nelson Range, Panamint Mtns, Saline Valley**; LAKE:** Katherine**; MOJA:** Granite Mtns, Mid Hills

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Populus fremontii / Baccharis (emoryi, salicina) [CEGL002946]	1	–	x	–	–
Populus fremontii / Baccharis sergiloides [CEPP006735]	5	x	–	x	–
Populus fremontii–Salix gooddingii [CEGL00944]	3	–	x	x	–
Populus fremontii–Salix laevigata [CEGL005308]	3	–	x	–	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 962.5 m, Range 326 – 1610 m
- Aspect: Flat, Variable (2), N (2), NE (1), E (1), SE (2), W (1), S (2)
- Slope: Mean 3.5 degrees, Range 0 – 12 degrees
- Macro Topography: Channel bed (4), Low level/bottom (3), Lowslope (1), Midslope (1)
- Tree Cover: Mean 42.6%, Range 9 – 100%
- Shrub Cover: Mean 32.7%, Range 0.4 – 75%
- Herb Cover: Mean 22.2%, Range 3 – 50%
- Large Rock: Mean 7.1%, Range 0 – 30%
- Small Rock: Mean 19.2%, Range 0 – 58%
- Fines Cover: Mean 15.2%, Range 2 – 59%
- Litter Cover: Mean 49.7%, Range 15 – 92%
- Geology: alkali-granite (alaskite) (3), alluvium (4), granodiorite (4), limestone (1)
- Soil Texture: Clay loam (2), Fine sand (1), Loam (1), Medium to very fine loamy sand (1), Sand (3), Sandy loam (1), Silt loam (1)

Environment: *Populus fremontii* forest alliance is found in seasonally intermittent streams and springs in lower canyons, alluvial fans and valleys with dependable sub-surface water supply during the growing season. The alliance was sampled at low to upper elevations in channel beds and up to midslopes with variable aspects. Soils are derived from a variety of substrates and textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous tree layer with a sparse to continuous shrub layer and sparse or intermittent herbaceous understory.

Vegetation Floristics: *Populus fremontii* is dominant or co-dominant in the tree layer, and it often occurs with *Salix* and *Prosopis* spp. Commonly associated shrubs include *Baccharis sergiloides* and *Salix exigua,* and herbs often present include *Artemisia ludoviciana*, *Bromus rubens,* and *Typha* sp.

Dynamics: *Populus fremontii* is a fast growing, short-lived shade intolerant plant. It may dominate the stand or mix with other riparian trees. Trees can regenerate vegetatively from root suckers and

propagules created during flood related disturbances. Seeds germinate on recently disturbed sites where subsurface water is available during the growing season. Some low elevation stands have endured negative impacts from reduced water supplies and changes in flooding regimes from dams. Regulating stream flow below dams to mimic natural flooding regimes is critical for restoring and maintaining healthy stands. The USFWS Wetland Inventory (1996) recognizes *Populus fremontii* as a FAC+ plant.

Classification Comments

The USNVC hierarchy denotes more than one alliance with *Populus fremontii* in Western Interior Riparian Forest & Woodland Group (G797), including one alliance primarily occurring in the Great Basin and another across the Southwest. For this Mojave Desert Network classification, we recognize one alliance in this G797 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S3

References

Buck-Diaz et al. 2012, Evens and San 2005, Evens et al. 2012, Klein and Evens 2005, Klein et al. 2007, NatureServe 2012, Potter 2005, Sawyer et al. 2009, Stillwater Sciences and URS 2007, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=12
LAKE (n=3): LAKE9431, LAKE9440, LMJOS002
DEVA (n=6): DEVA9127, DEVA9156, DEVA9275, DEVA9565, DEVA9814, MOJC1234
MOJA (n=3): MOJA9271, MOJA9910, MOJAE194
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Populus fremontii*	100	71	30	5	80	x	x	–	–
	Salix laevigata	33.3	9.2	4.4	0.5	20	–	–	–	–
	Salix gooddingii	25	5.1	3.7	4	35	–	–	–	–
	Prosopis pubescens	25	3.4	1.3	0.2	10	–	–	–	–
	Prosopis glandulosa	25	1.5	0.6	1	3	–	–	–	–
Shrub	*Baccharis sergiloides*	58.3	29	12	7	30	–	–	–	x
	Salix exigua	41.7	8.6	2	1	20	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Rhus trilobata*	41.7	3.9	1.5	1	7	–	–	–	–
	Atriplex polycarpa	33.3	6.4	1	0.2	10	–	–	–	–
	Acacia greggii	33.3	0.9	0.5	0.2	5	–	–	–	–
	Rhamnus ilicifolia	25	0.9	0.4	0.2	2	–	–	–	–
	Gutierrezia sarothrae	25	0.8	0.3	0.2	2	–	–	–	–
Herb	*Typha*	58.3	3.8	1.1	0.2	8	–	–	–	x
	Bromus rubens	50	14	2.6	1	20	–	–	–	x
	Artemisia ludoviciana	50	3.5	0.5	0.2	3.1	–	–	–	x
	Polypogon monspeliensis	41.7	2.3	0.4	0.2	3	–	–	–	–
	Juncus xiphioides	33.3	4.8	1.4	0.2	12	–	–	–	–
	Epilobium	25	5.3	1.4	0.2	12	–	–	–	–
	Mimulus guttatus	25	3.5	0.5	0.5	3	–	–	–	–
	Cynodon dactylon	25	1	0.3	0.5	2	–	–	–	–
	Amsinckia	25	0.8	0.1	0.2	1	–	–	–	–
	Sphaeralcea ambigua	25	0.5	0.1	0.2	1	–	–	–	–
	Penstemon	25	0.5	0.1	0.2	0.2	–	–	–	–
	Sonchus asper	25	0.2	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Moss	25	25	0.4	0.2	4	–	–	–	–

Common Name: Black Willow – Red Willow Riparian Forest
Group Assignment: G797; **Alliance Code:** A3752, A3803

Alliance Concept

The Black Willow – Red Willow Riparian Forest Alliance forms an open to continuous tree canopy with an open to intermittent shrub understory. Stands are local and scattered and can be found at streams and springs and along rivers including those with flood control dams. The alliance is found primarily on channel beds, bottoms and low to midslopes at variable aspects. Soils are derived from a variety of substrates and textures are variable. Elevations range from approximately 480 to 1500 meters. The dominant tree is *Salix gooddingii* or *Salix laevigata,* and *Prosopis glandulosa* is sometimes present. Shrubs that are sometimes present include *Acacia greggii (=Senegalia greggii), Atriplex polycarpa, Baccharis sergiloides, Eriogonum fasciculatum,* and *Pluchea sericea*. *Bromus rubens* is often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to continuous tree canopy with *Salix gooddingii* dominant and ranging from 10 to 99 percent cover. Sometimes other trees including willows may be co-dominant. The overall tree cover also ranges from 10 to 99 percent cover.

Alliance Distribution

The alliance was sampled at all three Parks. It is scattered throughout DEVA at mid to upper elevations. In MOJA it is found at Pachalka Spring in the Clark Mountains and Sheep Spring in the Marl Mountains at upper elevations, and has been observed in the Granite Mountains. In LAKE it is found in Sacatone Wash and at an artificial channel bed near a water treatment facility, though other stands have been observed along Lake Mead and associated stream channels.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ad, 322Aj, 322Am, 322Ay; Southeastern Great Basin (3): 341Fc, 341Fd, 341Fe

Park Sampling Zones: DEVA: Black Mtns, Funeral Mtns, Grapevine Mtns, Nelson Range**; LAKE:** Katherine, Lakeshore**; MOJA:** Clark Mtn, (Granite Mtns), Marl Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Salix gooddingii [CEGL002743]	7	x	x	x	–
Salix laevigata [CEGL002952]	3	–	x	–	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 966.9 m, Range 480 – 1474 m
- Aspect: E (2), NE (1), NW (1), SW (4), S (1)
- Slope: Mean 4.7 degrees, Range 1 – 18 degrees
- Macro Topography: Channel bed (1), Low level/bottom (3), Lowslope (2), Midslope (3)
- Tree Cover: Mean 41.7%, Range 10.4 – 99%
- Shrub Cover: Mean 24.6%, Range 0.2 – 69.9%
- Herb Cover: Mean 26.5%, Range 1 – 63%
- Large Rock: Mean 8.9%, Range 0 – 48%
- Small Rock: Mean 4.9%, Range 1 – 10%
- Fines Cover: Mean 13.4%, Range 0 – 51%
- Litter Cover: Mean 52.8%, Range 6 – 94%
- Geology: alkali-granite (alaskite) (1), alluvium (1), andesite (1), diorite (1), gneiss (1), limestone (1), rhyolite (2), sandstone (2)
- Soil Texture: Loam (2), Loamy sand (3), Silt loam (1), Silty clay (1)

Environment: The alliance is found at all three parks at most elevations along springs and streams, in stream and channel beds, and on low and midslopes at all aspects. Soils range from loamy sand to silt loam derived from variable substrates.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous tree layer with a sparse to intermittent shrub layer and sparse or intermittent herbaceous understory.

Vegetation Floristics: The dominant tree is *Salix gooddingii* or *Salix laevigata,* and *Prosopis glandulosa* is sometimes present. Shrubs that are sometimes present include *Acacia greggii (=Senegalia greggii), Atriplex polycarpa, Baccharis sergiloides, Eriogonum fasciculatum,* and *Pluchea sericea*. *Bromus rubens* is often present in the herbaceous layer.

Dynamics: *Salix gooddingii* and *S. laevigata* stands are common in the southwest United States. In the Mojave Desert, stands are local and scattered and can be found at streams and springs and along rivers including those with flood control dams. Disturbance during winter and spring floods modify and create riparian stands with successful seedling establishment determined by timing of dispersal and flood patterns. Established plants tolerate inundation, and plants sprout from a root crown in lighted conditions. Altered hydrologic regimes, flood control projects, and the presence of invasive plants may pose a threat to *S. goodingii* stands.

Classification Comments

Currently, the USNVC hierarchy includes associations with *Salix goodingii* dominant in two different alliances, including this mixed tree *Salix* spp. alliance and another mixed with *Populus fremontii* and *Fraxinus velutina.* For this Mojave Network classification, we have placed all tree willow-dominated associations into this mixed willow alliance; however, further review and analysis is needed to determine if these types should all be merged into one alliance or kept split.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S3

References

Buck-Diaz et al. 2012, Evens et al. 2012, Klein and Evens 2005, Klein et al. 2007, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=10

LAKE (n=2): LAKE9421, LMFMH071

DEVA (n=6): DEVA9155, DEVA9373, DEVA9466, DEVA9538, DEVA9921, DEVAS079

MOJA (n=2): MOJA0346, MOJA9155

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Salix gooddingii*	70	68	26	10	99	–	–	–	X
	Salix laevigata	30	30	14	25	60	–	–	–	–
	Prosopis glandulosa	30	2	0.4	0.2	3	–	–	–	–
Shrub	*Baccharis sergiloides*	40	15	5.1	0.2	35	–	–	–	–
	Pluchea sericea	40	21	3.2	2	15	–	–	–	–
	Atriplex polycarpa	30	6.5	2.3	0.01	20	–	–	–	–
	Acacia greggii	30	1.5	0.2	0.2	1	–	–	–	–
	Eriogonum fasciculatum	30	0.2	0.1	0.11	0.2	–	–	–	–
Herb	*Bromus rubens*	70	7.8	1.3	0.2	5	–	–	–	X
	Phragmites australis	40	15	6.9	1	60	–	–	–	–
	Typha	40	16	3.7	3	25	–	–	–	–
	Anemopsis californica	30	3.1	2.1	0.2	20	–	–	–	–
	Nasturtium officinale	30	8	2.1	0.2	20	–	–	–	–
	Unknown Graminoid (grass or grasslike)	30	2.2	1	0.33	6.6	–	–	–	–
	Polypogon monspeliensis	30	3.5	0.6	0.11	3	–	–	–	–
	Bromus tectorum	30	2.6	0.4	0.2	3	–	–	–	–
	Eriogonum inflatum	30	0.3	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Moss	30	30	0.5	0.2	5	–	–	–	–

1. Forest & Woodland Class

1.B.3. Temperate Flooded & Swamp Forest Formation

1.B.3.Nd. Interior Lowland West 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

Common Name: Himalayan Blackberry – Purple Rattlebox – Edible Fig Ruderal Shrubland
Group Assignment: G510; **Alliance Code**: A4160

Alliance Concept

The Himalayan Blackberry – Purple Rattlebox – Edible Fig Ruderal Shrubland stands form an open to continuous shrub layer. The alliance was sampled at only two mountain springs in the region, and patches are small in size (<0.1 hectare). This alliance requires more data to adequately describe, and its small stands are likely an artifact of cultural plantings with escaped individuals. Elevations range from approximately 728 to 1401 meters. *Ficus carica* is the dominant and characteristic shrub of this alliance. *Nerium oleander* is sometimes present as an associated non-native, and other shrubs may include *Ambrosia dumosa, Atriplex canescens, Ericameria cuneata* and *Larrea tridentata*. Adjacent woody riparian stands include those dominated by *Baccharis sergiloides, Pluchea sericea, Populus fremontii, Prosopis glandulosa,* and *Salix laevigata,* as well as culturally planted stands of *Fraxinus velutina, Nerium oleander,* and *Tamarix aphylla*.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Ficus carica* strongly dominant in the stands sampled. *Nerium oleander* is sometimes present as an associated non-native.

Alliance Distribution

The alliance is scattered in DEVA in mid to upper elevation mountain springs. Samples were taken from two springs of Mint Spring and Warm Spring, and patches are small in size (<0.1 hectare).

States: CA

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

Park Sampling Zone: DEVA: Panamint Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ficus carica Ruderal Riparian [CEPP006709]	5	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1133.2 m, Range 728 – 1401 m
- Shrub Cover: Mean 87%, Range 60 – 100%

Environment: The alliance is found in localized mountain springs in Death Valley. The elevations range from mid to high.

Vegetation Description

Vegetation Structure: The Alliance forms a continuous shrub layer and the overall shrub cover ranges from 60 to 100 percent. The tree layer is sparse or absent.

Vegetation Floristics: *Ficus carica* is the dominant and characteristic shrub in the stands sampled. *Nerium oleander* is sometimes present as an associated non-native, and other shrubs may include *Ambrosia dumosa, Atriplex canescens, Ericameria cuneata* and *Larrea tridentata.* Adjacent woody riparian stands include those dominated by *Baccharis sergiloides, Pluchea sericea, Populus fremontii, Prosopis glandulosa,* and *Salix laevigata,* as well as culturally planted stands of *Fraxinus velutina, Nerium oleander,* and *Tamarix aphylla*.

Dynamics: *Ficus carica* is not common in the region, and the fig's presence is apparently from cultural plantings and naturally escaping at a very small degree.

Classification Comments

None.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR
State (California): GNR

References

None

Surveys (with Sample Sizes) Used in Description

MOJN: N=5
LAKE (n=0)
DEVA (n=5): DEVA8005, DEVA8006, DEVA8007, DEVA8008, DEVA8009
MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ficus carica*	100	99	86	60	100	x	x	–	–

Common Name: Ruderal Date Palm – California Fan Palm Stands
Group Assignment: G510; **Alliance Code:** A4161

Alliance Concept

The Ruderal Date Palm – California Fan Palm Stands forms an open to continuous tree canopy with an open to intermittent shrub understory. *Phoenix dactylifera* and/or *Washingtonia filifera* is dominant or co-dominant together in localized patches in DEVA, LAKE and MOJA. Elevations range from approximately 2 to 500 meters. The alliance is found primarily on stream bottoms and lowslopes springs at variable aspects. Stands occurring in the study area in the Mojave Desert and Great Basin are non-native, where the palms have been naturalizing in alkali spring and stream areas, typically from cultural plantings. Soils can be clay and are derived typically from alluvium, limestone, and sandstone. This alliance was described using some incomplete map data and classification sampling data.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous tree canopy with *Phoenix dactylifera* and/or *Washingtonia filifera* dominant or co-dominant, and ranging from 2.2 to 95 percent cover. The overall tree cover also ranges from 2.2 to 95 percent cover.

Alliance Distribution

The alliance was sampled at low elevations in DEVA at the southern end of the Black Mountains, in Saline Valley at Lower Warm Springs, and along and near Cow Creek, including at Nevares, Ratatat, Shoot-me-up Springs, and Travertine East springs, and in LAKE at the top of Rogers Wash near Echo Bay and in Overton. These stands are ruderal/semi-natural and typically have naturalized from cultural plantings in spring and stream areas. The palms have been mapped as individuals and as stands at the Travertine Springs complex in DEVA (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). Stands have also been observed around Zzyzx Springs.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (19): 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)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Washingtonia filifera / spring Ruderal [CEPP006845]	12	x	x	–	–
Phoenix dactylifera Ruderal [CEPP006859]	8	–	x	–	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 214.1 m, Range 2 – 476 m
- Aspect: Flat, Variable (1), SW (1), S (1)
- Slope: Mean 5 degrees, Range 0 – 10 degrees
- Macro Topography: Low level/bottom (1), Lowslope (2)
- Tree Cover: Mean 64%, Range 2.2 – 95%
- Shrub Cover: Mean 25.1%, Range 2.4 – 51%
- Herb Cover: Mean 12.2%, Range 3 – 27%
- Large Rock: 0%
- Small Rock: Mean 31%, Range 3 – 80%
- Fines Cover: Mean 2.6%, Range 0 – 27%
- Litter Cover: Mean 5.5%, Range 0 – 61%
- Geology: alluvium (17), limestone (1), sandstone (1)
- Soil Texture: Clay (1)

Environment: The alliance was sampled along stream bottoms, lowslope springs, and sometimes in or near ponds or playas at low elevations with variable aspects in DEVA and LAKE. It also has been observed planted and expanding along Zzyzx Springs and Soda Lake near the Desert Studies Center in MOJA. Soils include clay, and they are derived from alluvium, limestone, and sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous tree layer.

Vegetation Floristics: The dominant tree is *Phoenix dactylifera* and/or *Washingtonia filifera* in the overstory, and *Prosopis* spp. are sometimes present. The shrub layer is open to intermittent, and the herbaceous understory is sparse to open. *Pluchea sericea* and other various shrubs are sometimes present in the shrub layer.

Dynamics: More than 75 stands of *Washingtonia filifera* occur naturally in California in springs and along fault lines where water is continuously available. *Washingtonia filifera* in the three Parks was planted, and it has been naturalizing in various spring-fed and stream areas where water is perennially available. *Phoenix dactylifera* is marginally naturalizing in riparian areas in southern California, and can draw upon limited water resources, including rare desert spring aquifers. In DEVA, date palm trees were planted in the early 1900's when Furnace Creek was diverted for ranching, and efforts to remove these trees from the Travertine Springs complex have been undertaken recently (Thomas 2006, Sada and Cooper 2012).

Classification Comments

Native stands of *Washingtonia filifera* in the Sonoran Desert are placed in the Warm Southwest Riparian Forest & Woodland (G797). We have placed the non-native and naturalizing stands of palm

trees from the Mojave Desert and southeastern Great Basin in the Interior West Ruderal Riparian Forest & Scrub Group (G510).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: GNR

State (California): GNR

References

Evens et al. 2012, Keeler-Wolf et al. 1998, Sawyer et al. 2009, Thomas 2006, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=20

LAKE (n=2): LAKE9298, LAKE9414

DEVA (n=18): DEVA8011, DEVA8012, DEVA8013, DEVA8014, DEVA8015, DEVA8016, DEVA8017, DEVA8018, DEVA8019, DEVA8021, DEVA8022, DEVA8023, DEVA8024, DEVA8025, DEVA8026, DEVA8027, DEVA8028, DEVA8029

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Washingtonia filifera*	67	47	24	2	95	x	–	–	x
	Phoenix dactylifera	43	35	30	1	95	x	–	–	–
Shrub	*Pluchea sericea*	24	14.5	3.8	2	50	–	–	–	–

Common Name: Ruderal Tamarisk Riparian Scrub
Group Assignment: G510; **Alliance Code:** A0842

Alliance Concept

The Ruderal Tamarisk Riparian Scrub Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to intermittent. The alliance is found primarily along lake margins and drainage channel beds at variable aspects. Soils are derived from a variety of substrates including water and textures are variable. Elevations range from approximately 0 to 1250 meters. This alliance is defined by a non-native, naturalizing*Tamarix* species as the strong dominant in the shrub layer. Characteristic herbs include *Schismus* spp. and those often present are *Bromus rubens* and *Eriogonum deflexum.*

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Tamarix ramosissima* strongly dominant*,* or another naturalizing shrub *Tamarix* species may be dominant. The overall shrub cover ranges from 4.8 to 70.2 percent.

Alliance Distribution

The alliance was sampled at LAKE, DEVA and MOJA at low to high elevation riparian and wetland areas. It occurs commonly in LAKE along the edges of Lake Mead in drawdown zones and along Lake Mohave, which is a long stretch of the Colorado River behind Davis Dam. It occurs scattered in DEVA, including along Saline Valley and at a spring area (named the Cow Creek Urban site I), and scattered in MOJA including along a wash channel with former settling ponds for a mine.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (17): 322Ab, 322Al, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (1): 341Fc

Park Sampling Zones: LAKE: Callville, Cottonwood Cove, Echo Bay, Gold Butte, Overton, Parashant, Pearce Ferry, Willow Beach**; MOJA:** New York Mtns**; DEVA:** Death Valley, Saline Valley

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Tamarix spp. Ruderal Riparian [CEGL003114]	18	x	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 357.2 m, Range 1 – 1233 m

- Aspect: E (2), Flat, Variable (1), W (2), SW (4), S (3)
- Slope: Mean 3.8 degrees, Range 1 – 15 degrees
- Macro Topography: Channel bed (2), Lake bottom (7), Lowslope (1), Midslope (2)
- Tree Cover: Mean 0.3%, Range 0 – 3%
- Shrub Cover: Mean 20.1%, Range 4.8– 70.2%
- Herb Cover: Mean 10.6%, Range 0.3 – 39%
- Large Rock: Mean 2.6%, Range 0 – 13%
- Small Rock: Mean 35%, Range 3 – 85%
- Fines Cover: Mean 35.1%, Range 0 – 89%
- Litter Cover: Mean 15.7%, Range 0 – 59%
- Geology: alluvium (1), conglomerate (1), dacite (1), gneiss (1), limestone (1), sandstone (2), water (9)
- Soil Texture: Clay (1), Loamy sand (1), Sand (3), Silty clay (1)

Environment: The alliance occurs in riparian and wetland settings in LAKE, DEVA and MOJA, including lake margins, drainage channels, and settling ponds in at low to high elevations. It often occurs in unnatural and disturbed settings such as along the drawdown zones of Lake Mead and along Lake Mojave, and disturbed stream channels and springs. Soils are derived from a variety of substrates including water and soil textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 4.8 to 70.2 percent. The tree layer is typically sparse to open, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse.

Vegetation Floristics: A non-native naturalizing *Tamarix* species is strongly dominant in the shrub layer, especially *Tamarix ramosissima.* Other native shrubs can include *Larrea tridentata, Encelia 51anadens,* and *Pluchea sericea.* Characteristic herbs include *Schismus* spp. and those often present are *Bromus rubens,* and *Eriogonum deflexum.*

Dynamics: *Tamarix ramosissima* and related tamarisk are highly invasive; they can develop dense stands across floodplains, stream channels, lake margins, marshy areas, and other wetlands. In the Mojave Desert, it invades native stands of *Hymenoclea salsola, Prosopis glandulosa, Pluchea sericea, Salix exigua,* and other shrubs. Many interacting factors facilitate tamarisk invasion, including intentional plantings for erosion control, reduced flood frequencies upon damming rivers, changing and stabilizing water flows and rates downstream from reservoirs, and increased salinity levels along the lakes and rivers from evaporating reservoirs.

The invasive stands pose significant risk to habitats and vegetation. They can form dense thickets and exclude light, nutrients, and water from other plants. Tamarisk is exceptional at drawing up and consuming water, which can lower ground water levels, and it also can cause more flooding by choking streambeds with its extensive root systems.

Classification Comments

Shrubland stands of *Tamarix* spp. that are ruderal/semi-natural and invasive have been categorized separately from the relatively non-invasive, culturally planted tree stands of *Tamarix aphylla.*

Classification Confidence of Alliance: High

Conservation Status Rank

Global: GNR

State (California): GNR

References

Buck-Diaz et al. 2012, Evens et al. 2012, Keeler-Wolf et al. 1998, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=18

LAKE (n=15): ERVIGHav, LAKE0390, LAKE0412, LAKE0510, LAKE9217, LAKE9221, LAKE9275, LAKE9278, LAKE9405, LAKE9509, LAKE9604, LAKE9631, LMJOA044, LMJOA045, LMJOA046

DEVA (n=2): DEVA8061, DEVA8062

MOJA (n=1): MOJA9314

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Tamarix ramosissima*	100	84	18	2	70	x	x	–	–
	Larrea tridentata	38.9	1.2	0.1	0.1	0.79	–	–	–	–
	Encelia farinosa	27.8	0.3	0.1	0.2	1	–	–	–	–
	Stephanomeria pauciflora	27.8	0.8	0.1	0.1	0.2	–	–	–	–
Herb	*Schismus*	72.2	21	1.8	0.2	13.8	–	–	–	x
	Bromus rubens	50	6.4	1.2	0.2	15	–	–	–	x
	Eriogonum deflexum	44.4	11	0.7	0.2	7.3	–	–	–	–
	Brassica tournefortii	33.3	5	0.4	0.2	4	–	–	–	–
	Salsola	33.3	5	0.3	0.2	3	–	–	–	–
	Chaenactis fremontii	33.3	1	0.1	0.2	1	–	–	–	–
	Cryptantha pterocarya	33.3	0.7	0.1	0.04	0.2	–	–	–	–
	Camissonia brevipes	27.8	0.8	0.1	0.2	0.34	–	–	–	–
	Cryptantha barbigera	27.8	0.7	0.1	0.13	0.2	–	–	–	–
	Heliotropium curassavicum	27.8	0.5	0	0.02	0.2	–	–	–	–

2. Shrub & Herb Vegetation Class

2.B.1. Mediterranean Scrub & Grassland Formation

2.B.1.Na. Californian Scrub & Grassland Division

M045. Californian Annual & Perennial Grassland Macrogroup

G766. Californian Annual Grassland & Forb Meadow Group

Amsinckia menziesii – Amsinckia tessellata – Phacelia spp. Herbaceous Alliance

Common Name: Fiddleneck Fields
Group Assignment: G766; **Alliance Code:** A4182

Alliance Concept

The Fiddleneck Fields Alliance forms an intermittent to continuous herbaceous layer. The shrub layer is open and the tree layer, when present, is sparse. The alliance was sampled once on a lowslopes with east aspect and soils derived from alkali-granite (alaskite). Elevation is 874 meters. The dominant herb is an *Amsinckia* species, including *Amsinckia tessellata.* Other herbs include *Asclepias subulata, Chamaesyce polycarpa, Chorizanthe brevicornu, Erodium cicutarium, Eschscholzia minutiflora, Leptosiphon aureus, Lupinus sparsiflorus, Mirabilis laevis, Pectocarya recurvata, Phacelia distans, Physalis hederifolia, Plagiobothrys* spp.*, Porophyllum gracile, Schismus* spp., and *Stillingia linearifolia.* Associated emergent shrubs at open percent cover include *Hymenoclea salsola, Acamptopappus sphaerocephalus, Ambrosia dumosa, Encelia farinosa, Eriogonum plumatella, Larrea tridentata, Salazaria mexicana, Stephanomeria pauciflora, Tetradymia stenolepis, Viguiera parishii,* and *Yucca schidigera.*

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous herbaceous layer with an *Amsinckia* species dominant or co-dominant, including *Amsinckia tessellata* and *A. menziesii*. The overall herbaceous cover is 67 percent cover in the one stand sampled.

Alliance Distribution

The alliance was sampled once in the study area at LAKE in the south east of Spirit Mountain at mid elevation. Other stands have been observed in lower elevations of DEVA, but have not been sampled.

States: NV, (CA)

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

Park Sampling Zones: LAKE: Katherine

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Codes]	Sample Size	LAKE	DEVA	MOJA	Johnson
Amsinckia tessellata – Erodium cicutarium [CEPP005792]	1	x	–	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 874 m
- Aspect: E (1)
- Slope: 3 degrees
- Macro Topography: Lowslope (1)
- Tree Cover: 0%
- Shrub Cover: 4%
- Herb Cover: 67%
- Large Rock: 0%
- Small Rock: 85%
- Fines Cover: 4%
- Litter Cover: 6%
- Geology: alkali-granite (alaskite) (1)
- Soil Texture: (unknown)

Environment: The alliance was sampled once at mid elevations in LAKE in a burn scar on a lowslope with an east aspect. Soils are derived from alkali-granite (alaskite).

Vegetation Description

Vegetation Structure: The alliance forms a continuous herbaceous layer, and the overall herbaceous cover is 67 percent cover. The shrub layer is sparse to open. The tree layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: The dominant herb is an *Amsinckia* species, *A. tessellata*, and other herbs include *Asclepias subulata, Chamaesyce polycarpa, Chorizanthe brevicornu, Erodium cicutarium, Eschscholzia minutiflora, Leptosiphon aureus, Lupinus sparsiflorus, Mirabilis laevis, Pectocarya recurvata, Phacelia distans, Physalis hederifolia, Plagiobothrys* spp.*, Porophyllum gracile, Schismus* spp., and *Stillingia linearifolia.* Associated emergent shrubs at open percent cover include *Hymenoclea salsola, Acamptopappus sphaerocephalus, Ambrosia dumosa, Encelia farinosa, Eriogonum plumatella, Larrea tridentata, Salazaria mexicana, Stephanomeria pauciflora, Tetradymia stenolepis, Viguiera parishii,* and *Yucca schidigera.*

Dynamics: *Amsinkia tessellata* is well-adapted to disturbance and climate fluctuations due to its ability to bank seeds and germinate quickly during high rainfall years. Stand size and appearance may vary depending on the amount and timing of precipitaiton.

Classification Comments

Further review of USNVC groups is necessary to determine the best placement of annual herbaceous types since three groups of ruderal (semi-natural) herbaceous stands exist with related concepts: California Ruderal Grassland & Forb Meadow Group (G497), North American Warm Desert Ruderal

Scrub & Grassland Group (G677), and Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group (G600).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5

State (California): S5

References

Buck-Diaz et al. 2012, Evens et al. 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=1

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

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Hymenoclea salsola*	100	50	2	2	2	x	x	–	–
	Acamptopappus sphaerocephalus	100	5	0.2	0.2	0.2	x	–	–	–
	Ambrosia dumosa	100	5	0.2	0.2	0.2	x	–	–	–
	Encelia farinosa	100	5	0.2	0.2	0.2	x	–	–	–
	Eriogonum plumatella	100	5	0.2	0.2	0.2	x	–	–	–
	Larrea tridentata	100	5	0.2	0.2	0.2	x	–	–	–
	Salazaria mexicana	100	5	0.2	0.2	0.2	x	–	–	–
	Stephanomeria pauciflora	100	5	0.2	0.2	0.2	x	–	–	–
	Tetradymia stenolepis	100	5	0.2	0.2	0.2	x	–	–	–
	Viguiera parishii	100	5	0.2	0.2	0.2	x	–	–	–
	Yucca schidigera	100	5	0.2	0.2	0.2	x	–	–	–
Herb	Amsinckia tessellata	100	88	60	60	60	x	x	–	–
	Erodium cicutarium	100	4.4	3	3	3	x	–	–	–
	Lupinus sparsiflorus	100	1.5	1	1	1	x	–	–	–
	Pectocarya recurvata	100	1.5	1	1	1	x	–	–	–
	Schismus	100	1.5	1	1	1	x	–	–	–
	Asclepias subulata	100	0.3	0.2	0.2	0.2	x	–	–	–
	Chamaesyce polycarpa	100	0.3	0.2	0.2	0.2	x	–	–	–
	Chorizanthe brevicornu	100	0.3	0.2	0.2	0.2	x	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eschscholzia minutiflora*	100	0.3	0.2	0.2	0.2	x	–	–	–
	Leptosiphon aureus	100	0.3	0.2	0.2	0.2	x	–	–	–
	Mirabilis laevis	100	0.3	0.2	0.2	0.2	x	–	–	–
	Phacelia distans	100	0.3	0.2	0.2	0.2	x	–	–	–
	Physalis hederifolia	100	0.3	0.2	0.2	0.2	x	–	–	–
	Plagiobothrys	100	0.3	0.2	0.2	0.2	x	–	–	–
	Porophyllum gracile	100	0.3	0.2	0.2	0.2	x	–	–	–
	Stillingia linearifolia	100	0.3	0.2	0.2	0.2	x	–	–	–

2. Shrub & Herb Vegetation Class

2.B.2. Temperate Grassland & Shrubland Formation

2.B.2.Na. Western North American Grassland & Shrubland Division

M048. Central Rocky Mountain Montane-Foothill Grassland & Shrubland Macrogroup

G305. Central Rocky Mountain-North Pacific High Montane Mesic Shrubland Group

Abies lasiocarpa – Populus tremuloides / *Acer glabrum* Central Rocky Mountain Avalanche Chute Shrubland Alliance

Common Name: Subalpine Fir – Quaking Aspen / Rocky Mountain Maple Avalanche Chute Shrubland

Group Assignment: G305; **Alliance Code:** A3968

Alliance Concept

The Western Alder Shrubland Alliance forms an intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer, if present, is sparse. The alliance was sampled once in the study area and was found on a channel bed with a north aspect at high elevation in the Panamint Mountains. Soils are derived from sandstone and texture is silt loam. Elevation is 2205 meters. *Acer glabrum* is dominant or co-dominant in the shrub canopy. Other shrubs in the one stand sampled include *Jamesia americana, Holodiscus dumosus, Ribes cereum, Salix exigua,* and *Symphoricarpos* sp. *Pinus monophylla* can be associated as emergent tree at sparse cover. The herbaceous layer is variable and includes *Lomatium parryi* in this region.

Diagnostic Criteria: This alliance is characterized by an intermittent shrub layer of *Acer glabrum* dominant or co-dominant with other shrubs, including *Jamesia americana, Holodiscus dumosus, Ribes cereum, Salix exigua,* and *Symphoricarpos* sp. The overall shrub cover is 58.2 percent.

Alliance Distribution

The alliance was sampled once in the study area. It occurs at Hummingbird Springs in the Panamint Range at high elevation.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Acer glabrum drainage bottom (provisional) [CEGL001062]	1	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2205 m
- Aspect: N (1)
- Slope: 25 degrees
- Macro Topography: Channel bed (1)
- Tree Cover: 1%
- Shrub Cover: 58.200001%
- Herb Cover: 0%
- Large Rock: 12%
- Small Rock: 63%
- Fines Cover: 0%
- Litter Cover: 25%
- Geology: sandstone (1)
- Soil Texture: Silt loam (1)

Environment: The alliance occurs in a mountain channel bed at a spring with a north aspect at high elevation. Soils are silt loam derived from sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an intermittent shrub layer and the overall shrub cover is 58.2 percent. The tree layer is typically sparse, and the herb layer and non-vascular plants, if present, are sparse.

Vegetation Floristics: The characteristic shrub is *Acer glabrum,* which is dominant or co-dominant in the shrub canopy. Other shrubs in the one stand sampled include *Jamesia americana, Holodiscus dumosus, Ribes cereum, Salix exigua,* and *Symphoricarpos* sp. *Pinus monophylla* can be associated as an emergent tree at sparse cover. The herbaceous layer is variable and includes *Lomatium parryi* in this region.

Dynamics: *Acer glabrum* stands are found mostly in the Rocky Mountains, and disjunct stands occur in higher elevation mountains of California, on cooler north and east-facing slopes in mountain draws and drainage channels where snow stays later than other sites. Also, stands can experience both alluvial and colluvial disturbance.

Classification Comments

Acer glabrum associations are currently placed in the Central Rocky Mountain-North Pacific High Montane Mesic Shrubland Group (G305) and Western Montane-Subalpine Riparian & Seep Shrubland Group (G527) of the USNVC hierarchy. For this Mojave Desert Network classification, we have treated the one stand sampled in the G305 group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5

State (California): S3?

References

NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=1

LAKE (n=0)

DEVA (n=1): DEVA9173

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	100	100	1	1	1	x	x	–	–
Shrub	*Acer glabrum*	100	43	25	25	25	x	–	x	–
	Jamesia americana	100	34	20	20	20	x	–	x	–
	Symphoricarpos	100	12	7	7	7	x	–	–	–
	Salix exigua	100	6.9	4	4	4	x	–	–	–
	Ribes cereum	100	3.4	2	2	2	x	–	–	–
	Holodiscus dumosus	100	0.3	0.2	0.2	0.2	x	–	–	–
Herb	*Lomatium parryi*	100	100	0.2	0.2	0.2	x	x	–	–

2. Shrub & Herb Vegetation Class

2.B.2. Temperate Grassland & Shrubland Formation

2.B.2.Na. Western North American Grassland & Shrubland Division

M049. Southern Rocky Mountain Montane Shrubland Macrogroup

G276. Southern Rocky Mountain Mountain-mahogany - Mixed Foothill Shrubland Group

Amelanchier utahensis – Cercocarpus montanus – Cercocarpus intricatus Shrubland Alliance

Common Name: Small Leaf Mountain Mahogany Scrub
Group Assignment: G276; **Alliance Code:** A3732

Alliance Concept

The Small Leaf Mountain Mahogany Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on midslopes to summits at all aspects at higher elevations on nutrient-poor and xeric, rocky soils, including in the Last Chance Range and Cottonwood Mountains of DEVA and Clark Mountain in MOJA. Soils are derived from limestone and dolostone, and textures range from loamy sand to clay loam. Elevations range from approximately 1750 to 2950 meters. The dominant and characteristic shrub is *Cercocarpus intricatus. Ephedra viridis* is also characteristic but at low cover, and those often present at low cover include *Artemisia tridentata* ssp. *vaseyana, Echinocereus mojavensis, Ericameria nauseosa, Gutierrezia microcephala,* and *Symphoricarpos* spp. *Yucca brevifolia* is a commonly associated emergent tree at sparse cover. Herbs that are often present are *Achnatherum hymenoides, Achnatherum speciosum,*and *Linanthus pungens.* Commonly associated non-vascular plants include unknown lichen and moss.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Cercocarpus intricatus* dominant. The overall shrub cover ranges from 7 to 46.4 percent.

Alliance Distribution

The alliance was sampled at high elevations at DEVA in the Last Chance Range and Cottonwood Mountains and the adjacent Inyo Mountains, and in MOJA at the summit of Clark Mtn.

States: CA

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

Park Sampling Zones: DEVA: Cottonwood Mtns, Last Chance Range, Mazourka Peak**; MOJA:** Clark Mtn

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Cercocarpus intricatus Montane [CEGL002587]	5	–	x	x	–
Cercocarpus intricatus – Glossopetalon spinescens [CEGL005426]	1 [2]	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 2234.8 m, Range 1797 – 2929 m
- Aspect: N (1), NE (2), W (2), S (1)
- Slope: Mean 28.2 degrees, Range 7 – 50 degrees
- Macro Topography: High level/summit (1), High slope (4), Midslope (1)
- Tree Cover: Mean 0.3%, Range 0 – 1%
- Shrub Cover: Mean 16.5%, Range 7 – 46.4%
- Herb Cover: Mean 1.6%, Range 0.3 – 3%
- Large Rock: Mean 51.7%, Range 15 – 81%
- Small Rock: Mean 36.2%, Range 14 – 60%
- Fines Cover: Mean 2.2%, Range 0 – 6%
- Litter Cover: Mean 4. 1%, Range 0 – 6.2%
- Geology: limestone (2), dolostone (dolomite) (3)
- Soil Texture: Clay loam (1), Loam (1), Loamy sand (1)

Environment: The alliance primarily occurs on bedrock outcrops on steep midslopes to ridgelines on all aspects, at high elevations that are nutrient-poor and xeric, rocky soils. Soils are derived from limestone and sandstone, and texture ranges from loamy sand to clay loam.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 7 to 46.4 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: The dominant and characteristic shrub is *Cercocarpus intricatus. Ephedra viridis* is also characteristic but at low cover, and those often present at low cover include *Artemisia tridentata* ssp. *vaseyana, Echinocereus mojavensis, Ericameria nauseosa, Gutierrezia microcephala,* and *Symphoricarpos* spp. *Yucca brevifolia* is a commonly associated emergent tree at sparse cover. Herbs that are often present are *Achnatherum hymenoides, Achnatherum speciosum,*and *Linanthus pungens.* Commonly associated non-vascular plants include unknown lichen and moss.

Dynamics: *Cercocarpus intricatus,* similar to *C. ledifolius,* occurs locally on calcareous substrates in higher elevation desert mountains of California in the same zone as *Pinus monophylla* woodlands

and *Artemisia tridentata* var. *vaseyana* shrublands, though typical sites are significantly drier and warmer than sites with *C. ledifolius*.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S3?

References

NatureServe 2012, Sawyer et al. 2009, Thomas et al. 2004

Surveys (with Sample Sizes) Used in Description

MOJN: N=6

LAKE (n=0); DEVA (n=5): DEVA9569, DEVA9570, DEVAS236, DEVAS240, DEVAS259; [DEVA-Slaton (n=2): SLTN0621, SLTN1051]; MOJA (n=1): MOJA9529; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	50	44	0.1	0.2	0.2	–	–	–	x
	Pinus monophylla	33.3	23	0.1	0.11	0.2	–	–	–	–
Shrub	*Cercocarpus intricatus*	100	55	9.7	4	30	x	x	–	–
	Ephedra viridis	83.3	6.2	0.7	0.11	3	x	–	–	–
	Symphoricarpos	50	3.9	0.4	0.11	2	–	–	–	x
	Gutierrezia microcephala	50	2	0.2	0.11	1	–	–	–	x
	Artemisia tridentata ssp. vaseyana	50	1.6	0.1	0.11	0.5	–	–	–	x
	Echinocereus mojavensis	50	1.2	0.1	0.11	0.5	–	–	–	x
	Ericameria nauseosa	50	0.9	0.1	0.11	0.2	–	–	–	x
	Glossopetalon spinescens	33.3	5.8	0.7	1	3	–	–	–	–
	Eriogonum heermannii	33.3	5.9	0.5	0.2	3	–	–	–	–
	Chrysothamnus viscidiflorus	33.3	0.7	0.1	0.11	0.5	–	–	–	–
	Ericameria cooperi	33.3	0.8	0.1	0.11	0.5	–	–	–	–
	Ericameria teretifolia	33.3	0.6	0.1	0.11	0.2	–	–	–	–
	Opuntia basilaris	33.3	0.3	0	0.11	0.11	–	–	–	–
Herb	*Achnatherum speciosum*	66.7	13	0.3	0.11	1	–	–	–	x
	Achnatherum hymenoides	66.7	9.7	0.1	0.11	0.2	–	–	–	x
	Linanthus pungens	50	19	0.2	0.11	1	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Cryptantha*	33.3	8.5	0.2	0.6	0.6	–	–	–	–
	Bromus rubens	33.3	3.1	0.1	0.2	0.2	–	–	–	–
	Elymus elymoides	33.3	2.8	0.1	0.2	0.2	–	–	–	–
	Castilleja angustifolia	33.3	6.6	0	0.11	0.11	–	–	–	–
Non-vascular	Unknown Lichen	50	43	2.2	1	8	–	–	–	x
	Unknown Moss	50	6.7	0.2	0.2	0.5	–	–	–	x

2. Shrub & Herb Vegetation Class

2.B.2. Temperate Grassland & Shrubland Formation

2.B.2.Na. Western North American Grassland & Shrubland Division

M168. Rocky Mountain-Vancouverian Subalpine-High Montane Mesic Meadow Macrogroup

G271. Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow Group

Poa secunda – Muhlenbergia richardsonis – Carex douglasii Moist Meadow Alliance

Common Name: Sandberg Bluegrass – Mat Muhly – Douglas' Sedge Meadow
Group Assignment: G271; **Alliance Code:** A4165

Alliance Concept

The Sandberg Bluegrass – Mat Muhly – Douglas' Sedge Herbaceous stands form an intermittent to continuous herbaceous layer. The shrub and tree layers, when present, are sparse. Stands occurred in moist meadows adjacent to riparian and upland shrub communities at upper elevations that range from approximately 2032 to 2047 meters. Soils are alluvial derived from granitic parent material, and the texture includes loamy sand. The dominant and characteristic herb in the two stands sampled is *Carex douglasii,* and *Rumex salicifolia* and *Artemisia ludoviciana* are characteristically present at low cover. The tree and shrub layers, when present, are typically sparse and may include *Artemisia tridentata, Ericameria nauseosa, Rosa woodsii,* and *Salix exigua*.

Diagnostic Criteria: This alliance is characterized by continuous herbaceous layer dominated by *Carex douglasii*. The overall herbaceous cover ranges from 75 to 85 percent cover.

Alliance Distribution

The alliance was sampled at upper elevations in the Hunter Mountain region in DEVA.

States: CA

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

Park Sampling Zones: DEVA: CottonWood Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Carex douglasii [CEGL001768]	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2032 – 2047 m

- Aspect: None (2)
- Slope: Flat (2)
- Macro Topography: Bottom (2)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 4.5%, Range 2 – 7%
- Herb Cover: Mean 62.5%, Range 75 – 85%
- Large Rock: (unknown)
- Small Rock: (unknown)
- Fines Cover: (unknown)
- Litter Cover: (unknown)
- Geology: Granitic alluvium (2)
- Soil Texture: Loamy sand (2)

Environment: The alliance occurs in upper elevation moist meadows in DEVA, adjacent to riparian and uplands shrubland stands of *Artemisia tridentata, Ericameria nauseosa, Rosa woodsii* and *Salix exigua*.

Vegetation Description

Vegetation Structure: The alliance forms an intermittent to continuous herbaceous layer, and the overall herbaceous cover ranges from 85 to 95 percent cover. The tree and shrub layers, when present, are typically sparse. Non-vascular plants are typically sparse.

Vegetation Floristics: The dominant and characteristic herb in the two stands sampled is *Carex douglasii,* and *Rumex salicifolia* and *Artemisia ludoviciana* are often present at low cover. Shrubs may include *Artemisia tridentata, Ericameria nauseosa, Rosa woodsii,* and *Salix exigua*.

Dynamics: *Carex douglasii* can tolerate alkaline soils and may occur along compacted edges of dirt or paved roads where runoff may provide higher than ambient moisture. Stands may suggest a history of heavy grazing and soil compaction.

Classification Comments

This alliance was previously placed in the Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh Group (G521). Upon review of the existing data and DEVA data, California ecologists have reclassified it into the Rocky Mountain-North Pacific Subalpine-Montane Mesic Grassland & Meadow (G271).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4?
State (California): S3

References

NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0)
DEVA (n=2): DEVA9967, DEVA9968
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ericameria nauseosa*	50	48	2.5	5	5	–	–	–	x
	Salix exigua	50	42	1	2	2	–	–	–	x
	Artemisia tridentata	50	1.9	0.1	0.2	0.2	–	–	–	x
	Rosa woodsii	50	4.2	0.1	0.2	0.2	–	–	–	x
Herb	*Carex douglasii*	100	90	73	70	75	x	x	–	–
	Rumex salicifolius	100	3.4	2.6	0.2	5	x	–	–	–
	Artemisia ludoviciana	100	0.2	0.2	0.2	0.2	x	–	–	–
	Juncus mexicanus	50	2.9	2.5	5	5	–	–	–	x
	Poa secunda	50	2.9	2.5	5	5	–	–	–	x
	Castilleja minor ssp. minor	50	0.1	0.1	0.2	0.2	–	–	–	x
	Equisetum laevigatum	50	0.1	0.1	0.2	0.2	–	–	–	x
	Leymus salinus	50	0.1	0.1	0.2	0.2	–	–	–	x
	Oenothera elata	50	0.1	0.1	0.2	0.2	–	–	–	x
	Taraxacum officinale	50	0.1	0.1	0.2	0.2	–	–	–	x

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

Common Name: Pointleaf Manzanita – Pringle's Manzanita – Desert Ceanothus Shrubland Alliance
Group Assignment: G281; **Alliance Code:** A3790

Alliance Concept

The Pointleaf Manzanita – Pringle's Manzanita – Desert Ceanothus Shrubland Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is open. The alliance is found on entire slopes at east and south aspects, including the Panamint Mountains and Nelson Range at DEVA, and stands have typically had recent fire disturbance. Soils are derived from sandstone. Elevations range from approximately 2600 to 2850 meters. *Ceanothus greggii* var. *vestitus* (=*Ceanothus vestitus*) is the dominant or co-dominant in the two stands sampled in the region, and other shrubs regularly occur including *Artemisia tridentata,* and *Eriogonum umbellatum.* Other stands mapped near the border of Lake Mead NRA may include *Arctostaphylos pungens* as a co-dominant. Those shrubs that are 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. Pinus monophylla* is an associated emergent tree at sparse cover. 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.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ceanothus greggii* var. *vestitus* (=*Ceanothus vestitus*) dominant or *Arctostaphylos pungens* co-dominant. Other shrubs may occur at lower cover including *Artemisia tridentata* and *Eriogonum umbellatum*. The overall shrub cover ranges from 26.9 to 50.2 percent.

Alliance Distribution

The alliance was sampled twice at high elevation near Porter Peak, and another stand was observed along Saline Valley Road in the Nelson Range of DEVA.

States: CA

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

Park Sampling Zones: DEVA: Panamint Mtns (and Nelson Range from observation)

Association

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ceanothus greggii var. vestitus [CEPP005938]	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 2709.5 m, Range 2613 – 2806 m
- Aspect: E (1), S (1)
- Slope: Mean 26 degrees, Range 25 – 27 degrees
- Macro Topography: Entire slope (2)
- Tree Cover: Mean 1%, Range 1 – 1%
- Shrub Cover: Mean 38.6%, Range 26.9 – 50.2%
- Herb Cover: Mean 25.25%, Range 24.4 – 26.1%
- Large Rock: Mean %, Range – % (unknown)
- Small Rock: Mean %, Range – % (unknown)
- Fines Cover: Mean %, Range – % (unknown)
- Litter Cover: Mean %, Range – % (unknown)
- Geology: sandstone (2)
- Soil Texture: (unknown)

Environment: The alliance occurs at mid to high elevations on slopes with east and south aspects, including near Porter Peak in the Panamint Mountains and along Saline Valley Road in the Nelson Range of DEVA. Soils are derived from sandstone. The alliance occurs in areas disturbed by fire and colluvial disturbance.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 26.9 to 50.2 percent. The tree layer is typically sparse and the herb layer is sparse to open. Non-vascular plants, if present, are sparse.

Vegetation Floristics: The characteristic shrub is *Ceanothus greggii* var. *vestitus,* which is dominant or co-dominant in the shrub layer. Other shrubs can regularly occur including *Artemisia tridentata* and *Eriogonum umbellatum.* Those that are 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. Pinus monophylla* is an associated emergent tree at sparse cover. 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.*

Dynamics: Most stands of this alliance 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.

Classification Comments

Various taxonomists now consider *Ceanothus greggii* in the southwestern US as different species (see Burge and Zhukovsky 2013 and Jepson Flora Project 2017), including *Ceanothus perplexans* (=*Ceanothus greggii* var. *perplexans*), and *Ceanothus pauciflorus* (=*Ceanothus greggii* var. *vestitus* and *Ceanothus vestitus*). We have tentatively placed the various entities of this *Ceanothus* complex in the same alliance until more sampling and analysis is completed.

Additionally, the revised USNVC hierarchy has placed *Ceanothus greggii* in a mixed alliance with montane *Arctostaphylos* spp. Further review and analysis is needed to determine whether this *Ceanothus* complex of species should remain in this alliance or be split into its own as has been done by Sawyer et al. (2009). The stands sampled with *Ceanothus greggii* var. *vestitus* occurred in post-burn montane areas in DEVA, while stands mapped at LAKE may include *Arctostaphylos pungens* in non post-burn settings at the border with GRCA-PARA.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G4
State (California): S3

References

Jepson Flora Project 2017, Keeler-Wolf et al. 1998, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0)
DEVA (n=2): DEVAD127, DEVAD128
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	100	100	1	1	1	x	x	–	–
Shrub	*Ceanothus greggii var. vestitus*	100	78	33	15	50	x	x	–	–
	Artemisia tridentata	100	9.4	2.6	0.1	5	x	–	–	–
	Eriogonum umbellatum	100	0.3	0.1	0.1	0.1	x	–	–	–
	Chrysothamnus viscidiflorus	50	9.3	2.5	5	5	–	–	–	x
	Tetradymia canescens	50	1.9	0.5	1	1	–	–	–	x
	Chamaebatiaria millefolium	50	0.2	0.1	0.1	0.1	–	–	–	x
	Eriogonum microthecum	50	0.2	0.1	0.1	0.1	–	–	–	x
	Gutierrezia sarothrae	50	0.2	0.1	0.1	0.1	–	–	–	x
	Holodiscus discolor	50	0.2	0.1	0.1	0.1	–	–	–	x
	Monardella linoides	50	0.2	0.1	0.1	0.1	–	–	–	x
	Opuntia polyacantha var. erinacea	50	0.2	0.1	0.1	0.1	–	–	–	x
	Purshia stansburiana	50	0.2	0.1	0.1	0.1	–	–	–	x
	Salvia pachyphylla	50	0.2	0.1	0.1	0.1	–	–	–	x
Herb	*Eriogonum nidularium*	100	9.7	2.6	0.1	5	x	–	–	–
	Bromus tectorum	100	4.7	2.1	0.1	4	x	–	–	–
	Chaenactis douglasii	100	0.3	0.1	0.1	0.1	x	–	–	–
	Heliomeris multiflora	100	0.3	0.1	0.1	0.1	x	–	–	–
	Lupinus	50	45	20	40	40	–	–	–	x
	Penstemon rostriflorus	50	19	5	10	10	–	–	–	x
	Eriogonum panamintense	50	9.6	2.5	5	5	–	–	–	x
	Lupinus caudatus ssp. caudatus	50	9.6	2.5	5	5	–	–	–	x
	Achnatherum hymenoides	50	0.2	0.1	0.1	0.1	–	–	–	x
	Achnatherum parishii	50	0.2	0.1	0.1	0.1	–	–	–	x
	Argemone corymbosa	50	0.2	0.1	0.1	0.1	–	–	–	x
	Bromus rubens	50	0.2	0.1	0.1	0.1	–	–	–	x
	Castilleja linariifolia	50	0.2	0.1	0.1	0.1	–	–	–	x
	Eriogonum eremicola	50	0.2	0.1	0.1	0.1	–	–	–	x
	Eriophyllum	50	0.2	0.1	0.1	0.1	–	–	–	x
	Linanthus pungens	50	0.2	0.1	0.1	0.1	–	–	–	x
	Mimulus bigelovii	50	0.1	0.1	0.1	0.1	–	–	–	x

Common Name: Sonoran Scrub Oak Chaparral
Group Assignment: G281; **Alliance Code:** A0793

Alliance Concept

The Sonoran Scrub Oak Chaparral Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found primarily on channel beds and midslopes at all aspects, often in areas with exposed bedrock and boulders. Soils are derived from alkali-granite (alaskite) and granodiorite, and textures include medium to coarse sand. Elevations range from approximately 950 to 1850 meters. Dominant and characteristic shrubs include *Gutierrezia sarothrae* and *Quercus turbinella.* Those often present include *Eriogonum wrightii, Ericameria linearifolia, Lotus rigidus,* and *Eriogonum fasciculatum.* The tree layer is emergent and often includes *Juniperus californica, Pinus edulis,* or *Pinus monophylla.* The herbaceous layer includes *Achnatherum speciosum, Artemisia ludoviciana,* and *Sphaeralcea ambigua*.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Quercus turbinella* as the dominant. The overall shrub cover ranges from 3.6 to 59 percent.

Alliance Distribution

The alliance was sampled in the Newberry Mountains in LAKE and in the New York Mountains in MOJA at high elevations and at mid to high elevations. Stands also have been observed in the Mid Hills in MOJA, and stands were mapped as an alliance complex with *Arctostaphylos* in LAKE along the border with Grand Canyon – Parashant National Monument.

States: (AZ), CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (19): 322Al, 322Am, (322Av)

Park Sampling Zones: LAKE: Bridge Canyon, Juniper Mine, Katherine, (Parashant), Searchlight SE, Spirit Mountain**; MOJA:** New York Mtns (and Mid Hills from observations)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Quercus turbinella–Baccharis sergiloides [CEPP006751]	8	–	–	x	–
Quercus turbinella–Juniperus californica–Eriogonum spp. [CEPP006752]	11	x	–	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1332.9 m, Range 988 – 1834 m
- Aspect: N (7), NNW (1), NE (2), NW (3), V (1), WSW (1), S (4)
- Slope: Mean 17.1 degrees, Range 2 – 40 degrees
- Macro Topography: Channel bed (2), Midslope (3)
- Tree Cover: Mean 3.1%, Range 0 – 15%
- Shrub Cover: Mean 19.7%, Range 3.6 – 59%
- Herb Cover: Mean 5.5%, Range 0. 7 – 10.4%
- Large Rock: Mean 54.4%, Range 0 – 76%
- Small Rock: Mean 34.7%, Range 7 – 86%
- Fines Cover: Mean 3.6%, Range 1 – 10%
- Litter Cover: Mean 4.9%, Range 1.2 – 14%
- Geology: alkali-granite (alaskite) (11), granodiorite (8)
- Soil Texture: Coarse sand (1), Medium sand (5), Sand (2)

Environment: The alliance occurs at all aspects in rocky boulder outcrops and intermittently flooded canyons and drainages at mid to high elevations, often in areas with exposed bedrock. Soils are medium to coarse sand derived from alkali-granite (alaskite) and granodiorite.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 3.6 to 59 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Dominant and characteristic shrubs include *Gutierrezia sarothrae* and *Quercus turbinella.* Those often present include *Eriogonum wrightii, Ericameria linearifolia, Lotus rigidus,* and *Eriogonum fasciculatum.* The tree layer is emergent and typically or often includes *Juniperus californica.* The herbaceous layer often includes *Achnatherum speciosum, Artemisia ludoviciana,* and *Sphaeralcea ambigua*.

Dynamics: *Quercus turbinella* occurs in desert mountain areas with pronounced summer rainfall, including disjunct stands in the New York Mountains and Mid Hills at MOJA and Newberry Mountains at LAKE. Stands can recover after fire with vigorous resprouting, as are seen in stands along the Mid Hills after the Hackberry Complex Fire.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S1

References

Evens 2000, NatureServe 2012, Sawyer et al. 2009, Thomas et al. 2004

Surveys (with Sample Sizes) Used in Description

MOJN: N=19

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

DEVA (n=0)

MOJA (n=8): MOJA9685, MOJA9686, MOJAE140, MOJAE141, MOJAE143, MOJAE144, MOJAE145, MOJAE146

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Juniperus californica*	57.9	54	2.4	0.24	15	–	–	–	x
	Pinus monophylla	31.6	14	0.2	0.03	1	–	–	–	–
	Pinus edulis	26.3	14	0.2	0.2	1.1	–	–	–	–
Shrub	*Quercus turbinella*	100	38	7.9	0.59	40	x	–	x	–
	Gutierrezia sarothrae	84.2	2.1	0.4	0.11	2	x	–	–	–
	Eriogonum wrightii	73.7	2.6	0.3	0.05	1.82	–	–	–	x
	Ericameria linearifolia	68.4	2.4	0.4	0.2	2.17	–	–	–	x
	Lotus rigidus	68.4	0.8	0.1	0.06	0.53	–	–	–	x
	Eriogonum fasciculatum	57.9	9	1.3	0.2	4.84	–	–	–	x
	Baccharis sergiloides	47.4	9.8	1.9	0.2	10	–	–	–	–
	Rhus trilobata	47.4	4.3	0.8	0.2	3	–	–	–	–
	Yucca schidigera	36.8	2.5	0.3	0.2	2.51	–	–	–	–
	Ephedra nevadensis	36.8	1.2	0.2	0.05	1.25	–	–	–	–
	Viguiera parishii	36.8	1	0.1	0.2	0.99	–	–	–	–
	Prunus fasciculata	36.8	0.6	0.1	0.05	1.1	–	–	–	–
	Cylindropuntia acanthocarpa	36.8	0.5	0.1	0.03	1	–	–	–	–
	Yucca baccata	36.8	0.7	0.1	0.2	0.2	–	–	–	–
	Ericameria cuneata	36.8	0.3	0	0.04	0.2	–	–	–	–
	Keckiella antirrhinoides	31.6	4.8	0.9	0.45	12	–	–	–	–
	Fallugia paradoxa	31.6	2.7	0.6	0.2	4	–	–	–	–
	Ferocactus cylindraceus	31.6	1.4	0.2	0.2	1.32	–	–	–	–
	Opuntia basilaris	31.6	0.3	0	0.03	0.2	–	–	–	–
	Eriogonum heermannii	26.3	1.2	0.2	0.2	3.01	–	–	–	–
	Nolina bigelovii	26.3	1.6	0.2	0.2	2.07	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Achnatherum speciosum*	73.7	29	0.5	0.19	2.53	–	–	–	x
	Artemisia ludoviciana	57.9	5.8	0.2	0.03	1.1	–	–	–	x
	Sphaeralcea ambigua	52.6	5.8	0.1	0.07	0.2	–	–	–	x
	Bromus rubens	47.4	5.6	0.2	0.2	2	–	–	–	–
	Elymus elymoides	47.4	6.1	0.1	0.03	0.51	–	–	–	–
	Bouteloua curtipendula	36.8	3	0.1	0.08	0.2	–	–	–	–
	Aristida purpurea	36.8	1.9	0	0.01	0.2	–	–	–	–
	Bromus diandrus	31.6	2.7	0.1	0.2	0.2	–	–	–	–
	Pellaea mucronata	26.3	1.6	0.1	0.2	0.2	–	–	–	–
	Cirsium neomexicanum	26.3	1	0	0.01	0.2	–	–	–	–
	Arabis perennans	26.3	1.1	0	0.01	0.2	–	–	–	–
	Porophyllum gracile	26.3	1.3	0	0.01	0.2	–	–	–	–
Non-vascular	Standing snag	42.1	42	0.5	0.29	3.49	–	–	–	–
	Unknown Lichen	42.1	24	0.2	0.4	0.4	–	–	–	–
	Unknown Moss	36.8	10	0.1	0.2	1	–	–	–	–

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

M075. Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland Macrogroup

G521. Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh Group

Juncus balticus – Juncus mexicanus Herbaceous Alliance

Common Name: Baltic and Mexican Rush Marshes
Group Assignment: G517, G521; **Alliance Code:** A1374

Alliance Concept

The Baltic and Mexican Rush Marshes Alliance forms a continuous herbaceous layer. The shrub and tree layers, when present, are sparse. The alliance was sampled three times in the study area. It is typically found in low-lying and wet areas such as freshwater and alkali calcareous springs, alkaline marshes, stream beds, and grazed meadows. Elevation is 520 (0-2200 m) meters. In the stands mapped, *Juncus mexicanus* is dominant or co-dominant in the herbaceous layer. Other herbs include *Sporobolus airoides, Cynodon dactylon, Phragmites australis,* and *Solidago spectabilis.*

Diagnostic Criteria: This alliance is characterized by a continuous herbaceous layer with *Juncus arcticus spp. littoralis (=Juncus balticus)* or *Juncus mexicanus* dominant or co-dominant with other herbs, including *Sporobolus airoides, Phragmites australis,* and *Solidago spectabilis.* The average overall herbaceous cover is 83.7 percent.

Alliance Distribution

The alliance has localized occurrences at springs in DEVA, including at Cow Creek Urban, Lost Spring, Little Sand Spring and Surprise Spring (Dilts and Weisberg 2010). It occurs at low to upper elevations.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Ab, Southeastern Great Basin (1): 341Fd

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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Juncus mexicanus [CEGL003486]	3	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 520 m
- Aspect: (unknown)
- Slope: (unknown)
- Macro Topography: (unknown)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0%, Range 0 – 0%
- Herb Cover: Mean 83.7%, Range 76 – 90%
- Large Rock: (unknown)
- Small Rock: (unknown)
- Fines Cover: (unknown)
- Litter Cover: (unknown)
- Geology: sandstone (1)
- Soil Texture: (unknown)

Environment: The alliance has been sampled and mapped in DEVA at various springs. It is typically found in low-lying and wet areas such as freshwater and alkali calcareous springs, alkaline marshes, stream beds, and grazed meadows. It can occur at low to high elevations.

Vegetation Description

Vegetation Structure: The alliance forms a continuous herbaceous layer, and the average overall herbaceous is 83.7 percent cover. The tree layer, shrub layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: In the stands mapped, the dominant herb is *Juncus mexicanus* in the herbaceous layer, though *Juncus arcticus* spp. *littoralis* may also be present. Other herbs at lower cover include *Sporobolus airoides, Cynodon dactylon, Phragmites australis,* and *Solidago spectabilis.*

Dynamics: *Juncus mexicanus* is tolerant of alkalinity, occurring in a fine-scale mosaic with other herbs and shrubs, along alkali calcareous seeps, springs, and marshes in DEVA. *Juncus arcticus* spp. *littoralis* (=*Juncus balticus*) is also tolerant of alkalinity and may be found in similar areas.

Classification Comments

Associations with *Juncus arcticus* spp. *littoralis* (=*Juncus balticus*) and *Juncus mexicanus* dominant or co-dominant vary in elevation, soil mineral, and salinity/alkalinity characteristics, and they have been placed in different groups in the USNVC hierarchy, including Vancouverian Freshwater Wet Meadow & Marsh (G517) for lower elevations, Vancouverian-Rocky Mountain Montane Wet Meadow & Marsh (G521) for higher elevations, and North American Desert Alkaline-Saline Marsh & Playa (G538) for interior alkaline wetlands. For this Mojave Desert Network classification, we

place stands in G521, though further review of the USNVC groups is necessary to determine the best placement.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G5

State (California): S4

References

Buck-Diaz et al. 2012, Evens and San 2005, Evens et al. 2006, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=3

LAKE (n=0)

DEVA (n=3): DEVA8056, DEVA8097, DEVA8098

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Juncus mexicanus*	100	60	50	32	60	x	x	–	–
	Sporobolus airoides	66.7	24	19	25	32	–	–	–	x
	Cynodon dactylon	33.3	10	9	27	27	–	–	–	–
	Phragmites australis	33.3	3.5	2.7	8	8	–	–	–	–
	Solidago spectabilis	33.3	1.8	1.3	4	4	–	–	–	–

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

M075. Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland Macrogroup

G526. Rocky Mountain-Great Basin Lowland-Foothill Riparian Shrubland Group

Rhus trilobata – Crataegus rivularis – Forestiera pubescens Shrubland Alliance

Common Name: Skunkbush Sumac – River Hawthorn – Desert Olive Shrubland Alliance
Group Assignment: G526, G533; **Alliance Code:** A3799; A0947

Alliance Concept

The Skunkbush Sumac – River Hawthorn – Desert Olive Shrubland Alliance forms an intermittent to continuous shrub layer. The emergent tree layer, if present, is sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on high slopes north and east aspects. Soils are derived from a variety of substrates including alluvium, granodiorite, and sandstone and textures range from loamy sand to clay. Elevations range from approximately 1400 to 1500 meters. The dominant and characteristic shrub is *Forestiera pubescens.* Other shrubs characteristically present include *Gutierrezia sarothrae,* and those often present include *Ericameria linearifolia* and *Prunus fasciculata. Bromus rubens* is a dominant and characteristic herb and *Erodium cicutarium* is often present.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous shrub layer with *Forestiera pubescens* dominant. The overall shrub cover ranges from 37.9 to 90 percent.

Alliance Distribution

The alliance was sampled at DEVA in the Panamint Mountains and in MOJA at Cima Dome and the Midhills and observed in MOJA in the New York Mountains. It occurs at high elevations.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (2): 322Aj, 322Al; Southeastern Great Basin (1): 341Ff

Park Sampling Zones: DEVA: Panamint Mtns**; MOJA:** (Castle Mtns), Cima Dome SE, Kelso-Cima, (and New York Mtns)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Forestiera pubescens Wet [CEGL001168]	3	–	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1529.7 m, Range 1426 – 1585 m
- Aspect: N (1), E (2)
- Slope: Mean 9.3 degrees, Range 3 – 20 degrees
- Macro Topography: High slope (3)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 71.9%, Range 37.9 – 90%
- Herb Cover: Mean 2.7%, Range 1 – 5%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 23.7%, Range 8 – 48%
- Fines Cover: Mean 16.7%, Range 7 – 30%
- Litter Cover: Mean 59.3%, Range 21 – 85%
- Geology: alluvium (1), granodiorite (1), sandstone (1)
- Soil Texture: Clay loam (1), Loamy sand (1), Sandy loam (1)

Environment: The alliance occurs on north and east aspects at high elevations on highslopes generally at springs. Soils are derived from a variety of substrates including alluvium, granodiorite, and sandstone and textures range from loamy sand to clay.

Vegetation Description

Vegetation Structure: The Alliance forms an intermittent to continuous shrub layer and the overall shrub cover ranges from 37.9 to 90 percent. The tree layer, if present, is sparse, and the herb layer is sparse to open. Non-vascular plants, if present, are sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Forestiera pubescens.* Shrubs that are characteristic at low cover include *Gutierrezia sarothrae,* and those often present include *Ericameria linearifolia* and *Prunus fasciculata. Bromus rubens* is a dominant and characteristic herb and *Erodium cicutarium* is often present.

Dynamics: *Forestiera pubescens* forms thickets localized in spring-fed washes and canyons in higher elevation foothills and mountains of the Mojave Desert and Great Basin.

Classification Comments

Foresteria pubescens associations have been placed in the Rocky Mountain & Great Basin lowland & Foothill Riparian Shrubland Group (G526) and North American Warm Desert Riparian Low Bosque & Shrubland (G533) of the USNVC hierarchy. For this Mojave Desert Network classification, we place the association and alliance defined into the G526 group, and we recommend that related associations in both G533 and G526 be merged into one alliance.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3

State (California): S2

References

Buck-Diaz et al. 2012, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=3

LAKE (n=0)

DEVA (n=1): DEVA9267

MOJA (n=2): MOJA9161, MOJA9241

MOJN-Johnson (n=0)

[CAMO (n=1): CAMO9128]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Forestiera pubescens*	100	68	52	25	80	x	x	–	–
	Gutierrezia sarothrae	100	6.6	2.7	0.2	7	x	–	–	–
	Prunus fasciculata	66.7	5.2	2.3	2	5	–	–	–	x
	Ericameria linearifolia	66.7	0.3	0.1	0.2	0.2	–	–	–	x
	Salix exigua	33.3	11	12	35	35	–	–	–	–
	Baccharis sergiloides	33.3	3	3.3	10	10	–	–	–	–
	Rosa woodsii	33.3	3	3.3	10	10	–	–	–	–
	Purshia stansburiana	33.3	0.9	1	3	3	–	–	–	–
	Fallugia paradoxa	33.3	0.8	0.7	2	2	–	–	–	–
	Salazaria mexicana	33.3	0.8	0.7	2	2	–	–	–	–
	Ericameria nauseosa	33.3	0.3	0.3	1	1	–	–	–	–
	Hymenoclea salsola	33.3	0.4	0.2	0.5	0.5	–	–	–	–
	Atriplex canescens	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Ephedra viridis	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Eriogonum fasciculatum	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Eriogonum wrightii	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Rhus trilobata	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Yucca schidigera	33.3	0.1	0.1	0.2	0.2	–	–	–	–
Herb	*Bromus rubens*	100	74	2.3	1	4	x	x	–	–
	Erodium cicutarium	66.7	6.2	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Polypogon monspeliensis*	33.3	5.4	0.2	0.5	0.5	–	–	–	–
	Achnatherum speciosum	33.3	1.4	0.1	0.2	0.2	–	–	–	–
	Datura wrightii	33.3	2.2	0.1	0.2	0.2	–	–	–	–
	Descurainia pinnata	33.3	2.2	0.1	0.2	0.2	–	–	–	–
	Elymus elymoides	33.3	4.8	0.1	0.2	0.2	–	–	–	–
	Marrubium vulgare	33.3	2.2	0.1	0.2	0.2	–	–	–	–
	Stanleya pinnata	33.3	1.4	0.1	0.2	0.2	–	–	–	–

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

M075. Western North American Montane-Subalpine-Boreal Marsh, Wet Meadow & Shrubland Macrogroup

G527. Western Montane-Subalpine Riparian & Seep Shrubland Group

Cornus sericea – Dasiphora fruticosa ssp. *floribunda – Ribes* spp. *Wet Shrubland Alliance*

Common Name: Western Non-willow Wetland Shrubland
Group Assignment: G527, G272; **Alliance Code:** A3773

Alliance Concept

The Red-osier Dogwood – Shrubby-cinquefoil – Currant species Shrubland Alliance forms a continuous shrub layer. The emergent tree layer is typically sparse, if present, and the herbaceous layer is open. The alliance is scattered in high elevation riparian sites where snow lingers in DEVA; it was sampled once in a gully along a north-facing lowslope of a ridge, and it has been observed in a wet meadow with small streams near Hunter Mountain in the Panamint Range. Soils are derived from rhyolite and granitic alluvium and texture is sandy loam. Elevation is 1917 (to 2030) meters. The dominant and characteristic shrub is *Rosa woodsii.* Other shrubs at low cover include *Artemisia dracunculus, Artemisia tridentata* ssp. *vaseyana, Clematis ligusticifolia, Ericameria nauseosa, Prunus andersonii, Ribes velutinum,* and *Salix exigua. Pinus monophylla* can be an associated emergent tree at sparse cover. Dominant and characteristic herbs include *Urtica dioica, Bromus tectorum, Leymus cinereus, Scrophularia* spp., and *Carex* spp.

Diagnostic Criteria: This alliance is characterized by a continuous shrub layer with *Rosa woodsii* dominant. Other shrubs occurring at low cover include *Artemisia dracunculus, Artemisia tridentata* ssp. *vaseyana, Clematis ligusticifolia, Ericameria nauseosa, Prunus andersonii, Ribes velutinum,* and *Salix exigua*. The overall shrub cover is 94 percent.

Alliance Distribution

The alliance was sampled once in the study area. It occurs at high elevation in the Grapevine Mountains. The alliance was also observed in the Panamint Range near Hunter Mountain.

States: NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Fd (and 341Fc)

Park Sampling Zones: DEVA: Grapevine Mtns (and observed in CottonWood Mtns)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Rosa woodsii [CEGL001126]	1	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 1917 m
- Aspect: N (1)
- Slope: 20 degrees
- Macro Topography: Lowslope (1)
- Tree Cover: 1%
- Shrub Cover: 94.4%
- Herb Cover: 3%
- Large Rock: 1%
- Small Rock: 1%
- Fines Cover: 1.6%
- Litter Cover: 96.2%
- Geology: rhyolite (1)
- Soil Texture: Sandy loam (1)

Environment: The alliance occurs in high elevation riparian sites, and mesic sites where snow lingers in DEVA. It was sampled in a gully along a lowslope below a ridge in the Grapevine Mountains, and it was observed in a wet meadow interlaced with small streams near Hunter Mountain. Soil is sandy loam derived from rhyolite and granitic alluvium.

Vegetation Description

Vegetation Structure: The alliance forms a continuous shrub layer and the overall shrub cover is 94.4 percent. The tree layer is typically sparse, and the herb layer is sparse to open.

Vegetation Floristics: The dominant and characteristic shrub is *Rosa woodsii.* Other shrubs at low cover include *Artemisia dracunculus, Artemisia tridentata* ssp. *vaseyana, Clematis ligusticifolia, Ericameria nauseosa, Prunus andersonii, Ribes velutinum* and *Salix exigua. Pinus monophylla* is an associated emergent tree at sparse cover. Dominant and characteristic herbs include *Urtica dioica, Bromus tectorum, Leymus cinereus, Scrophularia* spp., and *Carex* spp.

Dynamics: *Rosa woodsii* is a common riparian shrub in montane areas of the Great Basin, and it is important in stabilizing streambanks.

Classification Comments

Associations of *Rosa woodsii* in the USNVC hierarchy are included in two groups: Central Rocky Mountain Montane-Foothill Deciduous Shrubland (G272) and Western Montane-Subalpine Riparian & Seep Shrubland (G527). For this Mojave Desert Network classification, we have treated the stand sampled in the G527 group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5

State (California): S3

References

Manning and Padgett 1995, NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=1

LAKE (n=0)

DEVA (n=1): DEVA9584

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	100	100	1	1	1	x	x	–	–
Shrub	*Rosa woodsii*	100	90	85	85	85	x	x	–	–
	Clematis ligusticifolia	100	3.2	3	3	3	x	–	–	–
	Ribes velutinum	100	3.2	3	3	3	x	–	–	–
	Artemisia tridentata ssp. vaseyana	100	2.1	2	2	2	x	–	–	–
	Ericameria nauseosa	100	1.1	1	1	1	x	–	–	–
	Artemisia dracunculus	100	0.2	0.2	0.2	0.2	x	–	–	–
	Prunus andersonii	100	0.2	0.2	0.2	0.2	x	–	–	–
Herb	*Urtica dioica*	100	77	2	2	2	x	x	–	–
	Bromus tectorum	100	7.7	0.2	0.2	0.2	x	–	–	–
	Leymus cinereus	100	7.7	0.2	0.2	0.2	x	–	–	–
	Scrophularia	100	7.7	0.2	0.2	0.2	x	–	–	–

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

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

Phragmites australis – Arundo donax – Alopecurus pratensis Ruderal Marsh Alliance

Common Name: Western Common Reed - Giant Reedgrass - Meadow Foxtail Ruderal Marsh
Group Assignment: G524, G531; **Alliance Code:** A3847

Alliance Concept

The Western Common Reed - Giant Reedgrass - Meadow Foxtail Ruderal Marsh Alliance forms an open to continuous herbaceous layer. The shrub and tree layers are open. The alliance is typically found in washes and wetlands at low elevations. It is found primarily on low levels and bottoms at northeast to south aspects. Soils are derived from a variety of substrates including alluvium, sandstone and schist and textures are variable. Elevations range from approximately 190 to 500 meters. The dominant herb is *Phragmites australis,* and *Distichlis spicata* is often present. Commonly associated emergent shrubs at sparse cover include *Suaeda moquinii.*

Diagnostic Criteria: This alliance is characterized by an open to continuous herbaceous layer dominated by *Phragmites australis*. The overall herbaceous cover ranges from 23 to 90 percent cover.

Alliance Distribution

The alliance is likely to occur at all three Parks at low elevations. In LAKE a stand was sampled in a concrete channel along Las Vegas Wash at the west end of the lake near Northshore Rd., which may contain the ruderal (non-native) subspecies. The other stand sampled at LAKE near Salt Spring, stands in DEVA at Salt Lake and Saratoga Spring, and in MOJA at the edge of Soda Lake have been sampled and are likely to be the native ssp. *americanus*. Other small native stands occur across the three parks and in the Argus and Coso Ranges in California.

States: AZ, CA, NV

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

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Phragmites australis Western North American Ruderal [CEGL001475]	1?	x	–	–	–
Phragmites australis ssp. americanus Native Western Marsh [CEPP6866]	6	x	x	x	–

Association Notes: Stands of *Phragmites australis* include a native (ssp. *americanus*) and non-native (ssp. *australis*) subspecies. These two subspecies do hybridize, and the non-native subspecies and hybrids may outcompete other native plants. The USNVC working towards splitting these into two different associations and into two different alliances, though it is uncertain whether any stands sampled are of the non-native congenitor. Both hybrid and native populations do occur along Las Vegas Wash (Lambert et al. 2016), so stands at LAKE should be monitored.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 351.8 m, Range 191 – 499 m
- Aspect: NE (1), E (3), S (2)
- Slope: Mean 1.3 degrees, Range 1 – 2 degrees
- Macro Topography: Low level/bottom (3)
- Tree Cover: Mean 0.4%, Range 0 – 2%
- Shrub Cover: Mean 1.7%, Range 0 – 6.4%
- Herb Cover: Mean 70.2%, Range 23 – 90%
- Large Rock: Mean 0%, Range 0 – 0.2%
- Small Rock: Mean 0.2%, Range 0 – 1%
- Fines Cover: Mean 67.3%, Range 4 – 87.5%
- Litter Cover: Mean 14%, Range 0 – 40%
- Geology: alluvium (4), sandstone (1), schist (1)
- Soil Texture: Clay (1), Medium silt (2), Sandy loam (2)

Environment: The alliance is typically found at low elevations in washes and wetlands, which have high water tables. It is often found in semi-permanently flooded and slightly brackish marsh areas and spring sites. It is primarily found on low levels and bottoms with a northeast to south aspect. The soil is derived from alluvium, sandstone and schist with variable textures.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous herbaceous layer, and the overall herbaceous cover ranges from 23 to 90 percent cover. The tree and shrub layers are typically sparse to open. Non-vascular plants, when present, are sparse.

Vegetation Floristics: The dominant herb is *Phragmites australis.* Those often present include *Distichlis spicata.* The shrub layer is emergent and typically or often includes *Suaeda moquinii*.

Dynamics: *Phragmites australis* is dominant in the herbaceous layer in wetland areas across the West, with various strains including native, introduced and hybrid lineages (Lambert et al. 2016). The USFWS Wetland Inventory Recognizes *Phragmites australis* as a FACW plant. The alliance is wide spread and acts diferently in various regions, including the introduced populations being invasive in or near major urban centers and associated with anthropogenic disturbance in wetlands and rivers. In the NPS study area, most stands are native and limited to naturally occuring, unmanaged freshwater and alkaline wetland sites; however both hybrid and native stands occur along Las Vegas Wash (Lambert et al. 2016).

Classification Comments

Some *Phragmites australis* associations are currently listed in the Western North American Ruderal Marsh, Wet Meadow & Shrubland Group (G524) in the USNVC hierarchy.

However, the USNVC is working towards splitting the non-native and native stands into different alliances, with the native subspecies (ssp. *americanus*) being recommended to move to the alliance (A3896) including *Typha domingensis* and *Typha latifolia* in Arid West Interior Freshwater Marsh Group (G531). Non-native stands would remain in this ruderal alliance and in a ruderal assocation. While we do not have complete data on the subspecies of *Phragmites* to determine full placement in the native versus non-native association, this description currently defines all stands sampled for *Phragmites* and they are all likely the native ssp. *americanus*.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4?

References

Hickson and Keeler-Wolf 2007, Keeler-Wolf and Vaghti 2000, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=6
LAKE (n=2): LAKE9537, LAKE9638
DEVA (n=3): DEVA9620, MOJC0045, MOJC0052
MOJA (n=1): MOJC0056
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Suaeda moquinii*	50	26	0.2	0.2	0.5	–	–	–	x
Herb	*Phragmites australis*	100	81	62	15	90	x	x	–	–
	Distichlis spicata	50	12	5.7	2	20	–	–	–	x
	Juncus cooperi	33	3.4	2.5	5	10	–	–	–	–
	Typha	33	1.4	1.2	2	5	–	–	–	–
	Sporobolus airoides	33	1.3	0.8	1.5	3	–	–	–	–
	Nitrophila occidentalis	33	0.2	0.1	0.2	0.5	–	–	–	–
	Schismus	33	0.1	0.1	0.2	0.2	–	–	–	–

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

M888. Arid West Interior Freshwater Marsh Macrogroup

G531. Arid West Interior Freshwater Marsh Group

Schoenoplectus americanus – Schoenoplectus acutus – Schoenoplectus californicus Marsh Alliance

Common Name: Chairmaker's Bulrush – Hardstem Bulrush – California Bulrush Marsh
Group Assignment: G531; **Alliance Code:** A3895

Alliance Concept

The Chairmaker's Bulrush – Hardstem Bulrush – California Bulrush Marsh Alliance forms a continuous herbaceous layer. The tree and shrub layers, when present, are sparse. Most stands are associated with wetlands along alkali playas and seeps. Elevations range from approximately 60 to 1000 meters. The dominant herb is *Schoenoplectus americanus.*

Diagnostic Criteria: This alliance is characterized by a continuous herbaceous layer dominated by *Schoenoplectus americanus*. The overall herbaceous cover ranges from 50 to 100 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at DEVA. It is scattered throughout DEVA at low to mid elevations at springs. It also is observed in marshes along Soda Springs and Soda Lake.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (9): 322Ab; Southeastern Great Basin (4): 341Fc, 341Fd

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Grapevine Mtns, Nelson Range, Panamint Mtns, Saline Valley; [**MOJA**: Soda Lake]

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Schoenoplectus americanus Western Herbaceous Vegetation [CEGL001841]	13	x	[x]	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 256.2 m, Range 60 – 990 m

- Aspect: (unknown); Slope: (unknown); Macro Topography: (unknown)
- Tree Cover: Mean 0%, Range 0 – 0% (unknown)
- Shrub Cover: Mean 0%, Range 0 – 0% (unknown)
- Herb Cover: Mean 89.3%, Range 70 – 100%
- Large Rock: Mean %, Range – % (unknown)
- Small Rock: Mean %, Range – %(unknown)
- Fines Cover: Mean 0%, Range 0 – 0% (unknown)
- Litter Cover: Mean 0%, Range 0 – 0%(unknown)
- Geology: (unknown)
- Soil Texture: (unknown)

Environment: The alliance occurs at low to mid elevations in marshes, springs and rivers in sites with permanent water that may be fresh to brackish.

Vegetation Description

Vegetation Structure: The alliance forms a continuous herbaceous layer and the overall herbaceous cover ranges from 50 to 100 percent cover. The tree and shrub layers and non-vascular plants, when present, are sparse.

Vegetation Floristics: The dominant herb is *Schoenoplectus americanus.*

Dynamics: *Schoenoplectus americanus* stands occur in a mosaic with various alliances that segregate based on moisture and alkalinity tolerances. Stands of *S. americanus* occur in the wettest settings, and it tolerates alkalinity.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S3

References

Bradley 1970, Buck-Diaz et al. 2012, Keeler-Wolf and Vaghti 2000, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=13
LAKE (n=0); DEVA (n=13): DEVA8030, DEVA8031, DEVA8032, DEVA8033, DEVA8034, DEVA8035, DEVA8036, DEVA8037, DEVA8038, DEVA8039, DEVA8040, DEVA8041, DEVA8042;
MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Schoenoplectus americanus*	100	81	74	35	100	x	x	–	–

Common Name: Western Emergent Cattail Marsh
Group Assignment: G531; **Alliance Code:** A3896

Alliance Concept

The Western Emergent Cattail Marsh Alliance forms a continuous herbaceous layer. The emergent shrub and tree layers, when present, are sparse to open. The alliance occurs in semi-permanently flooded marshes, drainage channels, and spring sites. It was sampled on low levels and bottoms to high slopes at east and southeast aspects. Soils are derived from alluvium, and textures include clay and muck. Elevations range from approximately -80 to 1500 meters. A *Typha* species is dominant or co-dominant in the herbaceous layer, and herbs often present include *Sporobolus aroides.* Those herbs sometimes present are *Anemopsis californica, Artemisia ludoviciana, Distichlis spicata, Juncus cooperi,* and *Polypogon monspeliensis.* Emergent trees at sparse cover sometimes include *Yucca brevifolia*, and emergent shrubs at sparse to open cover sometimes include *Baccharis sergiloides, Gutierrezia sarothrae,* and *Tamarix ramosissima.*

Diagnostic Criteria: This alliance is characterized by a continuous herbaceous layer with *Typha* spp. dominant or co-dominant. The overall herbaceous cover ranges from 71 to 98 percent cover.

Alliance Distribution

The alliance was sampled east of the Panamint Range at the end of Borax Well Road in DEVA, and in a small valley in the New York Mountains in MOJA. It also was mapped and described at the Travertine Springs complex and at various other springs including at Cow Creek Urban, Nevares, and Unnamed Well A springs in DEVA (Dilts and Weisberg 2010, Sada and Cooper 2012, Thomas 2006), and it has been observed in the Granite Mountains in MOJA. Small stands have also been observed during map accuracy assessment training at LAKE in riparian washes, including at Roger's Wash. It is found at low to upper elevations.

States: CA, (NV)

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

Park Sampling Zones: DEVA: Saline Valley, Death Valley**; MOJA:** New York Mtns (Granite Mtns); **LAKE**: (Echo Bay)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Typha domingensis [CEGL001845]	3	–	x	–	–
Typha (latifolia, angustifolia) [CEGL002010]	1	–	–	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 702 m, Range -80 – 1484 m
- Aspect: E (1), SE (1)
- Slope: Mean 1 degrees, Range 1 – 1 degrees
- Macro Topography: High slope (1), Low level/bottom (1)
- Tree Cover: Mean 0.1%, Range 0 – 0.5%
- Shrub Cover: Mean 0.7%, Range 0 – 2.6%
- Herb Cover: Mean 85.5%, Range 71 – 98%
- Large Rock: Mean 0.5%, Range 0 – 1%
- Small Rock: Mean 5.1%, Range 0.2 – 10%
- Fines Cover: Mean 33.6%, Range 0.2 – 67%
- Litter Cover: Mean 60.7%, Range 22 – 99.4%
- Geology: alluvium (2)
- Soil Texture: Clay (1), Muck (1)

Environment: The alliance occurs in seasonally wet and saturated areas, including at alkaline springs and drainage channels in DEVA, LAKE and MOJA. Water can be ponded or slow-moving along channels dominated by *Typha* spp. The alliance is found at low to upper elevations on low to highslopes with east to southeast aspects. Soils are clay and derived from alluvium.

Vegetation Description

Vegetation Structure: The alliance forms a continuous herbaceous layer and the overall herbaceous cover ranges from 71 to 90 percent cover. The shrub and tree layers, when present, are typically sparse to open. Non-vascular plants, when present, are sparse.

Vegetation Floristics: A *Typha* species is dominant or co-dominant in the herbaceous layer, and those herbs often present include *Sporobolus airoides.* Herbs sometimes present are *Anemopsis californica, Artemisia ludoviciana, Distichlis spicata, Juncus cooperi,* and *Polypogon monspeliensis.* The tree layer is emergent and sometimes includes *Yucca brevifolia*. The shrub layer is emergent and sometimes includes *Baccharis sergiloides, Gutierrezia sarothrae,* and *Tamarix ramosissima*.

Dynamics: *Typha domingensis* can tolerate deeper and more saline soils than *T. latifolia.* Stands with *Typha domingensis* occur in DEVA and LAKE, and stands with both *T. domingensis* and *T. latifolia* occur in MOJA.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S5

References

Buck-Diaz et al. 2012, Dilts and Weisberg 2010, Junak et al. 2007, Sada and Cooper 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=4
LAKE (n=0)
DEVA (n=3): DEVA0399, DEVA8095, DEVA8096
MOJA (n=1): MOJA9235
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	25	25	0.1	0.5	0.5	–	–	–	–
Shrub	*Tamarix ramosissima*	25	38	0.4	2	2	–	–	–	–
	Baccharis sergiloides	25	5.7	0.04	0.2	0.2	–	–	–	–
	Gutierrezia sarothrae	25	5.7	0.04	0.2	0.2	–	–	–	–
Herb	*Typha*	100	96.5	81.2	65	97	x	x	–	–
	Sporobolus airoides	50	1.8	1.5	0.2	6	–	–	–	x
	Distichlis spicata	25	1.0	0.8	3	3	–	–	–	–
	Anemopsis californica	25	0.6	0.5	2	2	–	–	–	–
	Artemisia ludoviciana	25	0.01	0.04	0.2	0.2	–	–	–	–
	Juncus cooperi	25	0.01	0.04	0.2	0.2	–	–	–	–
	Polypogon monspeliensis	25	0.01	0.04	0.2	0.2	–	–	–	x

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

Common Name: Baccharis Dry Wash Shrubland Alliance
Group Assignment: G533; **Alliance Code:** A3874

Alliance Concept

The Baccharis Dry Wash Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found primarily on seasonally flooded channel beds but can also be found on spring-fed midslopes to summits at all aspects. Soils are derived from varied mixtures of rock and alluvium, and textures are variable ranging from sand to clay. Elevations range from approximately 550 to 1550 meters. *Baccharis sergiloides* or *Baccharis emoryi* is dominant or co-dominant in the shrub layer, and those that are often present include *Acacia greggii (=Senegalia greggii), Eriogonum fasciculatum,* and *Lotus rigidus.* Herbs that are often present are *Bromus rubens* and *Erodium cicutarium.* Commonly associated non-vascular plants include mosses.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Baccharis sergiloides* or *Baccharis emoryi* dominant or co-dominant. The overall shrub cover ranges from 9 to 91 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout MOJA in the Granite, Providence, and New York Mountains and in DEVA in the Funeral and Grapevine mountains at mid to high elevations. It also occurs in the Black Mountains and Newberry Mountains of LAKE.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (34): 322Ab, 322Ad, 322Af, 322Ai, 322Al, 322Am, 322Av; Southeastern Great Basin (1): 341Fd

Park Sampling Zones: DEVA: Death Valley, Funeral Mtns, Grapevine Mtns, Owlshead Mtns**; LAKE:** Katherine, Temple Bar**; MOJA:** Granite Mtns, New York Mtns, Providence Mtns, Van Winkle Mtn, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Baccharis sergiloides [CEGL002953]	16	x	x	x	–
Baccharis emoryi – Baccharis sergiloides (alliance)	2	x	–	–	–
Baccharis sergiloides / (Muhlenbergia rigens – Typha domingensis) [CEPP005846]	10	–	–	x	–
Baccharis sergiloides – Prunus fasciculata – Rhus trilobata [CEPP005842]	7	–	–	x	–

Association Notes: Two samples from LAKE were classified to the alliance level only, in which *Sporobolus airoides* occurred dominant in the understory with *Baccharis sergiloides.* A third sample from MOJA is related to stands of this alliance, which had high cover of *Celtis laevigata* var. *reticulata*, which may warrant its own association as described in the *Celtis laevigata* var. *reticulata – Rhus trilobata* Alliance. Other stands of *Baccharis emoryi* appear to exist in Death Valley, including the Panamint Range, though more sampling is needed to determine association-level variation.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1118.2 m, Range 578 – 1508 m
- Aspect: N (2), NE (2), E (4), NW (6), SE (4), SW (7), S (5)
- Slope: Mean 6.5 degrees, Range 1 – 20 degrees
- Macro Topography: Channel bed (11), High level/summit (1), High slope (3), Midslope (5)
- Tree Cover: Mean 0.7%, Range 0 – 5%
- Shrub Cover: Mean 44.0%, Range 9.2 – 91.2%
- Herb Cover: Mean 17.4%, Range 1 – 80%
- Large Rock: Mean 26%, Range 0.2 – 80%
- Small Rock: Mean 33.4%, Range 3 – 76%
- Fines Cover: Mean 18.4%, Range 1 – 62%
- Litter Cover: Mean 19%, Range 1 – 81%
- Geology: alkali-granite (alaskite) (8), alluvium (1), conglomerate (1), gneiss (2), granodiorite (16), plutonic rock (phaneritic) (1), rhyolite (2), sandstone (4), schist (1)
- Soil Texture: Clay (1), Clay loam (4), Coarse sand (3), Loamy sand (4), Medium sand (6), Medium to very fine sandy loam (1), Sand (8), Sandy loam (1), Silty clay (1)

Environment: The alliance occurs in springs, streams, washes, and drainages at mid to high elevations. The alliance is found primarily on channel beds but can also be found on spring-fed midslopes to summits at all aspects. Soils are derived from a variety of and textures are variable ranging from sand to clay.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 9.2 to 91.2 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Baccharis sergiloides* or *Baccharis emoryi* is the dominant and characteristic shrub, and those that are often present include *Acacia greggii (=Senegalia greggii), Eriogonum fasciculatum,* and *Lotus rigidus.* Herbs that are often present are *Bromus rubens* and *Erodium cicutarium.* Commonly associated non-vascular plants include unknown moss.

Dynamics: *Baccharis sergiloides* occurs commonly in the Mojave Desert and adjacent semi-desert ecoregions of California along streams, seeps, and springs where water is seasonally present and available year-round with ground water close to the ground. *B. emoryi* occurs less commonly in the region, though is found with similar habitat dynamics.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S3

References

Evens 2000, Evens et al. 2012, Keeler-Wolf 2007, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=35
LAKE (n=9): LAKE0619, LAKE9525, LAKE9708, LMFMH065, LMJOS026, LMJOS027, LMJOS030, LMJOS031, LMJOS032
DEVA (n=5): DEVA9189, DEVA9614, DEVA9630, DEVA9920, DEVA9925
MOJA (n=21): MOJA0428, MOJA0919, MOJA0925, MOJA9132, MOJA9413, MOJA9418, MOJA9452, MOJA9583, MOJA9590, MOJA9908, MOJA9917, MOJAE003, MOJAE008, MOJAE196, MOJAE198, MOJAE201, MOJAE203, MOJAE204, MOJAE237, MOJAE238, MOJAE239
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
	Baccharis sergiloides	100	69	30	5.6	75	x	x	–	–
	Acacia greggii	74.3	5	1.9	0.2	13	–	–	–	x
	Eriogonum fasciculatum	54.3	1.6	0.8	0.2	12	–	–	–	x
	Lotus rigidus	54.3	1	0.5	0.2	4	–	–	–	x
	Artemisia ludoviciana	49	1	0.3	0.2	2	–	–	–	–
	Prunus fasciculata	46	4	1.2	0.2	8	–	–	–	–
	Rhus trilobata	40	2.7	0.9	0.2	5	–	–	–	–
	Tamarix ramosissima	37	0.4	0.1	0.1	1	–	–	–	–
	Gutierrezia microcephala	34	1.5	0.3	0.2	2	–	–	–	–
	Phoradendron californicum	31	0.6	0.1	0.2	2	–	–	–	–
	Larrea tridentata	29	0.5	0.3	0.01	8	–	–	–	–
	Ericameria linearifolia	29	0.4	0.1	0.2	1.1	–	–	–	–
	Hymenoclea salsola	26	0.8	0.4	0.2	5	–	–	–	–
	Viguiera parishii	26	0.5	0.2	0.2	4	–	–	–	–
	Cylindropuntia acanthocarpa	26	0.3	0.1	0.2	1.1	–	–	–	–
	Ephedra viridis	26	0.3	0.1	0.2	1	–	–	–	–
Shrub	*Brickellia californica*	26	0.2	0.1	0.2	0.2	–	–	–	–
	Bromus rubens	74.3	25	3.4	0.2	15	–	–	–	x
	Erodium cicutarium	51.4	1.6	0.2	0.2	2	–	–	–	x
	Sphaeralcea ambigua	48.6	1.1	0.1	0.2	0.2	–	–	–	–
	Artemisia ludoviciana	48.6	1.1	0.3	0.2	2.1	–	–	–	–
	Achnatherum speciosum	37.1	1.4	0.2	0.2	4	–	–	–	–
	Amsinckia	37.1	1.2	0.1	0.2	2	–	–	–	–
	Schismus	37.1	3.5	0.6	0.2	7	–	–	–	–
	Typha	31	6.1	0.9	0.2	7.1	–	–	–	–
	Oenothera caespitosa	28.6	0.5	0.1	0.2	2	–	–	–	–
	Polypogon monspeliensis	28.6	0.6	0.1	0.2	1	–	–	–	–
	Aristida purpurea	28.6	0.5	0.1	0.2	0.2	–	–	–	–
	Bromus tectorum	25.7	5.3	1.0	0.2	9	–	–	–	–
	Muhlenbergia rigens	25.7	4.5	1.1	0.2	22	–	–	–	–
	Mimulus guttatus	25.7	1.5	0.3	0.2	6	–	–	–	–
	Juncus macrophyllus	25.7	1	0.2	0.2	3.1	–	–	–	–
Herb	*Mirabilis laevis*	25.7	0.8	0.1	0.2	2	–	–	–	–
Non-vascular	Unknown Moss	54.3	24	0.2	0.2	2	–	–	–	x
	Unknown Algae	28.6	24	1.8	0.4	20	–	–	–	–

Common Name: Netleaf Hackberry - Skunkbush Sumac Riparian Shrubland Alliance
Group Assignment: G533; **Alliance Code:** A1033

Alliance Concept

The Netleaf Hackberry - Skunkbush Sumac Riparian Shrubland Alliance forms a continuous shrub layer. The emergent tree layer is sparse if present, and the herbaceous layer is open. The alliance is found on seasonally flooded drainage channels and spring-fed midslope seeps. Soil is derived from sandstone and alluvium, and soil texture is clay loam. The elevation is approximately 1,070 meters in the one stand sampled. *Celtis laevigata* var. *reticulata* (=*Celtis reticulata*) is dominant in the shrub layer, and those that are often present include *Baccharis sergiloides, Acacia greggii (=Senegalia greggii), Frangula californica* ssp. *ursina, Phoradendron californicum,* and *Rhus trilobata*. Herbs present are *Bromus tectorum, Bromus rubens, Adiantum capillus-veneris, Amsinckia, Erodium cicutarium, Lythrum californicum, Sphaeralcea ambigua,* and *Typha.* The tree layer is emergent and may include *Pinus monophylla*. Non-vascular plantss include algae and moss.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous shrub layer with *Celtis laevigata* var. *reticulata* dominant. The overall shrub cover in the stand sampled is 75 percent.

Alliance Distribution

The alliance is rare, sampled once within MOJA at the headwaters of Cornfield Spring in the Providence Mountains at mid elevation. It also occur sporadically in other mountains of MOJA, such as in the New York Mountains and Clark Mountains.

States: (AZ,) CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): (322Ai), 322Al

Park Sampling Zones: MOJA: (Clark Mtns, New York Mtns), Providence Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Celtis laevigata - Rhus trilobata (alliance)	1	–	–	x	–

Association Notes: In the one stand sampled, it is related to the Baccharis emoryi - Baccharis sergiloides Wet Shrubland Alliance.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 1,067 m
- Aspect: NW (1)

- Slope: 11 degrees
- Macro Topography: Channel bed (1)
- Tree Cover: 0%
- Shrub Cover: 75.4%
- Herb Cover: 19%
- Large Rock: 3%
- Small Rock: 3%
- Fines Cover: 3%
- Litter Cover: 81%
- Geology: sandstone / alluvium (1)
- Soil Texture: Clay loam (1)

Environment: The alliance occurs rarely along mountain springs and seasonally flooded drainage channels in MOJA. The alliance is found at mid to upper elevations. Soils include clay loam and derived from sandstone and alluvium.

Vegetation Description

Vegetation Structure: The alliance forms a continuous shrub layer and the shrub cover is 75 percent in the one stand sampled. The tree layer, when present, is typically sparse to open. The herbaceous layer is open to intermittent. Non-vascular plants, when present, are sparse.

Vegetation Floristics: *Celtis laevigata* var. *reticulata* is dominant in the shrub layer. Other shrubs present include *Baccharis sergiloides, Acacia greggii (=Senegalia greggii), Frangula californica* ssp*. ursina, Phoradendron californicum,* and *Rhus trilobata*. Herbs present are *Bromus tectorum, Bromus rubens, Adiantum capillus-veneris, Amsinckia, Erodium cicutarium, Lythrum californicum, Sphaeralcea ambigua,* and *Typha.* The tree layer is emergent and may include *Pinus monophylla*. Non-vasculars include algae and moss.

Dynamics: This shrub version of *Celtis laevigata* (var. *reticulata = Celtis reticulata*) occurs sporadically across the western United States. It occurs in riparian channels with other riparian species.

Classification Comments

None.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G3
State (California): S1

References

NatureServe 2016

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=0)
DEVA (n=0)
MOJA (n=1): MOJA9421
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Celtis laevigata var. reticulata*	100	60	60	60	60	–	x	–	–
	Baccharis sergiloides	100	20	20	20	20	–	–	–	–
	Frangula californica ssp. ursina	100	7	7	7	7	–	–	–	–
	Acacia greggii	100	4	4	4	4	–	–	–	–
	Rhus trilobata	100	2	2	2	2	–	–	–	–
	Larrea tridentata	100	1	1	1	1	–	–	–	–
	Opuntia engelmannii	100	1	1	1	1	–	–	–	–
	Phoradendron californicum	100	0.2	0.2	0.2	0.2	–	–	–	–
Herb	*Bromus tectorum*	100	53	10	10	10	–	x	–	–
	Bromus rubens	100	26	5	5	5	–	–	–	–
	Adiantum capillus-veneris	100	16	3	3	3	–	–	–	–
	Amsinckia	100	1	0.2	0.2	0.2	–	–	–	–
	Erodium cicutarium	100	1	0.2	0.2	0.2	–	–	–	–
	Lythrum californicum	100	1	0.2	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	100	1	0.2	0.2	0.2	–	–	–	–
	Typha	100	1	0.2	0.2	0.2	–	–	–	–
Non-vascular	Unknown Algae	100	67	0.4	0.4	0.4	–	–	–	–
	Unknown Moss	100	33	0.2	0.2	0.2	–	–	–	–

Common Name: Mesquite Riparian Forest, Woodland & Shrubland Alliance
Group Assignment: G533, G299; **Alliance Code:** A3877, A3153

Alliance Concept

The Mesquite Riparian Forest, Woodland & Shrubland Woodland Alliance forms a sparse to continuous tree canopy with a shrub understory, when present, that is sparse to continuous. It is found primarily on lowslopes and channel bottoms at a variety of aspects. Soils are derived from a variety of substrates but primarily on alluvium, and have a range of textures from sand to clay. Elevations range from approximately -88 to 1383 meters. The dominant tree is *Prosopis glandulosa* and/or *Prosopis pubescens*. *Pluchea sericea* is a commonly associated shrub.

Diagnostic Criteria: This alliance is characterized by an open to continuous tree canopy of *Prosopis* spp., which ranges from 0.5 to 81 percent cover. The overall tree cover ranges from 0.5 to 80.5 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks (LAKE, DEVA and MOJA), where stands are scattered throughout in low to mid elevations.

States: AZ, CA, NV

Ecoregion Sections and Subsection Codes: Mojave Desert (77): 322Ab, 322Ad, 322Ae, 322Af, 322Ai, 322Aj, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (7): 341Fc

Park Sampling Zones: DEVA: Ballarat, Black Mtns, Death Valley, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Jail Canyon, Panamint Mtns, Saline Valley**; LAKE:** Boulder City, Cottonwood Cove, Echo Bay, Gold Butte, Katherine, Overton, Parashant, Pearce Ferry, Temple Bar**; MOJA:** Granite Mtns, Marl Mtns, New York Mtns, Piute Range, Soda Lake South

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Prosopis glandulosa–Prosopis velutina–Prosopis pubescens (alliance)	6	–	x	x	–
Prosopis glandulosa / (Atriplex spp.–Suaeda moquinii) [CEGL006861]	16	x	x	x	–
Prosopis glandulosa / Pluchea sericea [CEPP006737]	16	–	x	–	–
Prosopis glandulosa / Sporobolus airoides [CEGL001385]	4	x	–	–	–
Prosopis glandulosa var. torreyana [CEGL001381]	15	x	x	x	–
Prosopis glandulosa–(Salix exigua–Salix lasiolepis) [CEPP006860]	3	x	–	x	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Prosopis glandulosa–Tamarix ramosissima [CEPP006736]	5	x	–	–	–
Prosopis pubescens / Baccharis sergiloides [CEPP006738]	4	x	x	–	–
Prosopis pubescens / Pluchea sericea [CEPP006739]	17	x	x	–	–

Association notes: One sample was classified to alliance level only in which *Prosopis glandulosa* was co-dominant with *Acacia gregii,* and *Bromus rubens* was the dominant herb. Four additional samples were classified to the alliance level from the Root (1978) data set with *Prosopis* having variable cover.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 440.3m, Range -88 – 1383 m
- Aspect: N (4), NE (6), E (8), NW (8), SE (7), Flat, Variable (6), SW (3), W (1), SW (4), S (2)
- Slope: Mean 5.7 degrees, Range 0 – 25 degrees
- Macro Topography: Basin floor/wetland (1), Channel bed (11), Entire slope (1), High slope (1), Low level/bottom (11), Lowslope (10), Midslope (7)
- Tree Cover: Mean 24.5%, Range 0.5 – 80.5%
- Shrub Cover: Mean 26.8%, Range 0 – 94%
- Herb Cover: Mean 17.4%, Range 0 – 84%
- Large Rock: Mean 8.1%, Range 0 – 91%
- Small Rock: Mean 17.9%, Range 0 – 84%
- Fines Cover: Mean 33.6%, Range 0 – 94%
- Litter Cover: Mean 20.6%, Range 0 – 96%
- Geology: alkali-granite (alaskite) (7), alluvium (38), basalt (1), conglomerate (2), dune sand (5), gneiss (1), granite (2), granodiorite (3), gravel (1), limestone (6), rhyolite (2), sandstone (11), schist (4), water (1)
- Soil Texture: Clay (2), Clay loam (5), Coarse sand (1), Fine silty clay (1), Loam (1), Loamy sand (4), Medium loam (1), Medium silt (2), Moderately fine sandy clay loam (2), Sand (9), Sandy loam (4), Silt loam (1), Silty clay (3)

Environment: The alliance was sampled in all three parks primarily on channel beds, bottoms, and lowslopes. It can also be found on midslopes and highslopes where water is readily available, such as from seeps and springs. It occurs at all elevations and aspects. Soils are derived from a variety of substrates and textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to continuous tree layer with a sparse to continuous shrub layer and sparse or continuous herbaceous understory.

Vegetation Floristics: The dominant tree is *Prosopis glandulosa* and/or *Prosopis pubescens*. *Pluchea sericea* is a commonly associated shrub.

Dynamics: *Prosopis pubescens* is commonly found in other desert wetland alliances. However, the *Prosopis pubescens* associations are relatively rare in Arizona, California, and Nevada. It is more restricted to riparian areas and springs than is *Prosopis glandulosa*. The most extensive stands of *P. pubescens* in California are along the Armagosa River drainage and the northern most stands occur in the Saline Valley in DEVA, and they are localized in LAKE such as along Roger's Wash. Stands are typically adjacent to *Atriplex canescens, Distichlis spicata, Sporobolus airoides,* and *Suaeda moquinii* alliances.

Prosopis glandulosa occurs readily where it can access permanent underground water, up to 15 m below the surface. The northern most stands of *P. glandulosa* in California are in the Saline Valley. *Tamarix* is invading and replacing stands especially along rivers and lake margins.

The alliance is restricted to relatively sensitive sites, some of which have been degraded by wood cutting, invasion of *Tamarix* and other non-natives, groundwater pumping, and water diversion, and livestock also pose as threats to stands outside of the Parks.

Classification Comments

Mesquite bosque stands in LAKE, DEVA, and MOJA contain *Prosopis glandulosa* and/or *Prosopis pubescens;* bosque with *Prosopis velutina* occur further south in the Arizonan Sonoran Desert in similar habitats to the other *Prosopis* spp. such as riparian watercourses, washes and playas where plants may have access to underground water.

Prosopis glandulosa associations are currently placed in the North American Warm Desert Riparian Low Bosque & Shrubland Group (G533) and Chihuahuan Mesquite Upland Scrub (G289) of the USNVC heirarchy. For the Mojave Network classification, we have placed these associations into the G533 group. While some associations of both *Prosopis glandulosa* and *Prosopis pubescens* are denoted as shrubland and others as woodland in the USNVC, we have chosen "tree" for its layer due to the plant's tall tree-like stature.

Classification Confidence: High

Conservation Status Rank

Global: G5
State (California): S3

References

Buck-Diaz et al. 2012, Keeler-Wolf et al. 1998, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used for Description

MOJN: N=86
LAKE (n=36): LAKE0211, LAKE0415, LAKE0639, LAKE9120, LAKE9167, LAKE9171, LAKE9181, LAKE9256, LAKE9263, LAKE9296, LAKE9316, LAKE9404, LAKE9435, LAKE9501, LAKE9533, LAKE9534, LAKE9641, LAKE9642, LAKE9643, LMFMH064,

LMFMH066, LMFMH067, LMFMH068, LMJOS013, LMJOS014, LMJOS015, LMJOS016, LMJOS017, LMJOS019, LMJOS020, LMJOS021, LMJOS022, LMJOS024, LMJOS025, LMJOS028, LMJOS029
DEVA (n=41): DEVA0434, DEVA0519, DEVA8020, DEVA8075, DEVA8076, DEVA8077, DEVA8078, DEVA8079, DEVA8080, DEVA8081, DEVA8082, DEVA8083, DEVA8084, DEVA8085, DEVA8086, DEVA8087, DEVA9412, DEVA9435, DEVA9470, DEVA9564, DEVA9566, DEVA9567, DEVA9621, DEVA9811, DEVA9813, DEVA9815, DEVA9818, DEVA9916, DEVAD037, DEVAD192, DEVAR041, DEVAR102, DEVAR116, DEVAR147, DEVAR151, MOJC0040, MOJC0041, MOJC0048, MOJC0051, MOJC0551, MOJC0733
MOJA (n=9): MOJA9130, MOJA9152, MOJA9190, MOJA9193, MOJA9195, MOJA9453, MOJA9646, MOJAE010, MOJC0007
MOJN-Johnson (n=0):

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Prosopis glandulosa*	74.4	69	19	0.2	80.5	–	–	–	x
	Prosopis pubescens	27.9	23	3.8	1	40	–	–	–	–
Shrub	*Pluchea sericea*	51.2	27	7.3	0.1	63	–	–	–	x
	Suaeda moquinii	31.4	6.9	1.2	0.2	17	–	–	–	–
	Larrea tridentata	26.7	5.1	0.8	0.1	35	–	–	–	–

Common Name: Narrowleaf Willow Warm Desert Riparian Shrubland
Group Assignment: G533, G526; **Alliance Code:** A0947, A3800

Alliance Concept

The Sandbar Willow Thickets Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found primarily on channel beds and midslopes at northeast to southwest aspects. Soils are derived from a variety of substrates including and textures range from coarse sand to clay loam. Elevations range from approximately 500 to 2250 meters. *Salix exigua* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Acacia greggii (=Senegalia greggii), Baccharis sergiloides, Eriogonum fasiculatum,* and *Lotus rigidus.* Herbs that are often present include *Bromus rubens*, *Erodium cicutarium, and Achnatherum speciosum*. Commonly associated non-vascular plants include unknown mosses.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Salix exigua* dominant or co-dominant with shrubs such as *Baccharis sergiloides*. The overall shrub cover ranges from 17 to 95 percent.

Alliance Distribution

The alliance was sampled at low to high elevations in two of the parks. It is scattered throughout DEVA and in MOJA it occurs in the Granite and Providence Mountains.

The alliance is also likely to occur at LAKE in riparian channels such as at Grapevine Canyon in the Newberry Mountains.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (8): 322Ab, 322Al, (322Am); Southeastern Great Basin (4): 341Fc, 341Fd

Park Sampling Zones: DEVA: CottonWood Mtns, Craig Canyon, Grapevine Mtns**; MOJA:** Granite Mtns, Providence Mtns, Van Winkle Mtn; **LAKE:** (Katherine)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Salix exigua (alliance)	3	–	x	x	–
Salix exigua / Mesic graminoids [CEGL001203]	3	–	–	x	–
Salix exigua / Barren [CEGL005655]	1	–	x	–	–
Salix exigua–Baccharis sergiloides [CEPP006753]	6	–	x	x	–

Association Notes: Two samples of *Salix exigua* stands were classified to alliance level only, in which *Salix exigua* was co-dominant with *Frangula californica* and/or *Fallugia paradoxa.* A third sample had *Vitis girdiana* present, and *Phragmites australis* and other herbs at high cover.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1404.6 m, Range 505 – 2215 m
- Aspect: NE (1), E (4), SE (1), SW (4), S (1)
- Slope: Mean 6.7 degrees, Range 1 – 14 degrees
- Macro Topography: Channel bed (3), Midslope (4)
- Tree Cover: Mean 2.5%, Range 0 – 7%
- Shrub Cover: Mean 61.9%, Range 17.6 – 95%
- Herb Cover: Mean 12.25%, Range 0 – 90%
- Large Rock: Mean 19.6%, Range 0 – 70.2%
- Small Rock: Mean 19.3%, Range 0 – 65%
- Fines Cover: Mean 11.8%, Range 0 – 40%
- Litter Cover: Mean 44%, Range 0.2 – 98%
- Geology: alluvium (2), granodiorite (5), limestone (1), rhyolite (3), shale (1)
- Soil Texture: Clay loam (3), Coarse sand (1), Loam (1), Loamy sand (1), Medium sand (3), Medium to very fine sandy loam (1), Sand (1), Sandy loam (1)

Environment: The alliance occurs in or along streams, springs, and washes, and in wet meadows. It occurs at low to high elevations in channel beds to midslopes at northeast to southwest aspects. Soils range from coarse sand to clay loam derived from a variety of substrates.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 17.6 to 95 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Salix exigua* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Acacia greggii (=Senegalia greggii), Baccharis sergiloides, Eriogonum fasiculatum,* and *Lotus rigidus.* Herbs that are often present include *Bromus rubens*, *Erodium cicutarium, and Achnatherum speciosum*. Commonly associated non-vascular plants include unknown mosses.

Dynamics: *Salix exigua* stands in the desert occur at springs and in seasonally flooded streams along with other riparian shrubs. They occur in similar habitats to *Salix lasiolepis* stands, though *S. exigua* has wider ecological amplitude in the Mojave Desert and Great Basin from low to high elevations.

Classification Comments

Salix exigua associations are currently placed within the North American Warm Desert Riparian Low Bosque & Shrubland (G533) and Rocky Mountain & Great Basin Lowland & Foothill Riparian

Shrubland (G526) groups of the USNVC hierarchy. For the Mojave Network classification we have combined these associations into one alliance description and group (G533).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S4

References

Buck-Diaz et al. 2012, Evens 2000, Keeler-Wolf and Thomas 2000, Klein et al. 2007, NatureServe 2012, Sawyer et al. 2009, Vaghti 2003, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=12

LAKE (n=0)

DEVA (n=5): DEVA9235, DEVA9563, DEVA9583, DEVA9655, MOJC1237

MOJA (n=7): MOJA0912, MOJA9574, MOJA9698, MOJAE009, MOJAE195, MOJAE199, MOJAE202

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	50	32	0.6	0.2	3	–	–	–	x
	Prosopis glandulosa	25	20	0.8	1	7	–	–	–	–
Shrub	*Salix exigua*	100	56	39	4.6	95	x	x	–	–
	Acacia greggii	58.3	1.7	0.4	0.2	3.1	–	–	–	x
	Baccharis sergiloides	50	13	6.4	4	32	–	–	–	x
	Eriogonum fasciculatum	50	0.3	0.1	0.2	0.2	–	–	–	x
	Lotus rigidus	50	0.3	0.1	0.2	0.2	–	–	–	x
	Rhus trilobata	41.7	1.4	1.1	1	5	–	–	–	–
	Prunus fasciculata	41.7	0.6	0.5	0.2	3	–	–	–	–
	Brickellia californica	41.7	0.4	0.2	0.2	1	–	–	–	–
	Ericameria linearifolia	41.7	0.3	0.1	0.2	0.2	–	–	–	–
	Tamarix ramosissima	33.3	0.9	0.6	0.2	7	–	–	–	–
	Ephedra viridis	33.3	0.8	0.2	0.2	2	–	–	–	–
	Ferocactus cylindraceus	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Viguiera parishii	33.3	0.3	0.1	0.2	0.2	–	–	–	–
	Rhamnus ilicifolia	25	0.9	0.8	2	6	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Rosa woodsii*	25	0.8	0.6	0.5	5	–	–	–	–
	Phoradendron californicum	25	0.9	0.2	0.2	2.1	–	–	–	–
	Gutierrezia microcephala	25	0.9	0.2	0.2	1.1	–	–	–	–
	Eriogonum wrightii	25	0.1	0.1	0.2	0.2	–	–	–	–
	Opuntia chlorotica	25	0.1	0.1	0.2	0.2	–	–	–	–
	Stephanomeria pauciflora	25	0.2	0.1	0.2	0.2	–	–	–	–
	Yucca schidigera	25	0.2	0.1	0.2	0.2	–	–	–	–
Herb	*Bromus rubens*	66.7	23	2.5	0.2	8	–	–	–	x
	Erodium cicutarium	50	1.9	0.3	0.2	2	–	–	–	x
	Achnatherum speciosum	50	2.3	0.1	0.2	0.2	–	–	–	x
	Juncus mexicanus	41.7	6.5	1	0.2	6	–	–	–	–
	Bromus tectorum	41.7	4.7	0.1	0.2	0.2	–	–	–	–
	Artemisia ludoviciana	41.7	4.7	0.3	0.2	2.1	–	–	–	–
	Mirabilis laevis	41.7	0.9	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	41.7	0.8	0.1	0.2	0.2	–	–	–	–
	Muhlenbergia rigens	33.3	3.9	0.8	0.2	7	–	–	–	–
	Epilobium	33.3	1	0.2	0.2	1	–	–	–	–
	Cirsium neomexicanum	33.3	0.6	0.1	0.2	0.2	–	–	–	–
	Sonchus oleraceus	33.3	0.5	0.1	0.2	0.2	–	–	–	–
	Polypogon monspeliensis	25	1.3	0.2	0.2	2	–	–	–	–
	Dudleya pulverulenta	25	0.4	0.1	0.2	0.2	–	–	–	–
	Juncus macrophyllus	25	0.3	0.1	0.2	0.2	–	–	–	–
	Melica frutescens	25	0.4	0.1	0.2	0.2	–	–	–	–
	Oenothera caespitosa	25	0.3	0.1	0.2	0.2	–	–	–	–
	Schismus	25	0.3	0.1	0.2	0.2	–	–	–	–
	Euphorbia	25	0.2	0	0.01	0.2	–	–	–	–
Non-vascular	Unknown Moss	50	38	0.5	0.2	3	–	–	–	x
	Unknown Lichen	25	22	0.1	0.4	0.4	–	–	–	–

Common Name: Arroyo Willow Thickets
Group Assignment: G533, G527; Alliance Code: A3878, A0977

Alliance Concept

The Arroyo Willow Thickets Warm Desert Riparian Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer, if present, is sparse, and the herbaceous layer is sparse to intermittent. The alliance is found primarily on channel beds at east and southeast aspects. Soils are derived from granodiorite and sandstone and textures include sand and loamy sand. Elevations range from approximately 1650 to 1900 meters. The dominant and characteristic shrub is *Salix lasiolepis. Rosa woodsii* is often present, and *Salix exigua* is sometimes present at lower cover. Herbs often present include *Solidago canadensis, Solidago* spp., *Typha* spp., and *Bromus rubens.* Commonly associated non-vascular plants include moss and algae.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Salix lasiolepis* dominant. The overall shrub cover ranges from 15 to 94 percent.

Alliance Distribution

The alliance was sampled at two of the parks at high elevations. It occurs in DEVA in Wacuba Canyon and in the Nelson Range and in MOJA in the New York Mountains.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Al; Southeastern Great Basin (2): 341Fb, 341Fc

Park Sampling Zones: DEVA: Joshua Flat, Nelson Range**; MOJA:** New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Salix lasiolepis / Barren Ground [CEGL001216]	2	–	x	x	–
Salix lasiolepis / Rosa woodsia / Mixed Herbs [CEGL001217]	1	–	x	–	–

Association Notes: Associations with *Salix lasiolepis* dominant include two groups within the USNVC, including the *Salix lasiolepis* Warm Desert Assoction [CEPP005674]. Some stands in MOJA or DEVA may fit this designation, which is comparable with the *Salix lasiolepis /* Barren Ground Association [CEGL001216].

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1743 m, Range 1651 – 1856 m
- Aspect: E (1), SE (2)

- Slope: Mean 2.7 degrees, Range 2 – 3 degrees
- Macro Topography: Channel bed (3)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 49.1%, Range 15.6 – 95.4%
- Herb Cover: Mean 13.7%, Range 0 – 36%
- Large Rock: Mean 1%, Range 1 – 1%
- Small Rock: Mean 7. 7%, Range 1 – 14%
- Fines Cover: Mean 32.7%, Range 2 – 86%
- Litter Cover: Mean 57%, Range 2 – 96%
- Geology: granodiorite (1), sandstone (2)
- Soil Texture: Loamy sand (1), Sand (1)

Environment: The alliance occurs at high elevations in stream channels, drainages and springs at east and southeast aspects. Soils are sand and loamy sand derived from granodiorite and sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 15 to 95 percent. The tree layer, if present is sparse and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Salix lasiolepis. Rosa woodsii* is often present, and *Salix exigua* is sometimes present at lower cover. Herbs often present include *Solidago canadensis, Solidago* spp., *Typha* spp., and *Bromus rubens.* Commonly associated non-vascular plants include unknown moss and algae.

Dynamics: *Salix lasiolepis* stands in the desert occur at springs and in seasonally flooded streams along with other riparian shrubs. They occur in similar habitats to *Salix exigua* stands though always at relatively high elevations in the Mojave Desert and Great Basin.

Classification Comments

Salix lasiolepis associations are currently placed in the North American Warm Desert Riparian Low Bosque & Shrubland (G533) and Western Montane-Subalpine Riparian & Seep Shrubland (G527) groups of the USNVC hierarchy. For the Mojave Network classification we have combined these associations into one alliance description and group (G533).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S4

References

Buck-Diaz et al. 2012, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=3
LAKE (n=0)
DEVA (n=2): DEVA9249, DEVA9341
MOJA (n=1): MOJA9226
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	33.3	33	0.3	1	1	–	–	–	–
Shrub	*Salix lasiolepis*	100	91	47	12	95	x	x	–	–
	Rosa woodsii	66.7	2.3	0.4	0.2	1	–	–	–	x
	Salix exigua	33.3	4.2	0.7	2	2	–	–	–	–
	Artemisia tridentata	33.3	0.4	0.1	0.2	0.2	–	–	–	–
	Baccharis sergiloides	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Ericameria linearifolia	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Ericameria nauseosa	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Gutierrezia sarothrae	33.3	0.4	0.1	0.2	0.2	–	–	–	–
	Picrothamnus desertorum	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Prunus fasciculata	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Purshia tridentata	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Rhamnus ilicifolia	33.3	0.1	0.1	0.2	0.2	–	–	–	–
	Senecio	33.3	0.4	0.1	0.2	0.2	–	–	–	–
	Tamarix ramosissima	33.3	0.4	0.1	0.2	0.2	–	–	–	–
Herb	*Solidago canadensis*	66.7	7.8	1.7	1	4	–	–	–	x
	Solidago	66.7	5.8	1	1	2	–	–	–	x
	Typha	66.7	4.1	0.4	0.2	1	–	–	–	x
	Bromus rubens	66.7	7.4	0.1	0.2	0.2	–	–	–	x
	Juncus mexicanus	33.3	16	5.3	16	16	–	–	–	–
	Juncus xiphioides	33.3	3.9	1.3	4	4	–	–	–	–
	Equisetum	33.3	3	1	3	3	–	–	–	–
	Medicago sativa	33.3	2	0.7	2	2	–	–	–	–
	Mimulus guttatus	33.3	2	0.7	2	2	–	–	–	–
	Bromus tectorum	33.3	3.9	0.3	1	1	–	–	–	–
	Gilia	33.3	2.3	0.2	0.6	0.6	–	–	–	–
	Lupinus	33.3	1.6	0.1	0.4	0.4	–	–	–	–
	Mentzelia	33.3	1.6	0.1	0.4	0.4	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Phacelia*	33.3	1.6	0.1	0.4	0.4	–	–	–	–
	Amsinckia	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Camissonia claviformis	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Carex	33.3	6.7	0.1	0.2	0.2	–	–	–	–
	Castilleja angustifolia	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Cirsium	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Claytonia perfoliata	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Cryptantha utahensis	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Elymus elymoides	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Epipactis gigantea	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Eriastrum wilcoxii	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Eriogonum pusillum	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Juncus orthophyllus	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Leymus triticoides	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Penstemon palmeri	33.3	6.7	0.1	0.2	0.2	–	–	–	–
	Phacelia vallis-mortae	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Platanthera sparsiflora	33.3	0.2	0.1	0.2	0.2	–	–	–	–
	Poa	33.3	6.7	0.1	0.2	0.2	–	–	–	–
	Polypogon monspeliensis	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Salvia columbariae	33.3	0.8	0.1	0.2	0.2	–	–	–	–
	Solidago spectabilis var. confinis	33.3	6.7	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Algae	66.7	50	0.8	0.4	2	–	–	–	x
	Unknown Moss	66.7	42	0.1	0.2	0.2	–	–	–	x
	Cryptogamic crust	33.3	8.3	0.1	0.2	0.2	–	–	–	–

Common Name: Wild Grape Desert Shrubland
Group Assignment: G533; **Alliance Code:** A4162

Alliance Concept

The Wild Grape Desert Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically not present, and the herbaceous layer is sparse to intermittent. The alliance is found localized along mountain drainages, seasonal riparian streams, washes, and spring areas in the desert west at various aspects. Soils are alluvial and derived from a variety of substrates including alkali-granite, and sandstone. Elevations range from approximately 450 to 1500 meters. The dominant and characteristic shrubs in this alliance are either *Vitis arizonica* or *Vitis girdiana,* and those that are sometimes present include *Baccharis sergiloides, Pluchea sericea, Salix exigua,* and *Salix laevigata.* Sometimes *Salix exigua* may be co-dominant with *Vitis.* The herbaceous layer may be well-developed or open with *Phragmites australis* often present at variable cover, and *Cladium californicum, Marah macrocarpus, Bromus tectorum, Schismus* spp. and *Amsinckia* spp. sometimes present.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with either *Vitis arizonica, V. californica,* or *V. girdiana* dominant. Sometimes *Salix exigua* may be co-dominant. The overall shrub cover ranges from 26 to 92 percent. The herbaceous layer can be well-developed or open, including *Phragmites australis, Cladium californicum, Marah macrocarpus,* and others.

Alliance Distribution

The alliance is localized in mountain drainages, seasonal streams, washes, and springs. Sites from LAKE include Grapevine Canyon in the Newberry Mountains and at Rogers Wash in the Echo Bay area. Sites from DEVA include the Panamint Range along Johnson Canyon and Warm Spring Canyon, and observations in Grapevine Canyon of the Grapevine Mountains.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Ab, 322Af, 322Am, 322Az; Southeastern Great Basin (4): 341Fc, 341Fd, 341Ff

Park Sampling Zones: LAKE: Echo Bay, Katherine**; DEVA:** Grapevine Mtns., Panamint Mtns., Nelson Range

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Vitis arizonica (provisional) [CEPS009693]	8	x	–	–	–
Vitis arizonica / Cladium californicum [CEPP006832]	4	x	–	–	–
Vitis girdiana [CEPP006842]	6	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 745.6 m, Range 470 – 1529 m
- Aspect: Variable including North (1), South (4), East-southeast (9)
- Slope: (unknown)
- Macro Topography: (unknown)
- Tree Cover: 0%
- Shrub Cover: Mean 47%, Range 26 – 92%
- Herb Cover: Mean 26.8%, Range 0 – 44%
- Large Rock: (unknown)
- Small Rock: (unknown)
- Fines Cover: (unknown)
- Litter Cover: (unknown)
- Geology: (unknown)
- Soil Texture: (unknown)

Environment: The alliance is found primarily in perennial riparian areas including streams, spring-fed seeps, and washes at various aspects. Soils are derived from a variety of substrates including alkali-granite, and sandstone. The elevations range from mid to high.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 26 to 92 percent. The tree layer is typically not present, and the herb layer is sparse to intermittent. Non-vascular plants are typically not present.

Vegetation Floristics: Dominant and characteristic shrubs include *Vitis arizonica* or *V. girdiana,* and those that are sometimes present include *Baccharis sergiloides, Pluchea sericea, Salix exigua,* and *Salix laevigata. Phragmites australis* is often present in the herbaceous layer, and is often accompanied by *Amsinckia* spp*., Bromus tectorum, Cladium californicum, Marah macrocarpus,* and *Schismus* spp*.*

Dynamics: *Vitis arizonica* and *Vitis girdiana* form dense, thick mats of shrubby vines that are almost inpenetrable in the warm deserts and desert-transition areas, while *Vitis californica* forms similar thickets in Mediterranean California. They may be present as the only shrub or clambering along with other shrubs including willows in localized ravines and washes, especially in the Mojave Desert and southeastern Great Basin.

Classification Comments

NatureServe 2010.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3

State (California): S3

References

NatureServe 2010

Surveys (with Sample Sizes) Used in Description

MOJN: N=18

LAKE (n=12): LMJOS001, LMJOS003, LMJOS004, LMJOS005, LMJOS006, LMJOS007, LMJOS008, LMJOS009, LMJOS010, LMJOS011, LMJOS012, LMJOS018

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

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Vitis arizonica*	67	44	36	26	92	–	–	–	X
	Pluchea sericea	39	2.3	1.7	0.2	17	–	–	–	–
	Vitis girdiana	33	33	27	65	98	–	–	–	–
	Salix exigua	33	10	12	10	58	–	–	–	–
	Baccharis sergiloides	33	2.2	2	0.2	19	–	–	–	–
Herb	*Phragmites australis*	44	19	6.8	1	33	–	–	–	–
	Schismus	33	3.2	1	1	4	–	–	–	–
	Amsinckia	28	3.8	0.6	0.2	6	–	–	–	–
	Cladium californicum	22	16	5.3	20	30	–	–	–	–
	Marah macrocarpus	22	9.3	1.8	3	10	–	–	–	–
	Bromus tectorum	22	3.5	1.4	1	16	–	–	–	–

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

G545. Colorado Plateau Hanging Garden Seep

Calamagrostis scopulorum – Andropogon glomeratus Saturated Hanging Garden Herbaceous Alliance

Common Name: Arid West Saturated Hanging Garden
Group Assignment: G545; **Alliance Code:** A2655

Alliance Concept

The Arid West Saturated Hanging Garden Herbaceous Alliance forms an intermittent to continuous herbaceous layer. The shrub layer is open and the tree layer, when present, is sparse. Stands are found in low elevation alkali calcareous springs, wetland seeps in alcoves and in horizontal fractures in limestone or sandstone canyon walls, or other bedrock springs. Elevations range from approximately 100 to 300 meters. *Schoenus nigricans* and/or *Andropogon glomeratus* is dominant or co-dominant in the herbaceous layer, or other herbaceous plants such as *Calamagrostis scopulorum, Cladium californicum,* and *Muhlenbergia utilis* can occur. The shrub *Baccharis sergiloides* is also sometimes present.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous herbaceous layer with *Schoenus nigricans* and/or *Andropogon glomeratus* dominant or co-dominant with other herbs. The overall herbaceous cover ranges from 34 to 75 percent cover.

Alliance Distribution

The alliance was sampled and mapped at low elevations in DEVA west of the Amargosa Range in the Nevares Springs complex (including Ratatat Spring and Big Horn Spring), and Travertine Springs complex. The hanging garden seep group was also mapped at LAKE along the border with Grand Canyon – Parashant National Monument.

States: (AZ); CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322Ab, (322Av)

Park Sampling Zones: DEVA: Death Valley, **LAKE:** (Parashant)

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Andropogon glomeratus – Schoenus nigricans [CEGL005466]	6	(x)	x	–	–

Association Notes: A similar association of *Eleocharis rostellata – Schoenus nigricans* community has been noted by Sada and Cooper (2012).

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 237 m, Range 123 – 290 m
- Aspect: (unknown)
- Slope: Mean 10.7 degrees, Range 4.5 – 17.2 degrees (GIS derived)
- Macro Topography: (unknown)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 6.2%, Range 0 – 29%
- Herb Cover: Mean 52.3%, Range 34 – 75%
- Large Rock: Mean %, Range – % (unknown)
- Small Rock: Mean %, Range – % (unknown)
- Fines Cover: Mean 0%, Range 0 – 0% (unknown)
- Litter Cover: Mean 0%, Range 0 – 0% (unknown)
- Geology: (unknown)
- Soil Texture: (unknown)

Environment: The alliance occurs in low elevation alkali calcareous springs, wetland seeps in alcoves and in horizontal fractures in limestone or sandstone canyon walls, or other bedrock springs. It was sampled at DEVA at Big Horn Spring, Ratatat Spring, and Travertine Springs complex, and was mapped at LAKE along the border with Grand Canyon – Parashant National Monument.

Vegetation Description

Vegetation Structure: The alliance forms an intermittent to continuous herbaceous layer, and the overall herbaceous cover ranges from 34 to 75 percent cover. The tree layer, when present is typically sparse, and the shrub layer is sparse to open. Non-vascular plants, when present are typically sparse.

Vegetation Floristics: The dominant or co-dominant herb is *Schoenus nigricans* and/or *Andropogon glomeratus*. The shrub *Baccharis sergiloides* is also sometimes present.

Dynamics: Both *Andropogon glomeratus* and *Schoenus nigricans* are tolerant of alkalinity, and are found in the southeastern United States in brackish, freshwater and calcareous wetland sites. In DEVA, stands occur in a fine-scale mosaic with other herbs, shrubs, and trees in alkali calcareous springs, including the rare sedge *Fimbristylis thermalis* (CNPS List 2B.2).

Classification Comments

Some of the grass species occurring in this alliance are wide-ranging in the United Stands, and other associations and alliances have been defined for them. Stands are rare, and occur in a matrix with other wetland herbaceous and shrubland vegetation. The placement of this alliance in the USNVC hierarchy is uncertain because of its rarity and discontinuous distribution in desert seeps and hanging

gardens of Arizona, California, Nevada, as well as Colorado and Utah. Also, the *Cladium californicum* Alkaline Seep Alliance is related, though currently in a different USNVC group.

Classification Confidence of Alliance: Low

Conservation Status Rank
Global: G3
State (California): S1

References
Thomas 2006, cf. NatureServe 2012

Surveys (with Sample Sizes) Used in Description
MOJN: N=6
LAKE (n=0)
DEVA (n=6): DEVA8043, DEVA8044, DEVA8045, DEVA8046, DEVA8088, DEVA8089
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Baccharis sergiloides*	33.3	33	6.2	8	29	–	–	–	–
Herb	*Schoenus nigricans*	83.3	34	18	21	62	x	–	x	–
	Andropogon glomeratus	33.3	21	9.8	21	38	–	–	–	–

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

Common Name: Iodine Bush Wet Shrubland
Group Assignment: G537; **Alliance Code:** A0866

Alliance Concept

The Iodine Bush Wet Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to continuous. The alliance is found primarily on playas, valley bottoms and alkaline wetlands with little or no slope. Soils are derived from alluvium and sandstone and textures are variable. Elevations range from approximately -93 to 1300 meters. *Allenrolfea occidentalis* is dominant or co-dominant in the shrub layer. *Distichlis spicata* is sometimes present in the herb layer.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Allenrolfea occidentalis* dominant or co-dominant. The overall shrub cover ranges from 2 to 85 percent.

Alliance Distribution

The alliance was sampled at two of the parks at low to high elevations. It is scattered throughout DEVA and near Soda Dry Lake in MOJA. The alliance was also found during map accuracy assessment field sampling at LAKE in the Overton Wash/Muddy River basin along with other alkaline-wet shrubland alliances.

States: CA, (NV)

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Ab, 322Ai, (322Az); Southeastern Great Basin (6): 341Fc, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Jail Canyon, Saline Valley; (**LAKE:** Overton); **MOJA:** Soda Lake South

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Allenrolfea occidentalis [CEGL000988]	13	–	x	x	–
Allenrolfea occidentalis (alliance)	3	(x)	x	–	–

Associations Table (continued). "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Allenrolfea occidentalis / Distichlis spicata [CEPP005788]	10	–	x	–	–
Allenrolfea occidentalis–Suaeda moquinii [CEPP005787]	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 165.2 m, Range -93 – 1274 m
- Aspect: Flat, Variable (7), N (1), E (4), W (1), SW (2)
- Slope: Mean 0.8 degrees, Range 0 – 3 degrees
- Macro Topography: Basin floor/wetland (2), Low level/bottom (6), Midslope (1)
- Tree Cover: Mean 0%, Range 0 – 0.2%
- Shrub Cover: Mean 23.6%, Range 2 – 85%
- Herb Cover: Mean 8.4%, Range 0 – 84%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 3.1%, Range 0 – 30%
- Fines Cover: Mean 45%, Range 0 – 99.8%
- Litter Cover: Mean 5.8%, Range 0 – 91.2%
- Geology: alluvium (19), conglomerate (2), sandstone (6)
- Soil Texture: Clay (3), Clay loam (1), Fine silty clay (2), Loam (1), Medium silt (1), Sand (4), Sandy loam (1)

Environment: The alliance occurs on playas, valley bottoms, and salt marsh wetlands at low to high elevations with little or no slope. Soils are derived from alluvium and sandstone and textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 2 to 85 percent. The tree layer is typically sparse, and the herb layer is sparse to continuous. Non-vascular plants, if present, are sparse.

Vegetation Floristics: *Allenrolfea occidentalis* is dominant or co-dominant in the shrub layer. *Distichlis spicata* is sometimes present in the herb layer. Stands typically are simplistic in species composition and often monotypic.

Dynamics: *Allenrolfea occidentalis* is tolerant of high salinity and heavy clay soils, which tend to exclude other species, and it often forms the lowest ring of perennial vegetation around desert salt flats and alkaline terraces that receive intermittent saturation.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S3

References

Bradley 1970, Buck-Diaz et al. 2012, Evens and Hartman 2007, Keeler-Wolf and Thomas 2000, McHargue 1973, NatureServe 2012, Odion et al. 1992, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=27
LAKE (n=0)
DEVA (n=26): DEVA0516, DEVA0810, DEVA8063, DEVA8064, DEVA8065, DEVA8066, DEVA8067, DEVA8068, DEVA8069, DEVA8070, DEVA9179, DEVA9384, DEVA9812, DEVAD083, DEVAD189, DEVAD190, DEVAR013, DEVAR014, DEVAR063, MOJC0039, MOJC0044, MOJC0049, MOJC0050, MOJC0054, MOJC0726, MOJC0727
MOJA (n=1): MOJA0196
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Allenrolfea occidentalis*	100	94	20	0.5	85	x	x	–	–
Herb	*Distichlis spicata*	37	32	3.3	5	15	–	–	–	–

Common Name: Parry's Saltbush Scrub
Group Assignment: G537, G300; **Alliance Code:** A2507

Alliance Concept

The Parry's Saltbush Scrub Alliance forms an open shrub layer. The emergent tree layer, if present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found in alkaline basins, adjacent sand dunes, and alkaline spring sites of variable slope and aspect. Soils are derived from conglomerate and dune sand and textures include sand and silt loam. Elevations range from approximately 550 to 1300 meters. The dominant and characteristic shrub is *Atriplex parryi* and those that are often present include *Atriplex canescens, Atriplex confertifolia, Cylindropuntia echinocarpa, Psorothamnus polydenius,* and *Stephanomeria pauciflora.* Herbs that are often present are *Achnatherum hymenoides, Cleomella obtusifolia, Dicoria canescens, Distichlis spicata, Salsola* spp.*,* and *Sporobolus airoides.*

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Atriplex parryi* dominant. The overall shrub cover ranges from approximately 7 to 15 percent.

Alliance Distribution

The alliance was sampled twice in DEVA at low and high elevations. It occurs in the Eureka Dunes and near Mesquite Spring. It also occurs further north into the southern Great Basin such as at Fish Slough and in the Owens Lake Basin.

States: CA

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

Park Sampling Zones: DEVA: Death Valley, Eureka Valley

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex parryi (provisional) [CEGL002711]	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 933 m, Range 581 – 1285 m
- Aspect: NE (1), S (1)
- Slope: Mean 2 degrees, Range 1 – 3 degrees
- Macro Topography: Entire slope (1), Lowslope (1)

- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 10.9%, Range 6.7 – 15.1%
- Herb Cover: Mean 3.6%, Range 1.2 – 6%
- Large Rock: 1%
- Small Rock: 8%
- Fines Cover: 89%
- Litter Cover: 2%
- Geology: conglomerate (1), dune sand (1)
- Soil Texture: Sand (1), Silt loam (1)

Environment: The alliance occurs at low to high elevations in alkaline basins, adjacent sand dunes, and alkaline spring sites of variable slope and aspect. Soils are sand and silt loam derived from conglomerate and dune sand.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer and the overall shrub cover ranges from approximately 7 to 15 percent. The tree layer, if present, is sparse, and the herb layer is sparse to open. Non-vascular plants, if present, are sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Atriplex parryi,* and those that are often present include *Atriplex canescens, Atriplex confertifolia, Cylindropuntia echinocarpa, Psorothamnus polydenius,* and *Stephanomeria pauciflora.* Herbs that are often present are *Achnatherum hymenoides, Cleomella obtusifolia, Dicoria canescens, Distichlis spicata, Salsola* spp.*,* and *Sporobolus airoides.*

Dynamics: *Atriplex parryi* stands are uncommon in the Mojave Desert and Great Basin in alkaline/saline areas also occupied by other *Atriplex* spp. and *Distichlis spicata.*

Classification Comments

The *Atriplex parryi* shrubland Alliance is currently placed within the North American Desert Alkaline-Saline Wet Scrub Group (G537) as it primarily occurs in alkaline/saline environments in the study area, though the Intermountain Shadscale-Saltbush Scrub Group (G300) is another group to be considered.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G4?
State (California): S3?

References

VegCamp 2014, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2

LAKE (n=0)
DEVA (n=2): DEVA0919, DEVAD217
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Atriplex parryi*	100	78	8	6	10	x	x	–	–
	Cylindropuntia echinocarpa	50	9.9	1.5	3	3	–	–	–	x
	Psorothamnus polydenius	50	6.6	1	2	2	–	–	–	x
	Stephanomeria pauciflora	50	3.7	0.3	0.5	0.5	–	–	–	x
	Atriplex confertifolia	50	1.5	0.1	0.2	0.2	–	–	–	x
	Atriplex canescens	50	0.3	0.1	0.1	0.1	–	–	–	x
Herb	*Distichlis spicata*	50	46	2.5	5	5	–	–	–	x
	Salsola	50	42	0.5	1	1	–	–	–	x
	Cleomella obtusifolia	50	1.9	0.1	0.2	0.2	–	–	–	x
	Sporobolus airoides	50	1.9	0.1	0.2	0.2	–	–	–	x
	Achnatherum hymenoides	50	4.2	0.1	0.1	0.1	–	–	–	x
	Dicoria canescens	50	4.2	0.1	0.1	0.1	–	–	–	x

Common Name: Arrow Weed Thickets
Group Assignment: G537; **Alliance Code:** A0798

Alliance Concept

The Arrow Weed Thickets Wet Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found on playas, basin floors, channel beds, and spring-fed slopes with variable or no aspect. Soils are alluvial and derived from a variety of substrates, and textures are variable. Elevations range from approximately -82 to 950 meters. *Pluchea sericea* is dominant and characteristic in the shrub layer, which is sometimes accompanied by *Allenrolfea occidentalis.* The herbaceous layer often includes *Phragmites australis* and sometimes includes *Distichilis spicata.*

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Pluchea sericea* dominant. The overall shrub cover ranges from 2.5 to 92 percent.

Alliance Distribution

The alliance was sampled at two of the parks at low to mid elevations. It is scattered throughout DEVA across various sites and in LAKE around the perimeter of the lake and in spring-fed washes. It is also expected to occur in MOJA, such as in Piute Gorge (J. Andre pers. com. 2013).

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (25): 322Ab, 322Ad, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (4): 341Fc, 341Fd

Park Sampling Zones: DEVA: Death Valley, Funeral Mountains, Grapevine Mtns, Last Chance Vlly, Saline Valley**; LAKE:** Boulder City, Callville, Echo Bay, Katherine, Temple Bar; [**MOJA:** Piute Range]

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pluchea sericea (alliance)	1	–	x	–	–
Pluchea sericea / Phragmites australis [CEPP006734]	10	x	–	–	–
Pluchea sericea Wet [CEGL003080]	18	x	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 393.8 m, Range -82 – 935 m
- Aspect: NE (2), E (3), SE (3), SW (1), W (2), S (2)

- Slope: Mean 5.9 degrees, Range 1 – 32 degrees
- Macro Topography: Channel bed (1), Channel wall (1), High level/summit (1), Low level/bottom (3), Lowslope (1), Midslope (2)
- Tree Cover: Mean 0.2%, Range 0 – 5%
- Shrub Cover: Mean 26.8%, Range 2.5 – 87%
- Herb Cover: Mean 25.4%, Range 0 – 94%
- Large Rock: Mean 6.1%, Range 0 – 72%
- Small Rock: Mean 7.8%, Range 0 – 70%
- Fines Cover: Mean 47%, Range 0 – 93%
- Litter Cover: Mean 14.4%, Range 0 – 95.8%
- Geology: alkali-granite (alaskite) (3), alluvium (10), basalt (1), dune sand (2), granodiorite (4), limestone (1), sandstone (6), schist (1), sedimentary (gypsum) (1)
- Soil Texture: Clay (1), Clay loam (1), Fine sand (1), Loamy sand (1), Medium silt (1), Medium to very fine sandy loam (2), Sandy clay (1), Sandy loam (1), Silt loam (1)

Environment: The alliance occurs from low to mid elevations at springs, spring-fed slopes, seasonally flooded stream channels, playas, and basin floors that have subterranean water. Access to moisture is essential, in which ground water is available year-round and typically within 1–3 m of the ground surface. Aspect is variable. Soils are alluvial and derived from a variety of substrates, and soil textures are variable.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 2.5 to 92 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Pluchea sericea* is dominant and characteristic in the shrub layer, which is sometimes accompanied by *Allenrolfea occidentalis.* The herbaceous layer often includes *Phragmites australis* and sometimes includes *Distichilis spicata.*

Dynamics: *Pluchea sericea* stands form thickets along permanent springs and slow-flowing streams or occur in vegetation mosaics surrounding alkali springs and marshes. It can tolerate strongly alkaline/saline conditions, and invasion by *Tamarix* is a concern since it and *P. sericea* have similar water requirements as phreatophytes.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3
State (California): S3

References

Buck-Diaz et al. 2012, Cogan et al. 2004, Keeler-Wolf and Thomas 2000, NatureServe 2012, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=29

LAKE (n=16): LAKE0387, LAKE9386, LAKE9500, LAKE9625, LAKE9640, LMFMH056, LMFMH057, LMFMH058, LMFMH059, LMFMH060, LMFMH061, LMFMH062, LMFMH063, LMFMH069, LMFMH070, LMJOS023

DEVA (n=13): DEVA0600, DEVA0816, DEVA8071, DEVA8072, DEVA8073, DEVA8074, DEVA9596, DEVA9826, DEVAR064, MOJC0047, MOJC0552, MOJC0732, MOJC0734

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Pluchea sericea*	100	75	23	0.5	88	x	x	–	–
	Allenrolfea occidentalis	27.6	7.5	1.3	1	13	–	–	–	–
Herb	*Phragmites australis*	44.8	30	14	0.2	90	–	–	–	–
	Distichlis spicata	37.9	16	1.2	0.2	10	–	–	–	–

Common Name: Big Saltbush Scrub
Group Assignment: G537; **Alliance Code:** A3173

Alliance Concept

The Big Saltbush Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on disturbed bottomlands and channel beds at flat and south aspects. Soils are derived from alluvium and texture is silty clay. Elevations range from approximately 150 to 400 meters. *Atriplex lentiformis* or *Atriplex torreyi* is dominant and characteristic in the shrub layer, and *Encelia farinosa* is often present. *Prosopis glandulosa* is commonly an emergent tree at sparse cover. Dominant and characteristic herbs include *Cryptantha* spp., and *Schismus* spp., and those often present are *Amsinckia* spp., *Bassia scoparia, Bromus rubens, Bromus tectorum, Camissonia brevipes, Chaenactis fremontii, Chorizanthe brevicornu, Cryptantha pterocarya, Eriogonum deflexum, Malacothrix glabrata, Phacelia crenulata, Plantago ovata,* and *Salsola* spp.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Atriplex lentiformis* or *Atriplex torreyi* dominant. The overall shrub cover ranges from 4 to 55 percent.

Alliance Distribution

The alliance was sampled in LAKE on the shore line near Lake Las Vegas and along the road near Davis Dam. The alliance was also found during map accuracy assessment field sampling at LAKE at Overton Wash/Muddy River and at MOJA near Soda Lake along with other alkaline-wet shrubland alliances. This alliance is also found in California, along alkali-rich clay soil along playa edges and stream terraces.

States: AZ, NV, [CA]

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

Park Sampling Zones: LAKE: Lakeshore, Katherine, (Overton); [**MOJA**: Soda Lake]

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex lentiformis [CEPP005799]	2	x	–	(x)	–

Association Notes: More sampling and analysis is necessary to determine if stands with *Atriplex torreyi* dominant should be in a separate association from those of *A. lentiformis*.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 261 m, Range 152 – 370 m
- Aspect: Flat, Variable (1), S (1)
- Slope: Mean 0.5 degrees, Range 0 – 1 degrees
- Macro Topography: Channel bed (1), Low level/bottom (1)
- Tree Cover: Mean 0.1%, Range 0 – 0.2%
- Shrub Cover: Mean 29.5%, Range 4 – 55%
- Herb Cover: Mean 10.5%, Range 0 – 21%
- Large Rock: Mean 1.5%, Range 0 – 3%
- Small Rock: Mean 39%, Range 35 – 43%
- Fines Cover: Mean 33.5%, Range 15 – 52%
- Litter Cover: Mean 23.5%, Range 2 – 45%
- Geology: alluvium (2)
- Soil Texture: Silty clay (1)

Environment: The alliance is found primarily on disturbed bottomlands and channel beds at flat and south aspects. Soils are derived from alluvium and texture is silty clay. The elevation is low.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 4 to 55 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants, if present, are typically sparse.

Vegetation Floristics: *Atriplex lentiformis* or *Atriplex torreyi* is the dominant and characteristic shrub, and *Encelia farinosa* and other *Atriplex* species are often present. *Prosopis glandulosa* is commonly an emergent tree at sparse cover. Dominant and characteristic herbs include *Cryptantha* spp., and *Schismus* spp., and those often present are *Amsinckia* spp., *Bassia scoparia, Bromus rubens, Bromus tectorum, Camissonia brevipes, Chaenactis fremontii, Chorizanthe brevicornu, Cryptantha pterocarya, Eriogonum deflexum, Malacothrix glabrata, Phacelia crenulata, Plantago ovata,* and *Salsola* spp.

Dynamics: *Atriplex lentiformis* has been planted in various saline and alkaline wetlands and wash terraces to increase scrub cover for wildlife and for erosion control on disturbed riparian sites.

Classification Comments

Stands of both *Atriplex lentiformis* and *Atriplex torreyi* are included in this alliance. *Atriplex torreyi* occurs in specific desert environments and occurs in strongly dominant stands in alkali-rich clay soils along stream terraces, washes, and playa edges where drainages empty out into the playa. These stands often occur in a matrix with other related alkali scrub including *Suaeda moquinii* and *Atriplex canescens.* More sampling is needed to determine if stands of *A. lentiformis* in LAKE are actually *A. torreyi* (in which it has a synonym of *A. lentiformis* ssp. *torreyi*).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S4

References

Buck-Diaz et al. 2012, Keeler-Wolf and Evens 2006, Keeler-Wolf et al. 1998, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2

LAKE (n=2): LAKE0187, LAKE9170

DEVA (n=0)

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Prosopis glandulosa*	50	50	0.1	0.2	0.2	–	–	–	x
Shrub	*Atriplex lentiformis*	100	99	29	4	54	x	x	–	–
	Encelia farinosa	50	0.9	0.5	1	1	–	–	–	x
Herb	*Cryptantha*	100	39	0.6	0.6	0.6	x	–	x	–
	Schismus	100	13	0.2	0.2	0.2	x	–	–	–
	Eriogonum deflexum	50	42	10	20	20	–	–	–	x
	Salsola	50	2.1	0.5	1	1	–	–	–	x
	Amsinckia	50	0.4	0.1	0.2	0.2	–	–	–	x
	Bassia scoparia	50	0.4	0.1	0.2	0.2	–	–	–	x
	Bromus rubens	50	0.4	0.1	0.2	0.2	–	–	–	x
	Bromus tectorum	50	0.4	0.1	0.2	0.2	–	–	–	x
	Camissonia brevipes	50	0.4	0.1	0.2	0.2	–	–	–	x
	Chaenactis fremontii	50	0.4	0.1	0.2	0.2	–	–	–	x
	Chorizanthe brevicornu	50	0.4	0.1	0.2	0.2	–	–	–	x
	Cryptantha pterocarya	50	0.4	0.1	0.2	0.2	–	–	–	x
	Malacothrix glabrata	50	0.4	0.1	0.2	0.2	–	–	–	x
	Phacelia crenulata	50	0.4	0.1	0.2	0.2	–	–	–	x
	Plantago ovata	50	0.4	0.1	0.2	0.2	–	–	–	x

Common Name: Greasewood Intermountain Wet Shrubland
Group Assignment: G537; **Alliance Code:** A1046

Alliance Concept

The Greasewood Intermountain Wet Shrubland Alliance forms an open to intermittent shrub layer. The emergent tree, if present, is sparse, and the herbaceous layer is open to intermittent. The alliance is found primarily around alkaline springs and dry lake beds at flat and southeast aspects. Soils are derived from alluvium and sandstone and textures include fine silty clay and sandy loam. Elevations range from approximately 250 to 1750 meters. The dominant and characteristic shrub is *Sarcobatus vermiculatus,* and those that are often present at lower cover include *Artemisia tridentata, Atriplex canescens, Ephedra nevadensis, Ericameria nauseosa, Ericameria teretifolia, Gutierrezia sarothrae, Lycium andersonii, Lycium cooperi,* and *Opuntia basilaris.* Herbs that often present are *Achnatherum hymenoides, Amsinckia* spp.*, Bromus rubens, Bromus tectorum, Chaenactis fremontii, Chaenactis macrantha, Descurainia pinnata, Descurainia sophia, Distichlis spicata, Eriastrum* spp.*, Eriogonum palmerianum, Erodium cicutarium, Eschscholzia glyptosperma, Gilia* spp.*, Hordeum murinum, Juncus* spp.*, Lepidium lasiocarpum, Leymus cinereus, Malacothrix glabrata, Mentzelia* spp.*, Phacelia fremontii, Phacelia vallis-mortae, Sphaeralcea ambigua, Stanleya pinnata, Thelypodium integrifolium, Tridens muticus,* Unknown Graminoid (grass or grasslike)*, Vulpia* spp.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Sarcobatus vermiculatus* dominant or co-dominant. Rarely, *Chrysothamnus albidus* or *Atriplex parryi* may be present and co-dominant. The overall shrub cover ranges from 7 to 33.2 percent.

Alliance Distribution

The alliance was sampled once in DEVA at high elevation in the Last Chance Range. The alliance was sampled once in MOJA at low elevation outside of Baker at the southern edge of Silver Lake. Other stands of *Sarcobatus vermiculatus* and stands of related *Chrysothamnus albidus* appear to occur along the Amargosa River and wash terraces.

States: CA

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

Park Sampling Zones: DEVA: Last Chance Range; **MOJA:** Baker

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Sarcobatus vermiculatus (alliance)	1	–	–	x	–
Sarcobatus vermiculatus / Leymus cinereus [CEGL001366]	1	–	x	–	–

Association Notes: One sample was classified at the alliance level only. For this sample, we have vegetative cover data only for the dominant shrub while *Distichlis spicata* is a likely associate.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1012 m, Range 281 – 1743 m
- Aspect: Flat, Variable (1), SE (1)
- Slope: Mean 8.5 degrees, Range 0 – 17 degrees
- Macro Topography: Midslope (1)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 20.1%, Range 7 – 33.2%
- Herb Cover: Mean 24.5%, Range 2 – 47%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 3%, Range 0 – 6%
- Fines Cover: Mean 43.8%, Range 0 – 87.5%
- Litter Cover: Mean 47.8%, Range 2.5 – 93%
- Geology: alluvium (1), sandstone (1)
- Soil Texture: Fine silty clay (1), Sandy loam (1)

Environment: The alliance occurs at low to high elevations around alkaline springs and dry lake beds. It occurs on midslopes and bottoms with southeast and flat aspects. Soils are fine silty clay to sandy loam derived from alluvium and sandstone.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 7 to 33.2 percent. The tree layer, if present, is sparse, and the herb layer is sparse to intermittent. Non-vascular plants, if present, are sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Sarcobatus vermiculatus* and those that are often present include *Artemisia tridentata, Atriplex canescens, Ephedra nevadensis, Ericameria nauseosa, Ericameria teretifolia, Gutierrezia sarothrae, Lycium andersonii, Lycium cooperi,* and *Opuntia basilaris.* Herbs that often present are *Achnatherum hymenoides, Amsinckia* spp.*, Bromus rubens, Bromus tectorum, Chaenactis fremontii, Chaenactis macrantha, Descurainia pinnata, Descurainia sophia, Distichlis spicata, Eriastrum* spp.*, Eriogonum palmerianum, Erodium cicutarium, Eschscholzia glyptosperma, Gilia* spp.*, Hordeum murinum, Juncus* spp.*, Lepidium lasiocarpum, Leymus cinereus, Malacothrix glabrata, Mentzelia* spp.*, Phacelia fremontii, Phacelia vallis-mortae, Sphaeralcea ambigua, Stanleya pinnata, Thelypodium integrifolium, Tridens muticus,* Unknown Graminoid (grass or grasslike)*, Vulpia* spp.

Dynamics: *Sarcobatus vermiculatus* tolerates alkaline and saline soils such as along playas and springs, localized in the Mojave Desert and Great Basin.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5

State (California): S4

References

NatureServe 2012, Sawyer et al. 2009, Thomas et al. 2004, VegCAMP 2014, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2

LAKE (n=0); DEVA (n=1): DEVA9115; MOJA (n=1): MOJC0021; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Sarcobatus vermiculatus*	100	73	11	7	15	x	x	–	–
	Ericameria nauseosa	50	12	4	8	8	–	–	–	x
	Atriplex canescens	50	9	3	6	6	–	–	–	x
	Lycium cooperi	50	4.5	1.5	3	3	–	–	–	x
	Artemisia tridentata	50	0.3	0.1	0.2	0.2	–	–	–	x
	Ephedra nevadensis	50	0.3	0.1	0.2	0.2	–	–	–	x
	Ericameria teretifolia	50	0.3	0.1	0.2	0.2	–	–	–	x
	Gutierrezia sarothrae	50	0.3	0.1	0.2	0.2	–	–	–	x
	Lycium andersonii	50	0.3	0.1	0.2	0.2	–	–	–	x
	Opuntia basilaris	50	0.3	0.1	0.2	0.2	–	–	–	x
Herb	Unknown Graminoid (grass or grasslike)	50	23	15	30	30	–	–	–	x
	Leymus cinereus	50	16	11	21	21	–	–	–	x
	Juncus	50	4.7	3	6	6	–	–	–	x
	Bromus rubens	50	1.6	1	2	2	–	–	–	x
	Gilia	50	0.5	0.3	0.6	0.6	–	–	–	x
	Mentzelia	50	0.3	0.2	0.4	0.4	–	–	–	x
	Achnatherum hymenoides	50	0.2	0.1	0.2	0.2	–	–	–	x
	Amsinckia	50	0.2	0.1	0.2	0.2	–	–	–	x
	Bromus tectorum	50	0.2	0.1	0.2	0.2	–	–	–	x
	Chaenactis fremontii	50	0.2	0.1	0.2	0.2	–	–	–	x
	Chaenactis macrantha	50	0.2	0.1	0.2	0.2	–	–	–	x
	Descurainia pinnata	50	0.2	0.1	0.2	0.2	–	–	–	x
	Descurainia sophia	50	0.2	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Distichlis spicata*	50	0.2	0.1	0.2	0.2	–	–	–	x
	Eriastrum	50	0.2	0.1	0.2	0.2	–	–	–	x
	Eriogonum palmerianum	50	0.2	0.1	0.2	0.2	–	–	–	x
	Erodium cicutarium	50	0.2	0.1	0.2	0.2	–	–	–	x
	Eschscholzia glyptosperma	50	0.2	0.1	0.2	0.2	–	–	–	x
	Hordeum murinum	50	0.2	0.1	0.2	0.2	–	–	–	x
	Lepidium lasiocarpum	50	0.2	0.1	0.2	0.2	–	–	–	x
	Malacothrix glabrata	50	0.2	0.1	0.2	0.2	–	–	–	x
	Phacelia fremontii	50	0.2	0.1	0.2	0.2	–	–	–	x
	Phacelia vallis-mortae	50	0.2	0.1	0.2	0.2	–	–	–	x
	Sphaeralcea ambigua	50	0.2	0.1	0.2	0.2	–	–	–	x
	Stanleya pinnata	50	0.2	0.1	0.2	0.2	–	–	–	x
	Thelypodium integrifolium	50	0.2	0.1	0.2	0.2	–	–	–	x
	Tridens muticus	50	0.2	0.1	0.2	0.2	–	–	–	x
	Vulpia	50	0.2	0.1	0.2	0.2	–	–	–	x

Common Name: Mojave Seablite – Red Swampfire Alkaline Wet Scrub
Group Assignment: G537; **Alliance Code:** A3880

Alliance Concept

The Mojave Seablite – Red Swampfire Alkaline Scrub Alliance forms an open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily in low lying places, but also found on slopes at a variety of aspects, but often in flats. Soils are derived primarily from alluvium and dune sand and textures range from very sandy to silty clay. Elevations range from approximately -5 to 883 meters. *Suaeda moquinii* and/or *Isocoma acradenia* is the dominant shrub, and *Schismus* spp. are often present.

Diagnostic Criteria: This alliance is characterized by an open shrub layer of *Suaeda moquinii* and/or *Isocoma acradenia*. The overall shrub cover ranges from 0 to 15 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks (LAKE, DEVA, and MOJA), though scattered within basins of low to mid elevations. The alliance was also found during map accuracy assessment field sampling at LAKE in the Overton Wash/Muddy River basin along with other alkaline-wet shrubland alliances.

States: AZ, CA, (NV)

Ecoregion Sections and Subsection Codes: Mojave Desert (17): 322Ab, 322Ae, 322Ai, (322Az), 322Ay; Southeastern Great Basin (6): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Eureka Valley, Panamint Dunes, Saline Valley**; LAKE:** Katherine, (Overton)**; MOJA:** Soda Lake, Soda Lake South, Zzyzx

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Isocoma acradenia [CEGL005465]	2	–	–	x	–
Suaeda moquinii [CEGL001991]	17	x	x	x	–
Suaeda moquinii–Atriplex canescens [CEPP006758]	4	–	x	–	–

Association Notes: The *Isocoma acradenia* association [CEGL005465] found in this desert region at MOJA had trace cover of *Suaeda moquinii*, while another association also sampled in alkaline areas of cismontane California include co-dominance of these two species. Two assocations with *Isocoma acradenia* as the dominant (CEGL005465 and CEGL005395) are ecologically similar, and with further interpretation, may need to be merged in the USNVC.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 358 m, Range -5 – 883 m
- Aspect: Flat, Variable (11), N (1), NE (1), E (2), NW (1), SE (1), W (2), SW (1)
- Slope: Mean 1.1 degrees, Range 0 – 3 degrees
- Macro Topography: High slope (2), Low level/bottom (7), Lowslope (3), Midslope (2), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 3.6 %, Range 0 – 0.6%
- Shrub Cover: Mean 7.3%, Range 2 – 15%
- Herb Cover: Mean 3.5%, Range 0 – 15%
- Large Rock: Mean 0.1%, Range 0 – 2%
- Small Rock: Mean 7.1%, Range 0 – 84%
- Fines Cover: Mean 88.1%, Range 15 – 99.6%
- Litter Cover: Mean 2.5%, Range 0.2 – 15%
- Geology: alluvium (16), dune sand (5), sand (1)
- Soil Texture: Clay loam (1), Fine sand (1), Loamy sand (2), Medium sand (3), Sand (3), Silt loam (2), Silty clay (5)

Environment: The alliance is found on playas, sand dunes/flats, and alkaline washes that have low to high slopes at all aspects. Soils are derived from primarily alluvium including sand and dune sand. Soil textures are variable. The alliance is found at low to mid elevation.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer, and the overall shrub cover ranges from 2 to 15 percent cover. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants, if present, are sparse.

Vegetation Floristics: *Suaeda moquinii* and/or *Isocoma acradenia* is the dominant shrub, and *Schismus* spp. are often present.

Dynamics: Both *Suaeda moquinii* and *Isocoma acradenia* are common shrubs around alkaline basins and adjacent sand dunes and washes in a fine-scale matrix with other related alkaline sink scrub alliances. They appear to tolerate less flooding and salinity than *Allenrolfea occidentalis* in desert and semi-desert settings, though shrubs appear to tap into available water tables.

Classification Comments

This alliance has been recently expanded to include associations with *Isocoma acradenia* as well as *Suaeda moquinii.*

Classification Confidence: Moderate

Conservation Status Rank

Global: G5

State (California): S3

References

Buck-Diaz and Evens 2011, Buck-Diaz et al. 2012, NatureServe 2012, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used for Description

MOJN: N=23

LAKE (n=1): LAKE9172

DEVA (n=13): DEVA9422, DEVA9537, DEVA9639, DEVA9641, DEVA9642, DEVA9817, DEVAS020, DEVAS026, DEVAS063, DEVAS180, MOJC0720, MOJC0721, MOJC0722

MOJA (n=9): MOJA0194, MOJA0554, MOJA0637, MOJA0644, MOJA9187, MOJA9647, MOJA9648, MOJA9652, MOJC0024

MOJN-Johnson (n=0):

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	SpeciesName	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Suaeda moquinii*	100	66	4.7	0.2	15	x	x	–	–
	Atriplex canescens	36.4	9.1	0.6	0.2	7	–	–	–	–
	Atriplex polycarpa	31.8	3.1	0.2	0.01	2	–	–	–	–
Herb	*Schismus*	50	14	1	0.2	5	–	–	–	x
	Cryptantha	31.8	5.6	0.3	0.03	3	–	–	–	–
	Unknown Forb (herbaceous, not grass nor grasslike)	31.8	12	0.3	0.44	2	–	–	–	–

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

Common Name: Yerba Mansa – Nuttall's Sunflower – Nevada Goldenrod Alkaline Wet Meadow
Group Assignment: G538; **Alliance Code:** A4247

Alliance Concept

The Yerba Mansa – Nuttall's Sunflower – Nevada Goldenrod Alkaline Wet Meadow Alliance forms an open to continuous herbaceous layer. The shrub layer is sparse and the tree layer, when present, is sparse. Stands occur in low to mid elevation springs such as Blackjack Spring, Little Sand Spring, and Surprise Spring. Elevations range from approximately 50 to 950 meters. *Anemopsis californica, Solidago confinis (=Solidago spectabilis* var. *confinis),* or *Solidago spectabilis* (*Solidago spectabilis* var. *spectabilis*) is dominant in the herbaceous layer, and *Juncus mexicanus* is often present at low cover. Shrubs that are sometimes present include *Pluchea sericea* and *Tamarix ramosissima*

Diagnostic Criteria: This alliance is characterized by an open to continuous herbaceous layer dominated or co-dominated by *Anemopsis californica, Solidago confinis,* or *Solidago spectabilis*. The overall herbaceous cover ranges from 29 to 81 percent cover.

Alliance Distribution

The alliance was sampled in DEVA in low to mid elevation springs in the Grapevine Mountains, Nelson Range, and Death Valley. It also has been observed in MOJA along Soda Lake.

States: CA

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

Park Sampling Zones: DEVA: Death Valley, Grapevine Mtns, Nelson Range; [**MOJA**: Soda Lake]

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Solidago (spectabilis var. confinis, spectabilis var. spectabilis) [CEPP006757]	4	–	x	–	–

Association Notes: Stands dominated or co-dominated by *Anemopsis californica* also have been observed in DEVA and MOJA, but they were not sampled prior to the classification analysis.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 731.8 m, Range (50) 579 – 917 m
- Aspect: (unknown)
- Slope: Mean 11.8 degrees, Range 7.4 – 18.7 degrees (GIS derived)
- Macro Topography: (unknown)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0.1%, Range 0 – 0.4%
- Herb Cover: Mean 67.8%, Range 29 – 81%
- Large Rock: (unknown)
- Small Rock: (unknown)
- Fines Cover: (unknown)
- Litter Cover: (unknown)
- Geology: (unknown)
- Soil Texture: (unknown)

Environment: The alliance was sampled in DEVA with *Solidago* sp. in low to mid elevations in often alkaline springs such as Blackjack Spring, Little Sand Spring, and Surprise Spring (Dilts and Weisberg 2010). Stands with *Anemopsis californica* also occur in alkaline spring sites such as Big Sand Springs, Furnace Creek springs, Saratoga Springs, and Travertine Springs complexes in DEVA, and along the edge of Soda Lake in MOJA.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous herbaceous layer, and the overall herbaceous cover ranges from 29 to 81 percent cover. The tree and shrub layers, when present, are sparse.

Vegetation Floristics: The dominant herb is *Anemopsis californica* or *Solidago spectabilis,* and *Juncus mexicanus* is often present.

Dynamics: *Anemopsis californica, Helianthus nuttallii,* and *Solidago spectabilis* occur in a fine-scale mosaic with other herbs and shrubs in calcareous springs in DEVA.

Classification Comments

Stands of *Anemopsis californica* and *Solidago spectabilis* (sensu lato) are related to other wetland herbaceous vegetation, including *Eleocharis rostellata* and *Juncus mexicanus.* Further sampling and analysis is needed to determine if this alliance type should remain separate or be combined with one or more other alliances.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3

State (California): S2

References

None

Surveys (with Sample Sizes) Used in Description

MOJN: N=4
LAKE (n=0)
DEVA (n=4): DEVA8047, DEVA8048, DEVA8049, DEVA8050
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Pluchea sericea*	25	13	0.1	0.2	0.2	–	–	–	–
	Tamarix ramosissima	25	13	0.1	0.2	0.2	–	–	–	–
Herb	*Solidago spectabilis*	75	55	35	21	81	x	x	–	–
	Juncus mexicanus	50	9.4	4	8	8	–	–	–	x
	Solidago spectabilis var. confinis	25	17	14	55	55	–	–	–	–
	Lythrum californicum	25	9	7.3	29	29	–	–	–	–
	Eleocharis rostellata	25	4.1	3.3	13	13	–	–	–	–
	Typha	25	3.1	2.5	10	10	–	–	–	–
	Jucus cooperi	25	1.2	1	4	4	–	–	–	–
	Sisyrinchium funereum	25	1.3	1	4	4	–	–	–	–

Common Name: California Sawgrass Alkaline Seep
Group Assignment: G538; **Alliance Code:** A4164

Alliance Concept

The California Sawgrass Alkaline Seep Alliance forms an intermittent to continuous herbaceous layer. The shrub layer is open and the tree layer, when present, is sparse. Soils are alluvium or derived from sandstone. Stands occur in alkali springs along slopes, alkali marshes and meadows, and washes with carbonate rock water discharges at low elevation. Elevation ranges from approximately 220 to 440 meters. The dominant herb is *Cladium californicum,* and other herbs include *Anemopsis californica, Cirsium neomexicanum, Distichlis spicata, Eleocharis rostellata, Juncus arcticus, Samolus valerandi* ssp. *parviflorus, Schoenoplectus americanus,* and *Solidago spectabilis.* Associated emergent shrubs at sparse to open cover include *Pluchea sericea, Allenrolfea occidentalis, Baccharis sergiloides,* and *Vitis arizonica* and sometimes emergent trees such as *Washingtonia filifera* and *Prosopis* spp.

Diagnostic Criteria: This alliance is characterized by a continuous herbaceous layer dominated by *Cladium californicum.* Other herbs present in one sample include *Anemopsis californica, Cirsium neomexicanum, Distichlis spicata, Eleocharis rostellata, Juncus arcticus, Samolus valerandi* ssp. *parviflorus, Schoenoplectus americanus,* and *Solidago spectabilis*. The overall herbaceous cover ranges from 85 to 97 percent cover.

Alliance Distribution

The alliance was sampled at low elevations, including at Rogers Wash near Echo Bay in LAKE and mapped in the Nevares Springs complex (at Ratatat Spring) and Cow Springs in DEVA.

States: CA, NV

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

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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Cladium californicum Seep (provisional) [CEGL009683]	2	x	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 331.7 m, Range 220 – 443 m

- Aspect: (unknown)
- Slope: (unknown)
- Macro Topography: (unknown)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 3.0%, Range 0 – 6.1%
- Herb Cover: Mean 91.2%, Range 85 – 97.4%
- Large Rock: Mean %, Range – % (unknown)
- Small Rock: Mean %, Range – % (unknown)
- Fines Cover: Mean 0%, Range 0 – 0%
- Litter Cover: Mean 0%, Range 0 – 0%
- Geology: sandstone (1)
- Soil Texture: (unknown)

Environment: The alliance occurs at low elevations at alkali springs along slopes, alkali marshes and meadows, and washes that have water discharges from carbonate rock aquifers. Soils are alluvium or derived from sandstone.

Vegetation Description

Vegetation Structure: The alliance forms a continuous herbaceous layer and the overall herbaceous cover ranges from 85 to 97 percent cover. The shrub layer is sparse to open. The tree layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: The dominant herb is *Cladium californicum,* and other herbs present in one sample include *Anemopsis californica, Cirsium neomexicanum, Distichlis spicata, Eleocharis rostellata, Juncus arcticus, Samolus valerandi* ssp. *parviflorus, Schoenoplectus americanus,* and *Solidago spectabilis.* The shrub layer is emergent, sparse, and can include *Pluchea sericea, Allenrolfea occidentalis, Baccharis sergiloides,* and *Vitis arizonica,* and sometimes emergent trees such as *Prosopis* spp.

Dynamics: *Cladium californicum* is tolerant of alkalinity, occurring along alkali springs and washes with calcareous water discharges as small stands in fine-scale mosaics with other herbs, shrubs and trees. Stands may be impacted by emergent non-native palms in the region including *Washingtonia filifera*. However, *C. californicum* also is found in freshwater seeps, along with *Schoenoplectus americanus*.

Classification Comments

Stands of *Cladium californicum* are rare, and occur in a matrix with other wetland herbaceous and shrubland vegetation including in this group G538 plus the Arid West Interior Freshwater Marsh Group (G531), North American Warm Desert Riparian Low Bosque & Shrubland Group (G533), and other shrubland groups. The placement of this alliance in the USNVC hierarchy is uncertain because of its rarity and discontinuous distribution in desert seeps and spring-fed washes of Arizona to California and Nevada, with closest affinities to both G538 and G533.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G4

State (California): S1

References

NatureServe 2010

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)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Pluchea sericea*	50	30	1.9	3.7	3.7	–	–	–	x
	Allenrolfea occidentalis	50	14	0.9	1.7	1.7	–	–	–	x
	Vitis arizonica	50	5.7	0.3	0.7	0.7	–	–	–	x
Herb	*Cladium californicum*	100	97	88	85	91	x	x	–	–
	Distichlis spicata	50	0.7	0.6	1.3	1.3	–	–	–	x
	Eleocharis rostellata	50	0.5	0.5	1	1	–	–	–	x
	Anemopsis californica	50	0.4	0.3	0.7	0.7	–	–	–	x
	Cirsium neomexicanum	50	0.4	0.3	0.7	0.7	–	–	–	x
	Juncus arcticus	50	0.4	0.3	0.7	0.7	–	–	–	x
	Samolus valerandi ssp. parviflorus	50	0.4	0.3	0.7	0.7	–	–	–	x
	Solidago spectabilis var. confinis	50	0.4	0.3	0.7	0.7	–	–	–	x
	Schoenoplectus americanus	50	0.2	0.2	0.3	0.3	–	–	–	x

Common Name: Saltgrass Alkaline Wet Meadow
Group Assignment: G538; **Alliance Code:** A1332

Alliance Concept

The Saltgrass Alkaline Wet Meadow Alliance forms an open to continuous herbaceous layer. The shrub layer is open and the tree layer is sparse. The alliance is found primarily from basin floor wetlands to lowslopes at all aspects, occurring along the margins of alkaline calcareous springs, moist meadows, marshes, ponds, and flats associated with playa edges. Soils are derived from alluvium and felsic volcanic rock and textures are variable though usually clayey. Soils are typically deep, poorly drained, intermittently saturated, and alkaline-saline. Elevations range from approximately -80 to 1100 meters. The dominant or co-dominant herb is *Distichlis spicata* and/or *Juncus cooperi.* Commonly associated emergent shrubs at sparse to open cover include *Suaeda moquinii.*

Diagnostic Criteria: This alliance is characterized by an open to continuous herbaceous layer with *Distichlis spicata* and/or *Juncus cooperi* dominant or co-dominant with plants including other *Juncus* spp. The overall herbaceous cover ranges from 4 to 98 percent cover.

Alliance Distribution

The alliance was sampled at DEVA and MOJA. It is scattered in MOJA at low elevations including along the edges of Soda Lake near Zzyzx Rd, and is scattered in DEVA around playas and springs including as at low-lying alkali flats, seeps, and meadows in the Tecopa, Shoshone, and Death valleys. Small stands have also been observed during map accuracy assessment at LAKE in alkaline/salt basin areas such as the Overton Wash/Muddy River basin.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (11): 322Ab, 322Ai

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Last Chance Vlly**; MOJA:** Soda Lake, Zzyzx; (**LAKE:** Overton)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Distichlis spicata [CEGL001770]	4	–	x	x	–
Distichlis spicata–Juncus balticus var. littoralis [CEPP006700]	2	–	x	x	–
Distichlis spicata–Juncus cooperi [CEPP006701]	1	–	x	–	–
Juncus cooperi [CEPP006712]	4	–	–	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 291.3 m, Range -82 – 950 m
- Aspect: Flat, Variable (1), E (1), NE (2), SW (1), Flat, Variable (1), S (3)
- Slope: Mean 1 degrees, Range 0 – 3 degrees
- Macro Topography: Basin floor/wetland (1), Low level/bottom (6), Lowslope (1)
- Tree Cover: Mean 0.2%, Range 0 – 1%
- Shrub Cover: Mean 1.9%, Range 0 – 6.2%
- Herb Cover: Mean 30.3%, Range 4 – 95%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 1.9%, Range 0 – 10%
- Fines Cover: Mean 80.7%, Range 5 – 100%
- Litter Cover: Mean 1.6%, Range 0 – 5%
- Geology: alluvium (8), felsic volcanic rock (2), sandsone (1)
- Soil Texture: Clay (2), Loamy sand (2), Medium silt (1), Muck (1), Silty clay (3)

Environment: The alliance occurs at low to upper elevations primarily on bottoms, wetlands, lowslope springs, and playas that are typically alkaline and intermittently and seasonally flooded. It is particularly found in areas with high water tables (within 1–2 m of the ground surface). The alliance can be found at all aspects. Soils are derived from alluvium and felsic volcanic rock and textures are variable. Soils are typically deep, alkaline-saline and poorly drained.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous herbaceous layer, and the overall herbaceous cover ranges from 4 to 95 percent cover. The tree layer is typically sparse and the shrub layer is sparse to open. Non-vascular plants, when present, are sparse.

Vegetation Floristics: Dominant herbs include *Distichlis spicata* and/or *Juncus cooperi.* The shrub layer is emergent and typically or often includes *Suaeda moquinii*.

Dynamics: *Distichlis spicata*, once established, can grow in soils that vary greatly in salinity. However, seedling establishment requires high temperature, moist soil, and low salinity. *Distichlis spicata* has a high ability to sprout after disturbance. Stands with *Juncus cooperi* dominant or co-dominant typically associate with other species of low-lying alkali calcareous seeps or meadows such as *Distichlis spicata*. Adjacent alliances include *Allenrolfea occidentalis, Atriplex canescens, Atriplex polycarpa, Atriplex spinifera, Juncus cooperi, Phragmites australis, Pluchea sericea, Prosopis glandulosa, Prosopis pubescens, Sarcobatus vermiculatus, Schoenoplectus americanus,* and *Sporobolus airoides.* Stands may decrease in cover due to groundwater pumping during droughts in this region.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S4

References

Atwater et al. 1979, Bradley 1970, Buck-Diaz et al. 2012, Ferren and Davis 1991, Hickson and Keeler-Wolf 2007, Junak et al. 2007, Keeler-Wolf and Evens 2006, Keeler-Wolf and Vaghti 2000, Keeler-Wolf et al. 2003a, NatureServe 2007, Newton 1989, Odion et al. 1992, Peinado et al. 1994, Pickart 2006, Sawyer et al. 2009, Solomeshch and Barbour 2006, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=11

LAKE (n=0)

DEVA (n=4): DEVA0617, DEVA8054, DEVA8055, DEVA9193, DEVA9451, MOJC0053

MOJA (n=3): MOJA9185, MOJA9186, MOJA9198, MOJA9550, MOJA9552

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Suaeda moquinii*	45	11	0.2	0.2	1	–	–	–	x
	Tamarix ramosissima	27	17	0.2	0.2	1	–	–	–	–
	Isocoma acradenia	27	10	0.2	0.2	1	–	–	–	–
Herb	*Distichlis spicata*	91	52	17	4	35	x	x	–	–
	Juncus cooperi	55	25	19	3	60	–	–	–	–
	Phragmites australis	27	3.6	2	2	17	–	–	–	–
	Typha	27	2.2	1.7	0.2	18	–	–	–	–

Common Name: Common Spikerush and Beaked Spikerush Herbaceous Stands
Group Assignment: G538; **Alliance Code:** A3930

Alliance Concept

The Common and Beaked Spikerush Herbaceous Alliance forms an intermittent to continuous herbaceous layer. The shrub and tree layers are typically absent or sparse. The alliance occurs along alkali calcareous, spring-fed slopes at upper elevations in DEVA, and elevations range from approximately 1600 to 1700 meters. The dominant and characteristic herb is *Eleocharis rostellata,* and *Solidago spectabilis* is often present at low cover.

Diagnostic Criteria: The alliance is characterized by an intermittent to continuous herb layer dominated by *Eleocharis rostellata*. The overall herbaceous cover ranges from 44 to 81 percent.

Alliance Distribution

The alliance was sampled at upper elevations in the Grapevine Mountains and Last Chance Range, and in the Nevares Springs, Texas Spring and Travertine Springs complex, in DEVA. Stands are likely to be found also at LAKE in alkaline areas.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): (322Ab), Southeastern Great Basin (2): 341Fc, 341Fd

Park Sampling Zones: DEVA: (Death Valley,) Grapevine Mtns, Last Chance Range

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Eleocharis rostellata [CEGL003428]	2	–	x	–	–

Association Notes: The *Eleocharis rostellata* alliance was also noted at springs in DEVA by Sada and Cooper (2012), as the *Eleocharis rostellata – Schoenus nigricans* community. Additionally, two community types of *Eleocharis rostellata* with *Schoenoplectus americanus* and with *Muhlenbergia asperifolia* have been defined previously from the Fish Slough area by Odion et al. (1992), while a more generic *Eleocharis rostellata* association has been defined more recently from the same area by VegCAMP (2014).

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1794 m, Range 1650 m–2040 m
- Aspect: Southeast (2)
- Slope: Mean 13.6 degrees, Range 2.3 – 20.8 degrees (GIS derived)

- Macro Topography: Midslope (2)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0%, Range 0 – 0%
- Herb Cover: Mean 62.5%, Range 44 – 81%
- Large Rock: (unknown); Small Rock: (unknown); Fines Cover: (unknown); Litter Cover: (unknown)
- Geology: Limestone and Dolomite (2); Soil Texture: (unknown)

Environment: The alliance occurs at upper elevations in DEVA along spring-fed slope seeps that can be alkaline and calcareous, including at Black Spot Spring east of Grapevine Peak and Last Chance Springs east of Last Chance Mountain. It also was sampled and described in DEVA at Nevares Springs, Texas Spring, and Travertine Springs complex in wet meadows and seeps; stands occur in areas of sheet flow and springbrooks with flows of small perennial channels (Sada and Cooper 2012).

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous herbaceous layer, and the overall herbaceous cover ranges from 44 to 81 percent cover. The tree and shrub layers, when present, are typically sparse. Non-vascular plants are typically sparse to open.

Vegetation Floristics: The dominant and characteristic herb is *Eleocharis rostellata,* and *Solidago spectabilis* is present at low cover.

Dynamics: *Eleocharis rostellata* occurs as small stands in a fine-scale mosaic with other herbs, shrubs, and trees in springs including those with alkaline calcareous soils (e.g., travertine) in DEVA.

Classification Comments

Stands of *Eleocharis rostellata* have been defined in a mixed alliance with other spikerushes such as *E. macrostachya, E. palustris,* and *E. quinqueflora* per NatureServe (2012). Stands of *E. rostellata* and *E. palustris* can be found distinctly in alkaline semi-desert settings, while *E. quineflora* stands are often found in alkaline montane wet meadow and fen settings, and *E. macrostachya* stands occur in valley to montane wetland settings. We have recommended that *E. rostellata* be included with *E. palustris* at the alliance level in this alkaline-saline group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: GNR
State (California): S2S3

References

NatureServe 2012, cf. Sawyer et al. 2009, VegCAMP 2014

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0); DEVA (n=2): DEVA8052, DEVA8053; MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Eleocharis rostellata*	100	94	58	44	72	x	x	–	–
	Solidago spectabilis	50	6	4.5	9	9	–	–	–	x
	Cirsium mohavense	50	0.1	0.5	0	1	–	–	–	x

Common Name: Alkali Sacaton – Scratchgrass – Alkali Cordgrass Alkaline Wet Meadow
Group Assignment: G538; **Alliance Code:** A1334

Alliance Concept

The Alkali Sacaton – Scratchgrass – Alkali Cordgrass Alkaline Wet Meadow Alliance forms an open to intermittent herbaceous layer. The shrub layer is open and the tree layer is sparse. The alliance is found primarily on low level bottoms and valleys. It occurs along alkaline meadow margins, washes, springs, and playa bottoms. Soils are derived from alluvium or aeolian sand deposits, and texture is sandy loam. Elevations range from approximately 100 to 1500 meters. The dominant herb is *Sporobolus airoides, Muhlenbergia asperifolia,* or *Spartina gracilis.* Other herbs present at lower cover include *Achnatherum hymenoides, Bromus rubens, Bouteloua eriopoda, Bouteloua gracilis, Lupinus* spp., *Amsinckia* spp., *Calochortus* spp., *Chaetopappa ericoides, Eriastrum* spp., *Gaura coccinea, Lepidium lasiocarpum, Salsola* spp., and *Sphaeralcea ambigua.* Commonly associated emergent shrubs at sparse to open cover include *Gutierrezia sarothrae, Lycium cooperi, Ephedra nevadensis, Ericameria cooperi, Lycium andersonii, Opuntia polyacantha* var. *erinacea, Psilostrophe cooperi,* and *Stephanomeria pauciflora.* In the tree layer, *Yucca brevifolia* may be present at sparse cover.

Diagnostic Criteria: This alliance is characterized by an open to intermittent herbaceous layer dominated by *Sporobolus airoides* in the stands sampled, though *Muhlenbergia asperifolia* or *Spartina gracilis* can be dominant or co-dominant in other stands. The herbaceous cover ranges from 21 to 66 percent cover.

Alliance Distribution

The alliance was sampled at low elevations such ast at the Travertine East spring area in DEVA and at small seasonally wet site in a higher elevation valley in the New York Mountains in MOJA. It also was mapped in the Travertine Springs complex (Thomas 2006). Stands are likely to be found also at LAKE in alkaline basin areas, and it was sampled once during map accuracy assessment in a seasonally wet wash.

States: CA, (NV)

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

Park Sampling Zones: DEVA: Death Valley; (**LAKE:** Katherine), **MOJA:** New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Sporobolus airoides [CEGL001688]	2	(x)	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 802 m, Range 123 – 1481 m
- Aspect: SW (1)
- Slope: Mean 1 degrees, Range 0 – 1 degrees
- Macro Topography: Low level/bottom (1)
- Tree Cover: Mean 0.5%, Range 0 – 1%
- Shrub Cover: Mean 2.3%, Range 0 – 4.7%
- Herb Cover: Mean 43.5%, Range 21 – 66%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 24%, Range 24 – 24%
- Fines Cover: Mean 37.5%, Range 0 – 75%
- Litter Cover: Mean 0.5%, Range 0 – 1%
- Geology: Alluvium
- Soil Texture: Sandy loam (1)

Environment: The alliance occurs at low to high elevations typically in valley bottoms or lower level sites with minor or variable aspect. It typically occurs along alkaline meadow margins, washes, springs, and playa bottoms. Stands occur where subterranean water is present year-round. Soils are sand or sandy loam, derived from alluvium or aeolian sand deposits.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent herbaceous layer, and the overall herbaceous cover ranges from 21 to 66 percent cover. The tree layer is typically sparse, and the shrub layer is sparse to open. Non-vascular plants, if present, are sparse.

Vegetation Floristics: The dominant herb is *Sporobolus airoides* in the local stands sampled. Other herbs present include *Achnatherum hymenoides, Bromus rubens, Bouteloua eriopoda, Bouteloua gracilis, Lupinus* spp., *Amsinckia* spp., *Calochortus* spp., *Chaetopappa ericoides, Eriastrum* spp., *Gaura coccinea, Lepidium lasiocarpum, Salsola* spp., and *Sphaeralcea ambigua.* Commonly associated emergent shrubs at sparse to open cover include *Gutierrezia sarothrae, Lycium cooperi, Ephedra nevadensis, Ericameria cooperi, Lycium andersonii, Opuntia polyacantha* var. *erinacea, Psilostrophe cooperi,* and *Stephanomeria pauciflora.* In the tree layer *Yucca brevifolia* can be present at sparse cover.

Dynamics: While *Sporobolus airoides* is dominant in the herbaceous layer in the stands sampled, other similar stands may have *Muhlenbergia asperifolia* or *Spartina gracilis*. The latter taxon though is often in more mesic sites, while the Many non-native species are also generally present in the herbaceous layer threatening this rare and declining alliance in California. Shrubs may be emergent and at low cover. Stands are sometimes surrounded by stands of *Atriplex canescens.* Groundwater pumping lowers waters tables and can cause stands to transition into a shrub dominated stand.

Classification Comments

Sporobolus airoides associations in our area have been grouped into the North American Desert Alkaline-Saline Marsh & Playa Group (G538) and the Intermountain Semi-Desert Grassland Group (G311) in the USNVC hierarchy. We have placed associations into one group of G538, since stands occurred primarily in seasonally wet, alkaline basins.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S3

References

Buck-Diaz et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2012, Sawyer et al. 2009, Solomeshch and Barbour 2006, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=2 [+1]
LAKE (n=0); DEVA (n=1): DEVA8090; MOJA (n=1): MOJA0234
MOJN-Johnson (n=0); [McAuliffe: MOJAA068]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	50	50	0.5	1	1	–	–	–	x
Shrub	*Gutierrezia sarothrae*	50	32	1.5	3	3	–	–	–	x
	Lycium cooperi	50	5.3	0.3	0.5	0.5	–	–	–	x
	Ephedra nevadensis	50	2.1	0.1	0.2	0.2	–	–	–	x
	Ericameria cooperi	50	2.1	0.1	0.2	0.2	–	–	–	x
	Lycium andersonii	50	2.1	0.1	0.2	0.2	–	–	–	x
	Opuntia polyacantha var. erinacea	50	2.1	0.1	0.2	0.2	–	–	–	x
	Psilostrophe cooperi	50	2.1	0.1	0.2	0.2	–	–	–	x
	Stephanomeria pauciflora	50	2.1	0.1	0.2	0.2	–	–	–	x
Herb	*Sporobolus airoides*	100	96	42	21	62	x	x	–	–
	Achnatherum hymenoides	50	0.7	0.5	1	1	–	–	–	x
	Bromus rubens	50	0.7	0.5	1	1	–	–	–	x
	Bouteloua eriopoda	50	0.4	0.3	0.5	0.5	–	–	–	x
	Bouteloua gracilis	50	0.4	0.3	0.5	0.5	–	–	–	x
	Lupinus	50	0.3	0.2	0.4	0.4	–	–	–	x
	Amsinckia	50	0.1	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Calochortus*	50	0.1	0.1	0.2	0.2	–	–	–	x
	Chaetopappa ericoides	50	0.1	0.1	0.2	0.2	–	–	–	x
	Eriastrum	50	0.1	0.1	0.2	0.2	–	–	–	x
	Gaura coccinea	50	0.1	0.1	0.2	0.2	–	–	–	x
	Lepidium lasiocarpum	50	0.1	0.1	0.2	0.2	–	–	–	x
	Salsola	50	0.1	0.1	0.2	0.2	–	–	–	x
	Sphaeralcea ambigua	50	0.1	0.1	0.2	0.2	–	–	–	x

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

G293. Sonoran Paloverde – Mixed Cacti Desert Scrub Group

Carnegiea gigantea – Parkinsonia microphylla – Prosopis velutina Desert Scrub Alliance

Common Name: Saguaro – Yellow Paloverde – Velvet Mesquite Desert Scrub
Group Assignment: G293; **Alliance Code**: A3282

Alliance Concept

The Saguaro – Yellow Paloverde – Velvet Mesquite Desert Scrub Alliance forms a sparse to intermittent shrub canopy and a sparse to intermittent herbaceous understory. It is found primarily on channel beds and walls and lowslopes to summits at all aspects. Soils are derived from a variety of substrates including conglomerate, dacite, and gravel. Soil texture ranges from sand to clay loam. Elevations range from approximately 200 to 600 meters. The dominant tall shrub is *Parkinsonia microphylla*. Commonly associated sub-canopy shrubs include *Encelia farinosa, Larrea tridentata, Acacia greggii (=Senegalia greggii),* and *Ambrosia dumosa*. Commonly associated herbs include *Amsinckia* spp.*, Cryptantha* spp.*, Gilia* spp.*, Phacelia* spp.*, Schismus* spp.*, Camissonia* spp.*, Chaenactis* spp.*, Chamaesyce* spp.*, Eriogonum inflatum, Lupinus* spp.*,* and *Plantago ovata.*

Diagnostic Criteria: This alliance is characterized by a sparse to open tall shrub (or low tree) canopy of *Parkinsonia microphylla,* which ranges from 1 to 7 percent cover. The overall tall shrub cover ranges from 1 to 7 percent cover, and the understory shrub cover is variable and sometimes higher than the tall shrub cover.

Alliance Distribution

The alliance was sampled at low elevations in LAKE west of the Black Mountains.

States: AZ

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

Park Sampling Zones: LAKE: Willow Beach

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Parkinsonia microphylla–Larrea tridentata [CEGL001375]	8	x	–	–	–

Association notes: An existing provisional association of *Parkinsonia microphylla - Larrea tridentata* exists in the USNVC, though no current description exists through NatureServe (2012+); thus, this local alliance description serves as one representation of this association.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 395.3 m, Range 242 – 604 m
- Aspect: NE (1), NW (2), SE (1), W (2), S (2)
- Slope: Mean 20.1 degrees, Range 2 – 53 degrees
- Macro Topography: Channel bed (1), Channel wall (2), High level/summit (1), Highslope (1), Lowslope (2), Midslope (1)
- Tall Shrub Cover: Mean 2.6%, Range 1 – 7%
- Subcanopy Shrub Cover: Mean 5.3%, Range 0.8 – 9.4%
- Herb Cover: Mean 3.75%, Range 1 – 7%
- Large Rock: Mean 24.625%, Range 0 – 89%
- Small Rock: Mean 69.625%, Range 10 – 96%
- Fines Cover: Mean 3.25%, Range 0 – 5%
- Litter Cover: Mean 1.375%, Range 0 – 3%
- Geology: conglomerate (5), dacite (1), gravel (2)
- Soil Texture: Clay loam (1), Loamy sand (2), Sand (2), Sandy loam (2)

Environment: The alliance was sampled at low elevations in LAKE west of the Black Mountains. It is found from channel beds to summits at all aspects. Soils range from sand to clay loam derived from conglomerate, dacite, and gravel.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to open tall shrub layer with a sparse to open subcanopy shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: The dominant tall shrub is *Parkinsonia microphylla* in the overstory. Understory shrubs that are characteristic or often present include *Larrea tridentata*, *Acacia greggii (=Senegalia greggii),* and *Ambrosia dumosa.* Herbs that are characteristic or often present include *Amsinckia* spp.*, Cryptantha* spp.*, Gilia* spp.*, Phacelia* spp.*, Schismus* spp., *Camissonia* spp.*, Chaenactis* spp.*, Chamaesyce* spp.*, Eriogonum inflatum, Lupinus* spp.*,* and *Plantago ovata*.

Dynamics: *Parkinsonia microphylla* occurs extensively in Arizona's Sonoran Desert and occurs minimally in the Mojave Desert of western Arizona and southeastern California along the Colorado River where precipitation is bimodal (winter and summer). *Larrea tridentata* and a diversity of other shrubs occur with *P. microphylla*.

Classification Comments

The USNVC currently recognizes this as a shrubland alliance, though field observers collecting data for this project identified *Parkinsonia microphylla* as a low tree. Since this plant has taller stature and appears tree-like, we have described it as forming a tall shrub canopy.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S2

References

Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=8

LAKE (n=8): LAKE0104, LAKE0203, LAKE0205, LAKE0302, LAKE0633, LAKE9103, LAKE9630, LAKE9632

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

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Parkinsonia microphylla*	100	100	2.6	1	7	x	x	–	–
	Encelia farinosa	100	38	2.2	0.2	7	x	–	x	–
	Larrea tridentata	100	24	1.2	0.2	3	x	–	–	–
	Ambrosia dumosa	62	9.4	0.4	0.2	1	–	–	–	x
	Acacia greggii	62	5.4	0.1	0.2	0.2	–	–	–	x
	Krameria erecta	38	1.2	0.1	0.2	0.2	–	–	–	–
	Peucephyllum schottii	25	10	0.5	0.2	4	–	–	–	–
	Ephedra nevadensis	25	3.4	0.3	1	1	–	–	–	–
	Hymenoclea salsola	25	2.7	0.1	0.2	0.5	–	–	–	–
	Eriogonum fasciculatum	25	0.7	0.1	0.2	0.2	–	–	–	–
	Eucnide urens	25	1.2	0.1	0.2	0.2	–	–	–	–
	Psorothamnus fremontii	25	0.7	0.1	0.2	0.2	–	–	–	–
Herb	*Amsinckia*	88	8.4	0.7	0.2	2	x	–	–	–
	Cryptantha	75	21	1.7	0.6	3	x	–	–	–
	Gilia	75	10	0.6	0.6	1.8	x	–	–	–
	Phacelia	75	6.7	0.4	0.4	0.8	x	–	–	–
	Schismus	75	3	0.2	0.2	0.2	x	–	–	–
	Plantago ovata	62	8.1	0.6	0.2	2	–	–	–	x
	Chaenactis	62	4.3	0.3	0.4	0.4	–	–	–	x
	Lupinus	62	3.8	0.3	0.4	0.4	–	–	–	x
	Camissonia	50	3.3	0.2	0.4	0.4	–	–	–	x
	Chamaesyce	50	1.6	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eriogonum inflatum*	50	1.5	0.1	0.2	0.2	–	–	–	x
	Unknown Forb	38	6.1	0.7	1.6	2.4	–	–	–	–
	Erodium cicutarium	38	0.8	0.1	0.2	0.2	–	–	–	–
	Eschscholzia	38	1.5	0.1	0.2	0.2	–	–	–	–
	Lepidium lasiocarpum	38	1.2	0.1	0.2	0.2	–	–	–	–
	Phacelia crenulata	38	0.6	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	38	1.6	0.1	0.2	0.2	–	–	–	–
	Mentzelia	25	1.4	0.1	0.4	0.4	–	–	–	–
	Astragalus	25	0.5	0.1	0.2	0.2	–	–	–	–
	Eriogonum deflexum	25	1.3	0.1	0.2	0.2	–	–	–	–
	Perityle emoryi	25	1.9	0.1	0.2	0.2	–	–	–	–
	Salvia columbariae	25	1.1	0.1	0.2	0.2	–	–	–	–
	Xylorhiza tortifolia	25	0.5	0.1	0.2	0.2	–	–	–	–

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

Common Name: White Bursage Scrub
Group Assignment: G295; **Alliance Code:** A3279

Alliance Concept

The White Bursage Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically not present, and the herbaceous layer is sparse to open. The alliance is found primarily on rocky slopes and alluvial fans at all aspects. Soils are derived from a variety of substrates including sandstone, rhyolite, basalt, and alluvium, and textures are variable. Elevations range from approximately 250 to 1600 meters. *Ambrosia dumosa* is dominant and characteristic in the shrub layer, and those that are often present include *Larrea tridentata. Bromus rubens, Schismus* spp., and *Eriogonum inflatum* are often present in the herbaceous layer. Cryptogamic crust is frequently associated with this alliance.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ambrosia dumosa* dominant. The overall shrub cover ranges from 4 to 34 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout the parks at low to high elevation.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (27): 322Ab, 322Ac, 322Ad, 322Af, 322Ai, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (4): 341Fc, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, East of Chloride City, Last Chance Range, Last Chance Vlly, Owlshead Mtns, Panamint Mtns**; LAKE:** Boulder City, Callville, Echo Bay, Gold Butte, Katherine, Senator Mountain NW, Temple Bar, Willow Beach**; MOJA:** Devil's Playground, HackberryVontrigger

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ambrosia dumosa [CEGL005074]	43	x	x	x	x
Ambrosia dumosa (alliance)	1	–	x	–	–
Ambrosia dumosa–Ephedra torreyana(–Psorothamnus fremontii) [CEPP005789]	7	x	–	–	–

Association Notes: Another stand was sampled with *Ambrosia dumosa* dominant in the shrub layer by Root (1978), displaying additional variation than the associations listed.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 845.9 m, Range 264 – 1615 m
- Aspect: N (5), NE (3), E (7), NW (2), SE (6), SW (4), W (9), S (11)
- Slope: Mean 11.75 degrees, Range 0 – 36 degrees
- Macro Topography: Channel bed (4), High level/summit (3), High slope (4), Low level/bottom (4), Lowslope (2), Midslope (6), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 10.8%, Range 4.2 – 33.5%
- Herb Cover: Mean 5.4%, Range 0 – 27%
- Large Rock: Mean 14.5%, Range 0 – 92%
- Small Rock: Mean 60.6%, Range 8 – 100%
- Fines Cover: Mean 22.9%, Range 0 – 87%
- Litter Cover: Mean 1.0%, Range 0 – 5%
- Geology: alkali-granite (alaskite) (1), alluvium (3), basalt (3), claystone (1), conglomerate (2), dolostone (dolomite) (1), dune sand (1), gneiss (2), granodiorite (1), gravel (1), rhyolite (3), sandstone (10), sedimentary (gypsum) (1)
- Soil Texture: Clay loam (2), Fine sandy clay (1), Loamy sand (5), Medium to very fine sandy loam (2), Moderately fine silty clay loam (1), Sand (4), Sandy clay (1), Sandy loam (2)

Environment: The alliance is found primarily on rocky slopes and alluvial fans at all aspects. Soils are derived from a variety of substrates including sandstone, rhyolite, and basalt and textures are variable. The alliance is found from low to high elevation.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 4 to 34 percent. The tree layer is typically not present, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Elevations range from approximately 250 to 1600 meters. The dominant and characteristic shrub is *Ambrosia dumosa,* and those that are often present at lower cover include

Larrea tridentata. Bromus rubens, Schismus spp., and *Eriogonum inflatum* are often present. Cryptogamic crust is frequently associated with this alliance.

Dynamics: *Ambrosia dumosa* is a relatively short-lived shrub with shallow roots. It tends to replace *Larrea tridentata* on soils with high clay content and with strong caliche layers, and it can colonize and dominate recently disturbed upland sites.

Classification Comments
None.

Classification Confidence of Alliance: High

Conservation Status Rank
Global: G5
State (California): S4

References
Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description
MOJN: N=51
LAKE (n=19): LAKE0126, LAKE0148, LAKE0207, LAKE0208, LAKE0233, LAKE0234, LAKE0322, LAKE0325, LAKE9136, LAKE9145, LAKE9186, LAKE9210, LAKE9279, LAKE9323, LAKE9324, LAKE9344, LAKE9361, LAKE9402, LMJOA042
DEVA (n=9): DEVA0312, DEVA0821, DEVA9311, DEVA9426, DEVA9544, DEVAR087, DEVAS108, MOJC0375, MOJC0691
MOJA (n=3): MOJA9547, MOJC1203, MOJC1204
MOJN-Johnson (n=20): MOJJE107, MOJJE123, MOJJE138, MOJJE139, MOJJE141, MOJJE162, MOJJE212, MOJJE233, MOJJE302, MOJJE343, MOJJE351, MOJJE443, MOJJE492, MOJJE493, MOJJE494, MOJJE526, MOJJE599, MOJJE5T3, MOJJE914, MOJJE918

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ambrosia dumosa*	100	54	6	0.5	24	x	x	–	–
	Larrea tridentata	76.7	3.9	0.4	0.2	2	x	–	–	–
	Krameria erecta	46.7	2.8	0.3	0.2	2	–	–	–	–
	Opuntia basilaris	36.7	1.5	0.1	0.2	1	–	–	–	–
	Stephanomeria pauciflora	33.3	0.9	0.1	0.1	0.5	–	–	–	–
	Amphipappus fremontii	30	2.3	0.3	0.2	3	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Psorothamnus fremontii*	26.7	3.2	0.3	0.2	3	–	–	–	–
	Eriogonum fasciculatum	26.7	1.4	0.1	0.2	1	–	–	–	–
Herb	*Bromus rubens*	56.7	8.1	0.3	0.2	3	–	–	–	x
	Eriogonum inflatum	53.3	4.3	0.1	0.1	0.5	–	–	–	x
	Schismus	50	6.7	0.5	0.2	5	–	–	–	x
	Xylorhiza tortifolia	40	3.9	0.1	0.2	1	–	–	–	–
	Cryptantha	36.7	6.8	0.3	0.6	3	–	–	–	–
	Erodium cicutarium	33.3	3.1	0.2	0.2	2	–	–	–	–
	Gilia	33.3	3.7	0.2	0.6	1.2	–	–	–	–
	Pleuraphis rigida	33.3	4.4	0.2	0.2	2	–	–	–	–
	Mentzelia	33.3	2	0.1	0.4	0.4	–	–	–	–
	Sphaeralcea ambigua	33.3	1.7	0.1	0.2	0.5	–	–	–	–
	Rafinesquia neomexicana	33.3	1.3	0.1	0.2	0.2	–	–	–	–
	Plantago ovata	26.7	3.7	0.3	0.2	3.7	–	–	–	–
Non-vasc	Cryptogamic crust	53.3	52	0.9	0.2	5	–	–	–	x

Common Name: Teddy-bear Cholla Shrubland
Group Assignment: G295; **Alliance Code:** A3146

Alliance Concept

The Teddy-bear Cholla Shrubland Alliance forms an open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is open. The alliance is found primarily on rocky slopes and flat lands at various aspects. Soils are derived from a variety of substrates including alkali-granite (alaskite), gneiss, and rhyolite and textures include clay loam, sand, and silt loam. Elevations range from approximately 400 to 700 meters. This alliance is characterized by *Cylindropuntia bigelovii* (=*Opuntia bigelovii*) dominant or co-dominant with *Ambrosia dumosa, Encelia farinosa,* and *Larrea tridentata*. Also, *Eriogonum fasciculatum, Bebbia juncea, Ferocactus cylindraceus, Krameria erecta,* and *Opuntia basilaris* are characteristic at low cover and are often accompanied by *Acacia greggii (=Senegalia greggii).* Dominant and characteristic herbs include *Amsinckia* spp.*, Chorizanthe brevicornu, Eriogonum inflatum, Phacelia crenulata, Plantago ovata,* and *Schismus* spp.*,* and those often present are *Chaenactis* spp.*, Cryptantha* spp.*, Gilia* spp.*, Lepidium lasiocarpum.* Cryptogammic crust is often present in the alliance.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Cylindropuntia bigelovii* (=*Opuntia bigelovii*) dominant or co-dominant with other shrubs including *Ambrosia dumosa, Encelia farinosa, Eriogonum fasciculatum, Ferocactus cylindraceus,* and *Larrea tridentata*. The overall shrub cover ranges from 10 to 13 percent.

Alliance Distribution

This alliance is localized to the Newberry and El Dorado Mountains of western LAKE, especially the Cottonwood Cove region at low to mid elevations.

States: NV

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

Park Sampling Zones: LAKE: Cottonwood Cove, Katherine

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Cylindropuntia bigelovii [CEGL003065]	8	x	–	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 547 m, Range 439 – 670 m

- Aspect: N (1), E (2), SE (2), W (1), SW (1), S (1)
- Slope: Mean 13.0 degrees, Range 3 – 35 degrees
- Macro Topography: High level/summit (1), High slope (5), Midslope (2)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 11.6%, Range 9.8 – 12.8%
- Herb Cover: Mean 3.1%, Range 2 – 4%
- Large Rock: Mean 11.5%, Range 0 – 40%
- Small Rock: Mean 83.6%, Range 57.0 – 96.0%
- Fines Cover: Mean 1.5%, Range 0 – 3.0%
- Litter Cover: Mean 2.4%, Range 1.0 – 5.0%
- Geology: alkali-granite (alaskite) (2), andesite (1), gneiss (4), rhyolite (1)
- Soil Texture: Clay loam (2), Sand (1), Sandy loam (1), Silt loam (1)

Environment: The alliance is found primarily on rocky slopes and flat lands at various aspects. Soils are derived from a variety of substrates including alkali-granite (alaskite), gneiss, and rhyolite and textures include clay loam, sand, and silt loam. The alliance was found at low to mid elevation.

Vegetation Description

Vegetation Structure: The Teddy Bear Cholla Patches Shrubland Alliance forms an open shrub layer, and the overall shrub cover ranges from 10 to 13 percent. The tree layer is typically not present and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics This alliance is characterized by stands of *Cylindropuntia bigelovii* (=*Opuntia bigelovii*)*, Ambrosia dumosa, Encelia farinosa,* and *Larrea tridentata* at >1 percent cover with *Cylinropuntia bigelovii* dominant or co-dominant. *Eriogonum fasciculatum, Bebbia juncea, Ferocactus cylindraceus, Krameria erecta,* and *Opuntia basilaris* are also characteristic at low cover and are often accompanied by *Acacia greggii (=Senegalia greggii).* Dominant and characteristic herbs include *Amsinckia* spp.*, Chorizanthe brevicornu, Eriogonum inflatum, Phacelia crenulata, Plantago ovata,* and *Schismus* spp.*,* and those often present are *Chaenactis* spp.*, Cryptantha* spp.*, Gilia* spp.*, Lepidium lasiocarpum.* Cryptogammic crust is often present in the alliance.

Dynamics: *Cylindropuntia bigelovii* occurs on exposed rocky rolling hills, ridges, and flats in localized settings of the warmest southerly subsections of the Mojave Desert into the adjacent Colorado and Sonoran Deserts.

Classification Comments

Encelia farinosa and *Larrea tridentata* are common associates in the *Cylindropuntia bigelovii* (=*Opuntia bigelovii*) Shrubland Alliance, and the mixed alliance of these two species are typically found adjacent to this cholla alliance.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S3

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 2005, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=8

LAKE (n=8): LAKE0216, LAKE0258, LAKE0300, LAKE0442, LAKE0611, LAKE0626, LAKE9434, LAKE9612

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

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Cylindropuntia bigelovii*	100	33	3.9	2	7	x	–	x	–
	Encelia farinosa	100	29	3.3	1	5	x	–	–	–
	Larrea tridentata	100	14	1.7	0.2	4	x	–	–	–
	Ambrosia dumosa	87.5	10	1.2	0.2	5	x	–	–	–
	Ferocactus cylindraceus	87.5	1.6	0.2	0.2	0.2	x	–	–	–
	Krameria erecta	87.5	1.6	0.2	0.2	0.2	x	–	–	–
	Opuntia basilaris	87.5	1.5	0.2	0.2	0.2	x	–	–	–
	Bebbia juncea	75	1.3	0.2	0.2	0.2	x	–	–	–
	Eriogonum fasciculatum	75	1.4	0.2	0.2	0.2	x	–	–	–
	Acacia greggii	50	0.9	0.1	0.2	0.2	–	–	–	x
	Amphipappus fremontii	25	0.5	0.1	0.2	0.2	–	–	–	–
	Ephedra nevadensis	25	0.5	0.1	0.2	0.2	–	–	–	–
	Psorothamnus fremontii	25	0.5	0.1	0.2	0.2	–	–	–	–
	Stephanomeria pauciflora	25	0.5	0.1	0.2	0.2	–	–	–	–
Herb	*Plantago ovata*	87.5	3.7	0.2	0.2	0.5	x	–	–	–
	Amsinckia	87.5	3	0.2	0.2	0.2	x	–	–	–
	Eriogonum inflatum	87.5	3.4	0.2	0.2	0.2	x	–	–	–
	Schismus	87.5	3.5	0.2	0.2	0.2	x	–	–	–
	Phacelia crenulata	75	6.8	0.4	0.2	1	x	–	–	–
	Chorizanthe brevicornu	75	4.6	0.3	0.2	1	x	–	–	–
	Cryptantha	50	6.8	0.4	0.6	1.2	–	–	–	x
	Gilia	50	5.9	0.4	0.6	1.2	–	–	–	x
	Chaenactis	50	3.6	0.2	0.4	0.4	–	–	–	x
	Lepidium lasiocarpum	50	1.5	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Phacelia*	37.5	9.6	0.6	0.4	4	–	–	–	–
	Antheropeas	37.5	1.1	0.1	0.2	0.2	–	–	–	–
	Bromus rubens	37.5	1.4	0.1	0.2	0.2	–	–	–	–
	Camissonia refracta	37.5	1.3	0.1	0.2	0.2	–	–	–	–
	Chaenactis fremontii	37.5	1.1	0.1	0.2	0.2	–	–	–	–
	Chamaesyce	37.5	1.2	0.1	0.2	0.2	–	–	–	–
	Chorizanthe rigida	37.5	1.5	0.1	0.2	0.2	–	–	–	–
	Cryptantha pterocarya	37.5	1.2	0.1	0.2	0.2	–	–	–	–
	Eriogonum deflexum	37.5	1.7	0.1	0.2	0.2	–	–	–	–
	Erodium cicutarium	37.5	1.5	0.1	0.2	0.2	–	–	–	–
	Lotus	37.5	1.3	0.1	0.2	0.2	–	–	–	–
	Pectocarya recurvata	37.5	1.2	0.1	0.2	0.2	–	–	–	–
	Rafinesquia neomexicana	37.5	1.1	0.1	0.2	0.2	–	–	–	–
	Vulpia	37.5	1.2	0.1	0.2	0.2	–	–	–	–
	Cryptantha nevadensis	25	2.6	0.2	0.2	1	–	–	–	–
	Camissonia	25	1.9	0.1	0.4	0.4	–	–	–	–
	Lupinus	25	1.2	0.1	0.4	0.4	–	–	–	–
	Mentzelia	25	1.6	0.1	0.4	0.4	–	–	–	–
	Camissonia brevipes	25	1	0.1	0.2	0.2	–	–	–	–
	Chaenactis carphoclinia	25	1	0.1	0.2	0.2	–	–	–	–
	Chamaesyce polycarpa	25	0.6	0.1	0.2	0.2	–	–	–	–
	Cryptantha angustifolia	25	0.9	0.1	0.2	0.2	–	–	–	–
	Draba cuneifolia	25	0.8	0.1	0.2	0.2	–	–	–	–
	Mirabilis laevis	25	1.2	0.1	0.2	0.2	–	–	–	–
	Salvia columbariae	25	1.2	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	25	0.8	0.1	0.2	0.2	–	–	–	–
	Stylocline	25	0.9	0.1	0.2	0.2	–	–	–	–
Non-vasc	Cryptogamic crust	50	50	0.2	0.2	1	–	–	–	x

Common Name: Brittle Bush Scrub
Group Assignment: G295; **Alliance Code:** A4215

Alliance Concept

The Brittle Bush Scrub Alliance forms sparse to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to intermittent. The alliance is found on various landforms, and is often found on south to west-facing aspects along upper bajadas and lower mountain slopes. Substrates are usually rocky. Soils are derived from a variety of substrates including alkali-granite (alaskite), alluvium, volcanic, and sandstone, and textures are variable. Elevations range from approximately 200 to 1000 meters. The dominant and characteristic shrub is *Encelia farinosa.* Characteristic shrubs include *Larrea tridentata* at low cover*,* and often present is *Ambrosia dumosa. Eriogonum inflatum, Schismus* spp., and *Cryptantha* spp. are sometimes present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent shrub layer with *Encelia farinosa* dominant or co-dominant with other short shrubs including *Ambrosia dumosa*. The overall shrub cover ranges from 1 to 36 percent.

Alliance Distribution

The alliance is well-defined in sampling at LAKE, and is more scattered in the western portion of MOJA and the southern portion of DEVA. It occurs at low to mid elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (47): 322Ab, 322Ad, 322Af, 322Ai, 322Aj, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (4): 341Fe, 341Ff

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Funeral Mtns, Nelson Range, Owlshead Mtns, Panamint Mtns**; LAKE:** Boulder City, Bridge Canyon, Callville, Cottonwood Cove, Gold Butte, Katherine, Pearce Ferry, Spirit Mountain, Temple Bar, Willow Beach**; MOJA:** Granite Mtns, Halloran Spring, Old Dad Mtns, Piute Range, Zzyzx

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Encelia farinosa [CEGL001251]	23	x	x	x	x
Encelia farinosa–Ambrosia dumosa [CEGL005061]	19	x	x	x	x
Encelia farinosa–Peucephyllum schottii [CEGL005749]	12	x	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 574.1 m, Range 226 – 991 m
- Aspect: N (4), NE (4), E (10), NW (1), SE (9), SW (7), W (4), S (11)
- Slope: Mean 23.7 degrees, Range 1 – 70 degrees
- Macro Topography: Channel bed (3), Entire slope (1), High level/summit (2), High slope (4), Low level/bottom (2), Lowslope (1), Midslope (13), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0.1%, Range 0 – 3%
- Shrub Cover: Mean 11.9%, Range 1.1 – 35.5%
- Herb Cover: Mean 5.1%, Range 0 – 38%
- Large Rock: Mean 42.5%, Range 0 – 96%
- Small Rock: Mean 48.4%, Range 2 – 98%
- Fines Cover: Mean 5.7%, Range 0 – 89%
- Litter Cover: Mean 1.8%, Range 0 – 14.1%
- Geology: alkali-granite (alaskite) (9), alluvium (6), basalt (3), conglomerate (3), dacite (2), felsic volcanic rock (1), gneiss (4), granite (2), granodiorite (1), limestone (1), rhyolite (1), sandstone (10), schist (4), sedimentary (gypsum) (1), water (1)
- Soil Texture: Clay (1), Clay loam (2), Coarse sand (1), Loam (1), Loamy sand (4), Medium silt loam (2), Medium to very fine sandy loam (5), Sand (1), Sandy clay (1), Sandy loam (2), Silty clay (1)

Environment: The alliance is found on various landforms and is often found on south to west facing aspects. Substrates are usually rocky. Soils are derived from a variety of substrates including alkali-granite (alaskite), alluvium, volcanic, and sandstone, and textures are variable. The elevations range from low to mid.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to intermittent shrub layer and the overall shrub cover ranges from 1 to 36 percent. The tree layer is typically absent, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Dominant and characteristic shrubs include *Encelia farinosa*, characteristic shrubs include *Larrea tridentata,* and those that are often present include *Ambrosia dumosa. Eriogonum inflatum, Schismus* spp., and *Cryptantha* spp. are sometimes present in the herbaceous layer.

Dynamics: *Encelia farinosa* is a relatively short-lived shrub that does not tolerate sandy or clay-rich soils; it is often found dominating steep, rocky sites, especially south to west-facing aspects along upper bajadas and lower mountain slopes. In most parts of the Mojave Desert, it is a disturbance related alliance of rocky substrates including roadsides, wash margins, and recently

burned slopes, and it may occupy harsh rocky calcareous, granitic, and volcanic substrates (Thomas et al. 2004).

Classification Comments

Stands of *Encelia farinosa* that are co-dominant with *Ambrosia dumosa* are placed in this alliance. Stands with *Cylindropuntia bigeolvii* are placed in that alliance.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S4

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Minnich et al. 1993, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=53

LAKE (n=30): LAKE0257, LAKE0281, LAKE0393, LAKE0436, LAKE9154, LAKE9159, LAKE9162, LAKE9226, LAKE9265, LAKE9291, LAKE9304, LAKE9351, LAKE9363, LAKE9441, LAKE9504, LAKE9707, LAMEN009, LAMEN011, LAMEN015, LAMEN022, LAMEN026, LAMEN027, LAMEN051, LAMEN054, LAMEN056, LAMEN059, LAMEN060, LAMEN070, LAMEN112, LAMEN113

DEVA (n=15): DEVA0366, DEVA9282, DEVA9409, DEVA9411, DEVA9433, DEVAD043, DEVAS072, DEVAS164, DEVAS174, MOJC0489, MOJC0516, MOJC0517, MOJC0576, MOJC0577, MOJC0927

MOJA (n=6): MOJA0923, MOJA9166, MOJA9551, MOJA9658, MOJC0010, MOJC1050

MOJN-Johnson (n=3): MOJJE251, MOJJE288, MOJJE594

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Encelia farinosa*	100	53	6	0.5	18	x	x	–	–
	Larrea tridentata	75.5	5.5	0.6	0.05	3.7	x	–	–	–
	Ambrosia dumosa	67.3	11	1.6	0.1	16	–	–	–	x
	Eriogonum fasciculatum	42.9	3.3	0.4	0.09	3.67	–	–	–	–
	Bebbia juncea	40.8	3.1	0.3	0.2	3	–	–	–	–
	Opuntia basilaris	36.7	0.7	0.1	0.06	0.5	–	–	–	–
	Ferocactus cylindraceus	32.7	1.1	0.1	0.03	1	–	–	–	–
	Peucephyllum schottii	28.6	2.9	0.3	0.19	3	–	–	–	–
	Krameria erecta	28.6	0.7	0.1	0.11	0.95	–	–	–	–
	Ephedra nevadensis	26.5	1.8	0.2	0.13	2.06	–	–	–	–
	Krameria grayi	26.5	1.3	0.2	0.07	1.68	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Eriogonum inflatum*	49	15	0.1	0.02	0.53	–	–	–	–
	Cryptantha	30.6	7.9	0.2	0.33	3	–	–	–	–
	Schismus	30.6	3.1	0.1	0.11	2	–	–	–	–

Common Name: Ocotillo Desert Scrub
Group Assignment: G295; **Alliance Code:** cf. A3278

Alliance Concept

The Ocotillo Desert Scrub Alliance forms an open shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is open. The alliance is found on a variety of landforms, though often on older and xeric rocky bajadas and lower to mid-slopes that are exposed and rocky, in both the Sonoran Desert and southern Mojave Desert. Soils are derived from a variety of substrates including sandstone and schist and textures include clay loam, loamy sand, and sandy loam. Elevations range from approximately 600 to 750 meters. *Fouquieria splendens* is the dominant overstory plant of this alliance. Other characteristic shrubs include *Ambrosia dumosa, Ferocactus cylindraceus, Opuntia polyacantha* var. *erinacea,* and *Tiquilia canescens,* and those that are often present include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Encelia farinosa, Eriogonum fasciculatum,* and *Krameria erecta.* Characteristic herbs include *Bromus rubens, Eriogonum inflatum,* and *Sphaeralcea ambigua,* and often occuring herbs include *Antheropeas, Argythamnia neomexicana, Chorizanthe brevicornu, Cryptantha* sp.*, Dasyochloa pulchella, Erodium cicutarium, Gilia* sp.*, Lepidium lasiocarpum, Porophyllum gracile, Vulpia,* and *Xylorhiza tortifolia.* Commonly associated non-vascular plants include cryptogammic crust.

Diagnostic Criteria: This alliance is characterized by an open tree or tall-shrub layer of *Fouquieria splendens* as the dominant overstory plant. The shorter shrub layer is variable and includes *Ambrosia dumosa, Cylindropuntia acanthocarpa, Echinocereus engelmannii, Encelia farinosa, Eriogonum fasciculatum, Ferocactus cylindraceus, Krameria erecta, Opuntia polyacantha* var. *erinacea,* and/or *Tiquilia canescens*. The overall taller shrub to low tree cover ranges from 2 to 3%, and the lower shrub cover ranges from 5 to 12 percent.

Alliance Distribution

The alliance was found only at the eastern edge of LAKE at mid elevations.

States: AZ

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

Park Sampling Zones: LAKE: Parashant, Pearce Ferry, Temple Bar

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Fouquieria splendens [CEGL004452]	3	x	–	–	–
Fouquieria splendens / Encelia (farinosa, resinifera) [CEGL005118]	2	x	–	–	–

Association Notes: None

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 674.4 m, Range 632 – 735 m
- Aspect: E (1), N (1), SE (1), SW (2)
- Slope: Mean 17.4 degrees, Range 10 – 40 degrees
- Macro Topography: High level/summit (1), Midslope (4)
- Tree Cover: Mean 2.4%, Range 2 – 3%
- Shrub Cover: Mean 7.6%, Range 5.4 – 12.4%
- Herb Cover: Mean 4.8%, Range 2 – 7%
- Large Rock: Mean 34.8%, Range 0 – 94%
- Small Rock: Mean 59.8%, Range 4 – 95%
- Fines Cover: Mean 2.8%, Range 0 – 2%
- Litter Cover: Mean 0.8%, Range 0 – 2%
- Geology: conglomerate (1), sandstone (2), schist (2)
- Soil Texture: Clay loam (1), Loamy sand (1), Sandy loam (1)

Environment: The alliance is found on a variety of landforms, though is often on older and xeric, rocky upper bajadas and lower to mid-slopes that are exposed and rocky. Soils are derived from a variety of substrates including sandstone and schist and textures include clay loam, loamy sand, and sandy loam.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer and the overall shrub cover ranges from 5 to 12 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically not present.

Vegetation Floristics: *Fouquieria splendens* is the dominant overstory plant of this alliance, and often considered a tall shrub. Other characteristic shrubs include *Ambrosia dumosa, Ferocactus cylindraceus, Opuntia polyacantha* var. *erinacea,* and *Tiquilia canescens,* and those that are often present include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Encelia farinosa, Eriogonum fasciculatum,* and *Krameria erecta.* Characteristic herbs include *Bromus rubens, Eriogonum inflatum,* and *Sphaeralcea ambigua,* and often occuring herbs include *Antheropeas, Argythamnia neomexicana, Chorizanthe brevicornu, Cryptantha* sp.*, Dasyochloa pulchella, Erodium cicutarium, Gilia* sp.*, Lepidium lasiocarpum, Porophyllum gracile, Vulpia,* and *Xylorhiza tortifolia.* Commonly associated non-vascular plants include cryptogammic crust.

Dynamics: *Fouquieria splendens* is a common shrubland associate in the Sonoran Desert and rare in the Mojave Desert.

Classification Comments

Since the LAKE vegetation map placed stands with *Fouquieria splendens* dominant or co-dominant in a separate map class from stands with *Larrea tridentata – Encelia farinosa - Fouquieria splendens*

Upper Bajada & Rock Outcrop Desert Scrub Alliance (A3278), we have described these *Fouquieria* associations separate from that alliance. However, the USNVC currently places stands with *Fouquieria splendens* dominant or co-dominant within this Upper Bajada & Rock Outcrop Desert Scrub Alliance.

Some uncertainty exists whether these Mojavean stands with *Fouquieria splendens* dominant should be pulled out as a separate alliance, as it is closely related to others in this Mojave-Sonoran Bajada & Valley Desert Scrub Group, including the *Encelia farinosa* Desert Scrub Alliance, *Larrea tridentata – Encelia farinosa - Fouquieria splendens* Desert Scrub Alliance, and *Parkinsonia microphylla* Wooded Shrubland Alliance. Stands with *Fouquieria splendens* characteristically present and/or dominant in the overstory only occur in relatively hot desert areas with high summer rainfall, including the Sonoran Desert and western Grand Canyon, while the *Larrea tridentata – Encelia farinosa - Fouquieria splendens* Upper Bajada & Rock Outcrop Desert Scrub Alliance is much more wide-ranging into the Mojave Desert.

Classification Confidence of Alliance: Low

Conservation Status Rank
Global: GNR
State (California): GNR

References
NatureServe 2010, NatureServe 2012

Surveys (with Sample Sizes) Used in Description
MOJN: N=5
LAKE (n=5): LAKE0163, LAKE0373, LAKE0408, LAKE9260, LAKE9261; DEVA (n=0); MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Fouquieria splendens*	100	100	2.4	2	3	x	x	–	–
Shrub	*Ferocactus cylindraceus*	100	6.4	0.5	0.2	1	x	–	–	–
	Tiquilia canescens	80	8.3	0.7	0.2	3	x	–	–	–
	Ambrosia dumosa	80	4.9	0.3	0.2	1	x	–	–	–
	Opuntia polyacantha var. erinacea	80	1.5	0.1	0.2	0.2	–	–	–	–
	Encelia farinosa	60	16	1	0.2	4	–	–	–	x
	Eriogonum fasciculatum	60	7.6	0.7	0.2	3	–	–	–	x
	Cylindropuntia acanthocarpa	60	1.8	0.1	0.2	0.2	–	–	–	x
	Echinocereus engelmannii	60	1.8	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Krameria erecta*	60	1.6	0.1	0.2	0.2	–	–	–	x
	Psorothamnus fremontii	40	9.2	0.6	0.2	0.2	–	–	–	–
	Viguiera parishii	40	8	0.4	0.2	2	–	–	–	–
	Bebbia juncea	40	4.3	0.2	0.2	1	–	–	–	–
	Larrea tridentata	40	3.6	0.2	0.2	1	–	–	–	–
	Stephanomeria pauciflora	40	3.2	0.2	0.2	0.2	–	–	–	–
	Gutierrezia sarothrae	40	3.1	0.2	0.2	0.8	–	–	–	–
	Ephedra	40	2.3	0.1	0.2	0.5	–	–	–	–
	Acacia greggii	40	1.2	0.1	0.2	0.2	–	–	–	–
	Echinocactus polycephalus	40	1.1	0.1	0.2	0.2	–	–	–	–
	Ephedra nevadensis	40	1	0.1	0.2	0.2	–	–	–	–
	Ephedra torreyana	40	0.9	0.1	0.2	0.2	–	–	–	–
	Machaeranthera pinnatifida	40	1.3	0.1	0.2	0.2	–	–	–	–
	Mammillaria tetrancistra	40	1.1	0.1	0.2	0.2	–	–	–	–
	Opuntia basilaris	40	1.3	0.1	0.2	0.2	–	–	–	–
	Yucca schidigera	40	1.0	0.1	0.2	0.2	–	–	–	–
Herb	*Bromus rubens*	100	22	1.1	0.2	3	x	–	–	–
	Sphaeralcea ambigua	100	4.1	0.4	0.2	1	x	–	–	–
	Eriogonum inflatum	80	1.3	0.2	0.2	0.2	x	–	–	–
	Antheropeas	60	6.9	0.8	0.2	3	x	–	–	–
	Gilia	60	4.1	0.5	0.6	1.2	x	–	–	–
	Cryptantha	60	3.1	0.4	0.6	0.6	x	–	–	–
	Erodium cicutarium	60	2.3	0.3	0.2	1	x	–	–	–
	Vulpia	60	2.4	0.3	0.2	1	x	–	–	–
	Argythamnia neomexicana	60	1	0.1	0.2	0.2	x	–	–	–
	Chorizanthe brevicornu	60	1	0.1	0.2	0.2	x	–	–	–
	Dasyochloa pulchella	60	1.5	0.1	0.2	0.2	–	–	–	x
	Lepidium lasiocarpum	60	1	0.1	0.2	0.2	x	–	–	–
	Porophyllum gracile	60	1	0.1	0.2	0.2	x	–	–	–
	Xylorhiza tortifolia	60	1.5	0.1	0.2	0.2	–	–	–	x
	Eucrypta micrantha	40	2.6	0.2	0.2	1	–	–	–	–
	Chaenactis	40	1.4	0.2	0.4	0.4	–	–	–	x
	Linanthus	40	1.3	0.2	0.4	0.4	–	–	–	x
	Adenophyllum porophylloides	40	0.6	0.1	0.2	0.2	–	–	–	x
	Allionia incarnata	40	1.1	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Aristida purpurea*	40	0.6	0.1	0.2	0.2	–	–	–	x
	Astragalus nuttallianus	40	0.7	0.1	0.2	0.2	–	–	–	x
	Cryptantha pterocarya	40	1.2	0.1	0.2	0.2	–	–	–	–
	Gilia scopulorum	40	1.1	0.1	0.2	0.2	–	–	–	–
	Lotus	40	0.6	0.1	0.2	0.2	–	–	–	x
	Lupinus sparsiflorus	40	0.6	0.1	0.2	0.2	–	–	–	x
	Phacelia crenulata	40	0.6	0.1	0.2	0.2	–	–	–	x
	Phacelia rotundifolia	40	0.7	0.1	0.2	0.2	–	–	–	x
	Pterostegia drymarioides	40	0.7	0.1	0.2	0.2	–	–	–	x
	Rafinesquia neomexicana	40	0.6	0.1	0.2	0.2	–	–	–	x
	Schismus	40	0.6	0.1	0.2	0.2	–	–	–	x
	Thysanocarpus curvipes	40	1.2	0.1	0.2	0.2	–	–	–	–
	Tridens muticus	40	0.7	0.1	0.2	0.2	–	–	–	x
Non-vascular	Cryptogamic crust	60	48	0.7	0.2	3	–	–	–	x

Common Name: Creosote Bush Desert Scrub
Group Assignment: G295; **Alliance Code:** cf. A3278, A3277

Alliance Concept

The Creosote Bush Scrub Alliance forms a sparse to intermittent shrub layer. The emergent tree layer is sparse, when present, and the herbaceous layer is sparse to open. The alliance is found primarily on alluvial fans and bajadas at all aspects. Soils are derived from a variety of substrates including alluvium, dune sand, rhyolite, and sandstone and textures are highly variable. Elevations range from approximately -10 to 1500 meters, though stands are typically found at lower to mid-elevations. *Larrea tridentata* is the dominant and characteristic shrub of this alliance. *Ambrosia dumosa* is sometimes present at significantly lower cover. *Plantago ovata, Chorizanthe rigida, Eriogonum inflatum, Cryptantha* spp., *Amsinkia* spp., and *Schismus* spp. are all sometimes present in this alliance.

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent shrub layer with *Larrea tridentata* typically dominant or sometimes co-dominant with shrubs such as *Atriplex polycarpa*. The overall shrub cover ranges from 1 to 34 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks typically at lower to mid elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (112): 322Ab, 322Ac, 322Ad, 322Ae, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az, 341Fc; Southeastern Great Basin (29): 341Fe, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Death Valley, Eureka Valley, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Last Chance Vlly, Nelson Range, Nevada Triangle, Owlshead Mtns, Panamint Dunes, Panamint Mtns, Ryan, Saline Valley**; LAKE:** Boulder City, Callville, Cottonwood Cove, Echo Bay, Gold Butte, Government Wash, Katherine, Lakeshore, Pearce Ferry, Temple Bar, Willow Beach**; MOJA:** (Castle Mtns), Cima Dome NW, Cinder Cones, Clipper Vlly, Crucero Hill, Devil's Playground, Fenner Vlly, Ivanpah Vlly, Lanfair Vlly, Piute Range, Zzyzx

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Larrea tridentata [CEGL005145]	115	x	x	x	x
Larrea tridentata (alliance)	10	x	x	x	–
Larrea tridentata Sparse Post-burn / Herbaceous [CEPP006724]	7	x	–	–	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Larrea tridentata / Pleuraphis rigida [CEGL005768]	13	x	x	–	–
Larrea tridentata–Atriplex polycarpa [CEGL005765]	9	x	x	–	–
Larrea tridentata–Ephedra nevadensis [CEGL001268]	17	x	x	x	–

Association Notes: Three samples were classified only to alliance level, suggesting further variation in our study area, including stands with *Larrea tridentata* co-dominating with *Petalonyx thurberi* and other mixtures of shrubs.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 713.4 m, Range -10 – 1497 m
- Slope: Mean 5.3 %, Range 0 – 30%
- Aspect: N (16), NE (23), E (25), NW (10), SE (28), Flat (2), Flat, Variable (8), W (13), SW (13), S (23)
- Macro Topography: Backslope (1), Basin floor/wetland (1), Channel bed (5), Entire slope (5), High level/summit (7), High slope (7), Low level/bottom (15), Lowslope (22), Midslope (14), Toeslope (alluvial fan/bajada) (21)
- Tree Cover: Mean 0%, Range 0 – 1%
- Shrub Cover: Mean 7.2%, Range 0 – 65.2%
- Herb Cover: Mean 4.1%, Range 0 – 34%
- Large Rock: Mean 9.0%, Range 0 – 97%
- Small Rock: Mean 63.0%, Range 0 – 100%
- Fines Cover: Mean 24.0%, Range 0 – 99%
- Litter Cover: Mean 2.0%, Range 0 – 20%
- Geology: alkali-granite (alaskite) (1), alluvium (82), basalt (2), conglomerate (3), dolostone (dolomite) (1), dune sand (9), granite (1), gravel (4), limestone (7), rhyolite (17), sand (1), sandstone (11), schist (2), tephrite (basanite) (1)
- Soil Texture: Clay loam (6), Coarse sand (2), Fine sand (3), Fine sandy clay (1), Loam (2), Loamy sand (9), Medium sand (4), Medium silt loam (3), Medium to very fine sandy loam (8), Moderately coarse loamy sand (1), Moderately fine clay loam (1), Moderately fine sandy clay loam (5), Sand (12), Sandy clay (1), Sandy loam (17), Silty clay (1)

Environment: The alliance is found primarily on alluvial fans and bajadas at all aspects. Soils are derived from a variety of substrates including alluvium, dune sand, rhyolite, and sandstone and textures are highly variable. Elevations range from low to high.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to intermittent shrub layer and the overall shrub cover ranges from 1 to 65 percent. The tree layer is sparse, when present, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Larrea tridentata* is typically the sole dominant and characteristic shrub of this alliance, though sometimes other shrubs such as *Atriplex polycarpa* can be co-dominant. *Ambrosia dumosa* is sometimes present at low cover. *Plantago ovata, Chorizanthe rigida, Eriogonum inflatum, Cryptantha* spp., *Amsinkia* spp., and *Schismus* spp. are all sometimes present in this alliance.

Dynamics: Associations may vary based on soil texture, alkalinity, and disturbance regimes. For example, in sandy situations, *Larrea tridentata* often co-occurs with perennial grasses including *Pleuraphis rigida*; along certain washes and terraces with somewhat alkaline soils, it co-dominates with *Atriplex polycarpa*. In areas with disturbance, including grazing and post-burn, the *Larrea tridentata* may be the only shrub present but at low cover.

Classification Comments

The USNVC hierarchy for this alliance is under evaluation as to whether it will be separated out from those with *Larrea tridentata* co-dominant with *Ambrosia dumosa* and/or *Encelia farinosa*. Currently at least one association with *Larrea tridentata* solely dominant is placed in the *Larrea tridentata – Ambrosia dumosa* Bajada & Valley Desert Scrub Alliance (A3277), while another association with *Larrea tridentata* solely dominant is placed in the *Larrea tridentata – Encelia farinosa – Fouquieria splendens* Upper Bajada & Rock Outcrop Desert Scrub Alliance (A3278) within the current USNVC hierarchy. However, site history and environmental settings do predict the variation in (co-)dominant shrubs. For example, stands with *Larrea tridentata* soley dominant are often found on desert pavements and younger alluvial fans and aeolian soils that have variable or deeper soils, in which the deep, spreading roots of *Larrea tridentata* can penetrate (Hamerlynck et al. 2002), and is not as well adapted to bajadas with older alluvium and well-developed caliche layer where *Ambrosia dumosa* can co-dominate (with *Larrea tridentata*) or predominate.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S5

References

Annable 1985, Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Minnich et al. 1993, NatureServe 2012, Peterson 1984, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=170 [+2]
LAKE (n=25): LAKE0129, LAKE0134, LAKE0157, LAKE0190, LAKE0237, LAKE0315, LAKE0329, LAKE0337, LAKE0338, LAKE0347, LAKE0376, LAKE0522, LAKE9204,

LAKE9314, LAKE9349, LAKE9355, LAKE9389, LAKE9502, LAKE9507, LAKE9602, LAKE9636, LAKE9712, LAMEN002, LAMEN030, LMJOA040
DEVA (n=100): DEVA0297, DEVA0421, DEVA0908, DEVA9129, DEVA9130, DEVA9177, DEVA9242, DEVA9278, DEVA9281, DEVA9293, DEVA9299, DEVA9388, DEVA9417, DEVA9420, DEVA9423, DEVA9430, DEVA9461, DEVA9557, DEVA9624, DEVA9625, DEVA9900, DEVAD071, DEVAD088, DEVAD089, DEVAD193, DEVAD194, DEVAD198, DEVAD209, DEVAR018, DEVAR052, DEVAR075, DEVAR089, DEVAR090, DEVAR092, DEVAR095, DEVAR098, DEVAS001, DEVAS002, DEVAS003, DEVAS012, DEVAS015, DEVAS017, DEVAS018, DEVAS024, DEVAS027, DEVAS029, DEVAS030, DEVAS032, DEVAS073, DEVAS075, DEVAS078, DEVAS080, DEVAS093, DEVAS128, DEVAS129, DEVAS130, DEVAS133, DEVAS137, DEVAS140, DEVAS142, DEVAS143, DEVAS156, DEVAS157, DEVAS158, DEVAS163, DEVAS167, DEVAS168, DEVAS172, DEVAS173, DEVAS177, DEVAS191, DEVAS195, DEVAS202, MOJC0483, MOJC0490, MOJC0491, MOJC0493, MOJC0521, MOJC0561, MOJC0565, MOJC0581, MOJC0582, MOJC0583, MOJC0628, MOJC0643, MOJC0664, MOJC0666, MOJC0667, MOJC0668, MOJC0669, MOJC0675, MOJC0677, MOJC0678, MOJC0679, MOJC0694, MOJC0751, MOJC0752, MOJC0912, MOJC0956, MOJC0971
MOJA (n=16): MOJA0105, MOJA0203, MOJA0619, MOJA0926, MOJA9101, MOJA9202, MOJA9297, MOJA9398, MOJA9553, MOJA9700, MOJC0203, MOJC0210, MOJC0856, MOJC0857, MOJC0865, MOJC1225
MOJN-Johnson (n=29): MOJJE009, MOJJE019, MOJJE038, MOJJE114, MOJJE185, MOJJE193, MOJJE223, MOJJE323, MOJJE366, MOJJE380, MOJJE398, MOJJE532, MOJJE537, MOJJE541, MOJJE542, MOJJE547, MOJJE551, MOJJE554, MOJJE688, MOJJE697, MOJJE717, MOJJE719, MOJJE727, MOJJE735, MOJJE737, MOJJE741, MOJJE742, MOJJE833, MOJJE844
[CAMO (n=2): CAMO9101, CAMO9122]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	100	78	5.5	0.5	65	x	x	–	–
	Ambrosia dumosa	38.9	3.3	0.2	0.1	3	–	–	–	–
Herb	*Plantago ovata*	34	12	0.7	0.1	11	–	–	–	–
	Chorizanthe rigida	31.9	5.4	0.1	0.1	3	–	–	–	–
	Cryptantha	31.3	5.6	0.3	0.3	9	–	–	–	–
	Eriogonum inflatum	29.2	6.9	0.4	0.01	37.5	–	–	–	–
	Schismus	25	4.9	0.3	0.11	10	–	–	–	–

Common Name: Creosotebush – Burrobush Bajada & Valley Desert Scrub
Group Assignment: G295; **Alliance Code:** A3277

Alliance Concept

The Creosotebush – Burrobush Bajada & Valley Desert Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found on a variety of landforms, but is especially common on bajadas and alluvial fans in valleys. It occurs at all aspects. The alliance is primarily found on alluvial soils, but also occurs on a variety of other substrates. Soil texture is highly variable. Elevations range from approximately 25 to 1750 meters. *Larrea tridentata* and *Ambrosia dumosa* are co-dominant in this alliance. *Krameria erecta* and *Opuntia basilaris* are sometimes present. *Eriogonum inflatum* is often present in the herbaceous layer and is sometimes accompanied by *Schismus* spp., *Amsinkia* spp., *Cryptantha* spp., and *Bromus rubens.* Cryptogamic crust is sometimes associated with this vegetation alliance.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ambrosia dumosa* and *Larrea tridentata* co-dominant. Sometimes either shrub may be higher in cover, but not more than 2x the cover of the other. The overall shrub cover ranges from 2 to 41 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It occurs throughout the parks at low to high elevations with the majority of samples in the mid to low elevations range.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (433): 322Ab, 322Ac, 322Ad, 322Ae, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Ar, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (89): 341Fc, 341Fd, 341Fe, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Death Valley, Devil's Hole, East of Chloride City, East of Deadman Pass, East of Ryan, Eureka Valley, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Last Chance Vlly, Nelson Range, Nevada Triangle, Owlshead Mtns, Panamint Dunes, Panamint Mtns, Ryan, Saline Valley, West of Eagle Mountain**; LAKE:** Boulder City, Bridge Canyon, Callville, Cottonwood Cove, Echo Bay, Gold Butte, Government Wash, Juniper Mine, Katherine, Lakeshore, Moapa East, Overton, Parashant, Pearce Ferry, Searchlight SE, Temple Bar, Valley of Fire East, Willow Beach**; MOJA:** Baker-Halloran, Cima Dome NW, Cima Dome SE, Cinder Cones, Clark Mtn West, Clipper Vlly, Devil's Playground, Fenner Vlly, Fenner Vlly West, Goffs, Granite Mtns, Halloran Spring, Ivanpah Mtns, Ivanpah Vlly, Kelso Dunes, Kelso Mtns, Kelso-Cima, Lanfair Vlly, Marl Mtns, Nipton, Old Dad Mtns, Piute Range, Providence Mtns, Turquoise Mountain, Valley Wells, Van Winkle Mtn, Vulcan Mine, West of Juniper Mine, Zzyzx

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Larrea tridentata–Ambrosia dumosa [CEGL002954]	165	x	x	x	x
Larrea tridentata–Ambrosia dumosa (alliance)	30	–	x	–	–
Larrea tridentata–Ambrosia dumosa / (Oenothera deltoides–Palafoxia arida–Plantago ovata) [CEPP006722]	10	x	–	–	–
Larrea tridentata–Ambrosia dumosa / Cryptogamic Crust [CEGL005763]	13	x	x	x	–
Larrea tridentata–Ambrosia dumosa / Pleuraphis rigida [CEGL005764]	47	x	–	x	x
Larrea tridentata–Ambrosia dumosa–(Echinocactus polycephalus–Opuntia basilaris) [CEPP006718]	6	–	x	x	x
Larrea tridentata–Ambrosia dumosa–(Ephedra nevadensis–Lycium andersonii) [CEGL005755]	87	x	x	x	x
Larrea tridentata–Ambrosia dumosa–Amphipappus fremontii [CEGL005756]	18	x	x	x	x
Larrea tridentata–Ambrosia dumosa–Atriplex confertifolia [CEGL005757]	46	–	x	–	x
Larrea tridentata–Ambrosia dumosa–Atriplex hymenelytra [CEGL005758]	25	x	x	–	x
Larrea tridentata–Ambrosia dumosa–Opuntia (acanthocarpa, ramosissima) [CEPP006719]	16	–	–	–	x
Larrea tridentata–Ambrosia dumosa–Ephedra funerea [CEGL005759]	25	–	x	x	x
*Larrea tridentata–Ambrosia dumosa–Eriogonum fasciculatum [*CEGL005760]	31	x	x	x	x
Larrea tridentata–Ambrosia dumosa–Fouquieria splendens [CEGL005136]	9	x	–	–	–
Larrea tridentata–Ambrosia dumosa–Hymenoclea salsola [CEGL005761]	45	x	x	x	x
Larrea tridentata–Ambrosia dumosa–Krameria (erecta, grayi) [CEGL005137]	153	x	x	x	x
Larrea tridentata–Ambrosia dumosa–Psorothamnus (arborescens, fremontii) [CEPP006720]	51	x	x	–	x
Larrea tridentata–Ambrosia dumosa–Senna armata [CEPP006721]	10	–	–	–	x
Larrea tridentata–Ambrosia dumosa–Yucca schidigera [CEGL005762]	30	x	–	x	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 836.9 m, Range 26 – 1743 m

- Aspect: Flat, Variable (3), N (57), NE (67), E (87), NW (89), SE (125), SW (111), W (108), SW (85), S (107)
- Slope: Mean 7.2 degrees, Range 0 – 40 degrees
- Macro Topography: Basin floor/wetland (2), Channel bed (16), Channel wall (1), Entire slope (14), High level/summit (22), High slope (43), Low level/bottom (30), Low- to midslope (1), Lowslope (52), Midslope (95), Step in slope (3), Toeslope (alluvial fan/bajada) (20)
- Tree Cover: Mean 0.1%, Range 0 – 8%
- Shrub Cover: Mean 12.3%, Range 2 – 41.3%
- Herb Cover: Mean 5.1%, Range 0 – 83.5%
- Large Rock: Mean 7.4%, Range 0 – 88%
- Small Rock: Mean 69.3%, Range 0 – 100%
- Fines Cover: Mean 19.1%, Range 0 – 95%
- Litter Cover: Mean 1.8%, Range 0 – 20%
- Geology: alkali-granite (alaskite) (11), alluvium (247), andesite (2), basalt (26), claystone (1), conglomerate (19), dacite (6), dolostone (dolomite) (2), dune sand (10), gneiss (6), granite (5), granodiorite (21), gravel (7), limestone (6), plutonic rock (phaneritic) (3), rhyolite (29), sand (13), sandstone (93), schist (13), sedimentary (gypsum) (2), shale (2), tephrite (basanite) (4)
- Soil Texture: Clay (1), Clay loam (26), Coarse loamy sand (2), Coarse sand (12), Fine sand (14), Fine sandy clay (1), Fine silty clay (4), Loam (15), Loamy sand (44), Medium sand (18), Medium silt (5), Medium silt loam (8), Medium to very fine sandy loam (55), Moderately coarse loamy sand (1), Moderately fine clay loam (4), Moderately fine sandy clay loam (9), Moderately fine silty clay loam (3), Sand (42), Sandy clay (10), Sandy loam (59), Silt loam (3), Silty clay (2)

Environment: The alliance is found on a variety of landforms, but is especially common on bajadas and alluvial fans in valleys and lower slopes. It occurs at all aspects. The alliance is primarily found on alluvial soils, but also occurs on a variety of other substrates. Soil texture is highly variable. The alliance occurred from low to high elevations; however the majority of samples were at low to mid elevation.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 2 to 41 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse to open, though sometimes cryptogamic crust is well-developed.

Vegetation Floristics: *Larrea tridentata* and *Ambrosia dumosa* are co-dominant in this alliance. *Krameria erecta* and *Opuntia basilaris* are sometimes present. *Eriogonum inflatum* is often present in the herbaceous layer and is sometimes accompanied by *Schismus* spp., *Amsinkia* spp., *Cryptantha* spp., and *Bromus rubens.* Cryptogamic crust is sometimes associated with this alliance.

Dynamics: This alliance quintessentially covers vast portions of the Mojave Desert across alluvial fans and lower slopes. The variation in associations is based on soil texture and substrate, disturbance regimes, alkalinity and moisture availability. For example, associations on sandy substrates include the *Larrea tridentata–Ambrosia dumosa / Pleuraphis rigida* and *Larrea tridentata–Ambrosia dumosa / (Oenothera deltoides–Palafoxia arida*) Associations. Associations on strongly rocky slopes, ridges, alluvial drainages and often on carbonate or other metamorphic substrates include the *Larrea tridentata–Ambrosia dumosa–Amphipappus fremontii* and *Larrea tridentata–Ambrosia dumosa–Ephedra funerea* Associations.

Classification Comments

This alliance is the modal type in the North American hot deserts and has been differentiated from the others with *Larrea tridentata* and *Ambrosia dumosa* dominant based on soil and substrate, disturbance regimes, and moisture availability. For example, in younger to mid-aged bajadas with low to moderate clay content, *Ambrosia dumosa* co-dominates with *Larrea tridentata*. When soils have strongly developed clay or caliche layers, *Ambrosia dumosa* is well-adapted with its shallow root system and can dominate or co-dominate with other shrubs.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S5

References

Annable 1985, Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005, NatureServe 2012, Peterson 1984, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=817

LAKE (n=151): ASGEE1av, ASGEE2av, ASGES2av, ASGES3av, ASGES4av, ASGES5av, ASGES6av, ASGES7av, ASGES8av, ASGEW1av, ASGEW2av, LAKE0101, LAKE0102, LAKE0114, LAKE0117, LAKE0179, LAKE0189, LAKE0193, LAKE0198, LAKE0200, LAKE0201, LAKE0202, LAKE0227, LAKE0232, LAKE0239, LAKE0241, LAKE0244, LAKE0249, LAKE0266, LAKE0268, LAKE0269, LAKE0273, LAKE0292, LAKE0293, LAKE0301, LAKE0312, LAKE0317, LAKE0320, LAKE0368, LAKE0375, LAKE0378, LAKE0380, LAKE0381, LAKE0382, LAKE0383, LAKE0384, LAKE0385, LAKE0396, LAKE0399, LAKE0407, LAKE0428, LAKE0445, LAKE0448, LAKE0600, LAKE0605, LAKE0606, LAKE0635, LAKE0637, LAKE9105, LAKE9107, LAKE9108, LAKE9113, LAKE9118, LAKE9131, LAKE9142, LAKE9143, LAKE9146, LAKE9147, LAKE9151, LAKE9158, LAKE9160, LAKE9165, LAKE9174, LAKE9178, LAKE9184, LAKE9191, LAKE9206, LAKE9230, LAKE9245, LAKE9247, LAKE9250, LAKE9251, LAKE9252, LAKE9254, LAKE9274, LAKE9290, LAKE9306, LAKE9311, LAKE9326, LAKE9330, LAKE9333, LAKE9339, LAKE9342, LAKE9346, LAKE9348, LAKE9354, LAKE9356,

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DEVA (n=268): DEVA0209, DEVA0285, DEVA0300, DEVA0559, DEVA0598, DEVA0666, DEVA0902, DEVA9105, DEVA9120, DEVA9124, DEVA9154, DEVA9159, DEVA9172, DEVA9181, DEVA9185, DEVA9186, DEVA9187, DEVA9192, DEVA9202, DEVA9226, DEVA9259, DEVA9271, DEVA9272, DEVA9279, DEVA9288, DEVA9307, DEVA9308, DEVA9310, DEVA9313, DEVA9314, DEVA9320, DEVA9334, DEVA9338, DEVA9344, DEVA9349, DEVA9358, DEVA9359, DEVA9364, DEVA9367, DEVA9405, DEVA9419, DEVA9436, DEVA9448, DEVA9452, DEVA9459, DEVA9511, DEVA9512, DEVA9514, DEVA9524, DEVA9526, DEVA9536, DEVA9539, DEVA9545, DEVA9556, DEVA9606, DEVA9622, DEVA9623, DEVA9629, DEVA9631, DEVA9632, DEVA9636, DEVA9640, DEVA9643, DEVA9644, DEVA9647, DEVA9800, DEVA9808, DEVA9819, DEVA9909, DEVA9922, DEVA9963, DEVA9964, DEVAD001, DEVAD002, DEVAD008, DEVAD010, DEVAD017, DEVAD019, DEVAD031, DEVAD032, DEVAD044, DEVAD054, DEVAD063, DEVAD067, DEVAD078, DEVAD086, DEVAD091, DEVAD092, DEVAD095, DEVAD096, DEVAD097, DEVAD165, DEVAD176, DEVAD182, DEVAD222, DEVAR001, DEVAR002, DEVAR005, DEVAR006, DEVAR016, DEVAR019, DEVAR020, DEVAR021, DEVAR023, DEVAR024, DEVAR029, DEVAR032, DEVAR046, DEVAR047, DEVAR048, DEVAR058, DEVAR068, DEVAR077, DEVAR085, DEVAR103, DEVAR112, DEVAR113, DEVAR115, DEVAR118, DEVAR136, DEVAR137, DEVAR138, DEVAR139, DEVAR141, DEVAR144, DEVAS021, DEVAS023, DEVAS025, DEVAS028, DEVAS031, DEVAS033, DEVAS034, DEVAS035, DEVAS036, DEVAS045, DEVAS053, DEVAS056, DEVAS060, DEVAS061, DEVAS062, DEVAS066, DEVAS067, DEVAS069, DEVAS077, DEVAS087, DEVAS089, DEVAS095, DEVAS097, DEVAS101, DEVAS102, DEVAS104, DEVAS105, DEVAS109, DEVAS113, DEVAS114, DEVAS117, DEVAS118, DEVAS123, DEVAS125, DEVAS132, DEVAS155, DEVAS159, DEVAS160, DEVAS162, DEVAS166, DEVAS187, DEVAS189, DEVAS192, DEVAS193, MOJC0172, MOJC0362, MOJC0373, MOJC0376, MOJC0377, MOJC0414, MOJC0415, MOJC0416, MOJC0417, MOJC0418, MOJC0421, MOJC0456, MOJC0457, MOJC0470, MOJC0484, MOJC0498, MOJC0500, MOJC0501, MOJC0502, MOJC0503, MOJC0504, MOJC0505, MOJC0507, MOJC0508, MOJC0509, MOJC0518, MOJC0519, MOJC0520, MOJC0537, MOJC0538, MOJC0539, MOJC0544, MOJC0545, MOJC0546, MOJC0547, MOJC0548, MOJC0549, MOJC0550, MOJC0558, MOJC0570, MOJC0572, MOJC0573, MOJC0575, MOJC0578, MOJC0579, MOJC0580, MOJC0589, MOJC0614, MOJC0615, MOJC0616, MOJC0617, MOJC0620, MOJC0621, MOJC0622, MOJC0623, MOJC0624, MOJC0625, MOJC0629, MOJC0630, MOJC0642, MOJC0646, MOJC0647, MOJC0651, MOJC0652, MOJC0653, MOJC0656, MOJC0661, MOJC0685,

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Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	99.8	35	3.9	0.1	25	x	–	x	–
–	*Ambrosia dumosa*	98.9	35	4.1	0.08	20	x	–	x	–
–	*Opuntia basilaris*	38.7	1.3	0.1	0.03	3	–	–	–	–
–	*Krameria erecta*	31	1.9	0.2	0.08	4	–	–	–	–
Herb	*Eriogonum inflatum*	50.7	8.5	0.2	0.01	3	–	–	–	x
–	*Schismus*	37.9	8.2	0.6	0.11	35	–	–	–	–
–	*Bromus rubens*	35.3	5.8	0.4	0.01	25	–	–	–	–
–	*Cryptantha*	34.4	6.2	0.3	0.17	9	–	–	–	–
–	*Amsinckia*	30.5	1.8	0.2	0.03	13.7	–	–	–	–
–	*Chorizanthe rigida*	26.7	1.8	0.1	0.1	10	–	–	–	–
–	*Plantago ovata*	26.5	4.5	0.3	0.08	5.3	–	–	–	–
Non-vasc	Cryptogamic crust	36.6	33	0.3	0.01	6	–	–	–	–

Common Name: Creosotebush–Brittlebush Scrub
Group Assignment: G295; **Alliance Code:** A3278

Alliance Concept

The Creosotebush–Brittlebush Desert Scrub Alliance forms a sparse to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to intermittent. The alliance is found on a variety of landforms and aspects, though it is more often found on xeric bajadas and south to west facing hillslopes, or on cooler slopes with highly rocky substrates. Soils are derived from a broad variety of substrates and have a broad variety of textures. Elevations range from approximately 150 to 1050 meters. *Larrea tridentata* and *Encelia farinosa* are the co-dominant shrubs of this association. *Ambrosia dumosa* is characteristically present. The herbaceous layer often includes *Eriogonum inflatum,* and sometimes includes *Cryptantha* spp., *Plantago ovata, Bromus rubens, Amsinkia* spp., and *Schismus spp.* Cryptogamic crust is also sometimes present.

Diagnostic Criteria: This alliance is characterized by a sparse to open shrub layer with *Encelia farinosa* and *Larrea tridentata* co-dominant together and often co-dominant with other shrubs including *Ambrosia dumosa*. The overall shrub cover ranges from 1.5 to 33 percent.

Alliance Distribution

The alliance is well-defined in sampling at LAKE, MOJA, and southern DEVA. It is scattered throughout the parks at low to mid elevation.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (69): 322Ab, 322Ad, 322Af, 322Ai, 322Aj, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (4): 341Fe, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Death Valley, Funeral Mtns, Green Water Rng/Vlly, Nelson Range, Owlshead Mtns, Panamint Mtns**; LAKE:** Boulder City, Callville, Cottonwood Cove, Echo Bay, Gold Butte, Katherine, Lakeshore, Searchlight SE, Temple Bar, Willow Beach**; MOJA:** Baker-Halloran, Cow Hole Mtns, Devil's Playground, Fenner Vlly West, Goffs, Granite Mtns, Marl Mtns, Old Dad Mtns, Piute Range

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Larrea tridentata–Encelia farinosa [CEGL002955]	35	x	x	x	–
Larrea tridentata–Encelia farinosa–Fouquieria splendens (alliance)	1	x	–	–	–
Larrea tridentata–Encelia farinosa–Ambrosia dumosa [CEGL005766]	24	x	x	x	x

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Larrea tridentata–Encelia farinosa–Bebbia juncea [CEPP006723]	8	x	x	x	–
Larrea tridentata–Encelia farinosa–Pleurocoronis pluriseta [CEGL005767]	10	x	x	x	–

Association Notes: One sample was classified to the alliance level in LAKE with *Larrea tridentata* and *Encelia farinosa* was co-dominant with *Parkinsonia aculeata* (non-native in the area).

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 557.3 m, Range 159 – 1046 m
- Aspect: N (4), NE (7), E (14), NW (3), SE (10), W (3), SW (14), S (16), SSE (1)
- Slope: Mean 17.0 degrees, Range 1 – 48 degrees
- Macro Topography: Backslope (1), Basin floor/wetland (1), Channel bed (3), Channel wall (1), High slope (8), Low level/bottom (4), Lowslope (3), Midslope (26), Step in slope (1)
- Tree Cover: Mean 0.1%, Range 0 – 7.4%
- Shrub Cover: Mean 10.8%, Range 1.5 – 33.4%
- Herb Cover: Mean 5.1%, Range 0 – 37%
- Large Rock: Mean 30.5%, Range 0 – 93%
- Small Rock: Mean 57.3%, Range 0 – 100%
- Fines Cover: Mean 7.6%, Range 0 – 57%
- Litter Cover: Mean 1.3%, Range 0 – 10%
- Geology: alkali-granite (alaskite) (8), alluvium (13), basalt (4), conglomerate (2), dacite (5), dolostone (dolomite) (1), dune sand (1), gneiss (8), granite (5), granodiorite (3), gravel (1), orthoquartzite (1), rhyolite (6), sandstone (8), schist (5), sedimentary (gypsum) (1), water (1)
- Soil Texture: Clay loam (2), Coarse sand (1), Fine sand (1), Fine silty clay (1), Loam (2), Loamy sand (3), Medium sand (1), Medium silt loam (1), Medium to very fine sandy loam (2), Moderately coarse loamy sand (1), Moderately fine sandy clay loam (1), Moderately fine silty clay loam (1), Sand (2), Sandy loam (7), Silt loam (1), Silty clay (1)

Environment: This alliance is able to grow on a wide variety of landforms, soils, and substrates at low to mid elevations in all three parks. It is more often found on xeric bajadas and south to west facing hillslopes, or on cooler slopes that with highly rocky substrates.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to intermittent shrub layer and the overall shrub cover ranges from 1.5 to 33 percent. The tree layer is typically sparse to open, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Larrea tridentata* and *Encelia farinosa* are the co-dominant shrubs of this association. *Ambrosia dumosa* is characteriscally present.The herbaceous layer sometimes includes *Cryptantha* spp., *Eriogonum inflatum, Plantago ovata, Bromus rubens, Amsinkia* spp., and *Schismus* spp. Cryptogamic crust is also sometimes present.

Dynamics: The associations may vary based on substrate, aspect, and disturbance regimes. For example, the *Larrea tridentata–Encelia farinosa* Association occurs as the driest, hottest expression of the alliance including steep south-facing slopes, while the *Larrea tridentata–Encelia farinosa–Ambrosia dumosa* occurs on more neutral steep slopes. The *Larrea tridentata–Encelia farinosa–Bebbia juncea* association occurs in washes in alluvial fans.

Classification Comments

This alliance represents the drought-tolerant expression of stands where *Larrea tridentata* co-dominants with shrubs. It is found on hotter, rockier, and often steeper sites without well-developed sand or clay as compared to the *Larrea tridentata – Ambrosia dumosa* alliance. It is more widespread in hotter, drier portions of the Mojave Desert (i.e., found more often at LAKE as compared to the DEVA and MOJA, which have relatively cooler and higher elevations).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 2005, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=78
LAKE (n=47): LAKE0119, LAKE0135, LAKE0194, LAKE0222, LAKE0309, LAKE9122, LAKE9128, LAKE9137, LAKE9140, LAKE9155, LAKE9156, LAKE9164, LAKE9169, LAKE9173, LAKE9214, LAKE9218, LAKE9219, LAKE9224, LAKE9235, LAKE9238, LAKE9255, LAKE9277, LAKE9280, LAKE9303, LAKE9305, LAKE9307, LAKE9318, LAKE9321, LAKE9335, LAKE9336, LAKE9370, LAKE9391, LAKE9410, LAKE9503, LAKE9508, LAKE9526, LAKE9624, LAMEN001, LAMEN010, LAMEN021, LAMEN023, LAMEN024, LAMEN025, LAMEN057, LAMEN058, LAMEN061, LAMEN111
DEVA (n=12): DEVA9191, DEVA9347, DEVA9410, DEVA9531, DEVAD085, DEVAR070, DEVAS151, MOJC0563, MOJC0645, MOJC0926, MOJC1043, MOJC1044
MOJA (n=14): MOJA9184, MOJA9361, MOJA9558, MOJA9559, MOJA9561, MOJA9563, MOJA9640, MOJC0115, MOJC0116, MOJC0128, MOJC0129, MOJC0207, MOJC0254, MOJC1223
MOJN-Johnson (n=5): MOJJE033, MOJJE263, MOJJE291, MOJJE806, MOJJE809

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	100	30	3	0.2	10	x	–	x	–
	Encelia farinosa	98.6	41	4.5	0.2	20	x	–	x	–
	Ambrosia dumosa	75.3	7.7	0.8	0.09	8	x	–	–	–
	Ferocactus cylindraceus	38.4	1.3	0.2	0.01	3	–	–	–	–
	Opuntia basilaris	32.9	1.4	0.1	0.06	1	–	–	–	–
	Eriogonum fasciculatum	31.5	1.2	0.1	0.2	1	–	–	–	–
	Bebbia juncea	30.1	1.8	0.3	0.07	7	–	–	–	–
Herb	*Cryptantha*	45.2	16	1.2	0.33	12	–	–	–	–
	Eriogonum inflatum	42.5	8.1	0.1	0.01	0.5	–	–	–	–
	Amsinckia	41.1	6.2	0.7	0.2	30	–	–	–	–
	Schismus	39.7	3.7	0.2	0.2	3	–	–	–	–
	Plantago ovata	35.6	7.7	0.6	0.2	18	–	–	–	–
	Bromus rubens	34.2	3.2	0.3	0.2	15	–	–	–	–
Non-vasc	Cryptogamic crust	42.5	38	0.2	0.2	3	–	–	–	–

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

Common Name: Mojave-Sonoran Sparsely Vegetated Dune
Group Assignment: G675; **Alliance Code:** A4026

Alliance Concept

The Desert Twinbugs - Desert Sand-verbena - Desert Panicgrass Dune Alliance forms sparse to open herbaceous layer. The shrub layer is open and the tree layer is absent or sparse. The alliance is found on dunes (active to stable) and sand fields on basin floors and entire slopes from toeslope to summits at all aspects. Soils are derived primarily from dune sand but substrates also include alluvium, dolostone (dolomite), and sandstone. Soil textures range from fine and medium sand to medium to very fine sandy loam. Elevations range from approximately 50 to 1300 meters. *Dicoria canescens* is often present and characteristic as an annual plant, but not necessarily dominant. Various other annual and perennial plants can occur including *Abronia villosa, Cryptantha* spp., *Oenothera* spp., *Palafoxia arida, Panicum urvilleanum,* and *Swallenia alexandrae.* Shrubs that are sometimes present include *Petalonyx thurberi* and *Larrea tridentata.* However, the presence of sand sheets, flats, and dunes more reliably characterize this alliance than does any set of species.

Diagnostic Criteria: This alliance is characterized by a sparse to open herbaceous layer with scattered annual and perennial plants that usually have a combined absolute cover of less than 10% cover. Various psammophytic herbs may be present, while perennial plants such as *Achnatherum hymenoides, Larrea tridentata,* and *Pleuraphis rigida* have less than 2% absolute cover. The overall herbaceous cover ranges from 0 to 31 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and MOJA, and has been observed at LAKE. It is found scattered low to upper elevation dunes and sand flats. It is also denoted during map accuracy assessment field sampling at LAKE along dunes and sand flats bordering Lake Mead.

States: CA, (AZ, NV)

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (29): 322Ab, 322Ae, 322Ai, (322Av, 322Az); Southeastern Great Basin (11): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Eureka Valley, Joshua Flat, Panamint Dunes, Saline Valley**; LAKE:** (Calville, Cottonwood Cove, Katherine, Pearce Ferry)**; MOJA:** Cow Hole Mtns, Devil's Playground, Kelso Dunes, Zzyzx

Associations Table. “x” indicates species present, “–” indicates species not found, “(x)” indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Oenothera deltoides–Cryptantha spp. [CEPP006728]	2	(x)	–	x	–
Dicoria canescens [CEGL005747]	13	(x)	x	x	–
Dicoria canescens–Abronia villosa–Panicum urvilleanum (alliance)	8	–	x	x	–
Panicum urvilleanum [CEPP006730]	5	–	–	x	–
Petalonyx thurberi [CEPP006731]	8	–	x	x	–
Swallenia alexandrae [CEGL005468]	5	–	x	–	–

Association Notes: Eight samples were classified to alliance level only. These plots did not contain *Dicoria canescens* or *Abronia villosa*, but are dune plant communities that contain various ephemeral annuals and the non-native *Salsola*.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 689.0 m, Range 63 – 1285 m
- Aspect: N (5), NE (1), E (4), NW (4), SE (11), SW (1), W (2), SW (4), S (4)
- Slope: Mean 6.5 degrees, Range 1 – 37.5 degrees
- Macro Topography: Basin floor/wetland (1), Entire slope (3), High level/summit (2), Low level/bottom (3), Lowslope (9), Midslope (4), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0.1%, Range 0 – 2%
- Shrub Cover: Mean 1.4%, Range 0 – 20%
- Herb Cover: Mean 6.4%, Range 0 – 31%
- Large Rock: Mean 0.5%, Range 0 – 15%
- Small Rock: Mean 2.3%, Range 0 – 37.5%
- Fines Cover: Mean 92.3%, Range 62.5 – 100%
- Litter Cover: Mean 0.7%, Range 0 – 2.5%
- Geology: alluvium (6), dolostone (dolomite) (1), dune sand (32)
- Soil Texture: Fine sand (9), Medium sand (2), Medium to very fine sandy loam (1), Sand (15)

Environment: The alliance is found primarily on sand dunes, flats and ramps at low to upper elevations. It occurs on basin floors and entire slopes from toeslopes to summits at all aspects. Soils are derived primarily from aeolian sand. Soil textures range from sand to sandy loam.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to open herbaceous layer, and the overall herbaceous cover ranges from 0 to 31 percent cover. The tree layer is typically sparse, and the shrub layer is sparse to open. Non-vascular plants, if present are sparse.

Vegetation Floristics: Annual plants on dune systems and flats vary with presence and cover of annual plants. *Dicoria canescens* is often present as a summer annual, and *Camissonia* spp., *Crypthantha* spp., *Oenothera* spp., and *Palafoxia arida* are often spring annuals. Perennial plants can include rhizomatous grasses such as *Panicum urvilleanum.* Shrubs that are sometimes present at sparse cover include *Petalonyx thurberi* and *Larrea tridentata.*

Dynamics: The presence of sand sheets and sand dunes more reliably characterize this alliance than does any set of plant species. Plant species composition and abundance are driven mostly by annual rainfall, temperature variation, and seasonality. *Salsola tragus,* a non-native herb, can invade these sites and sometimes has higher cover than the native plants, but its cover also varies spatially and temporarily.

Classification Comments
None.

Classification Confidence of Alliance: High

Conservation Status Rank
Global: G3
State (California): S2

References
Evens et al. 2012, Sawyer et al. 2009, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description
MOJN: N=40
LAKE (n=0):
DEVA (n=23): DEVA0540, DEVA0634, DEVA9562, DEVA9633, DEVAD024, DEVAD025, DEVAD027, DEVAD191, DEVAD213, DEVAS022, DEVAS176, DEVAS178, DEVAS179, DEVAS181, DEVAS182, DEVAS183, DEVAS184, DEVAS185, DEVAS186, MOJC0442, MOJC0444, MOJC0445, MOJC0692
MOJA (n=17): MOJA0405, MOJA0678, MOJA9188, MOJA9197, MOJA9406, MOJA9407, MOJA9548, MOJC0346, MOJC0347, MOJC0348, MOJC0349, MOJC0731, MOJC0855, MOJC0858, MOJC0859, MOJC0860, MOJC0862
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Petalonyx thurberi*	35	27	1.1	0.2	20	–	–	–	–
Herb	*Dicoria canescens*	58	18	1.3	0.1	27	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Salsola*	30	16	0.9	0.2	15	–	–	–	–
	Schismus	25	5.2	0.4	0.2	8	–	–	–	–
	Achnatherum hymenoides	25	3.2	0.2	0.1	4	–	–	–	–

Common Name: Big Galleta Desert Grassland
Group Assignment: G675; **Alliance Code:** A3170

Alliance Concept

The Big Galleta Desert Grassland Alliance forms an open to intermittent herbaceous layer. The shrub layer is open and the tree layer is sparse. The alliance is found from bottoms to summits at all aspects along dune fields, sand sheets, and sandy valley floors. Soils are derived from a variety of substrates and texture is primarily sand but can range from medium sand to loam to sandy clay. Elevations range from approximately 250 to 1400 meters. *Pleuraphis rigida* is dominant or co-dominant in the herbaceous layer, and *Schismus* spp. are characteristically present. Those often present are *Oenothera deltoides* and *Stephanomeria exigua. Larrea tridentata* is often associated as an emergent shrub at sparse cover.

Diagnostic Criteria: This alliance is characterized by an open to intermittent herbaceous layer with *Pleuraphis rigida* dominant or co-dominant. The overall herbaceous cover ranges from 3 to 31 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at MOJA and is also found uncommonly in LAKE, often in sand dune/flat areas. It is scattered throughout MOJA in low to upper elevations. The alliance was also found during map accuracy assessment field sampling at LAKE primarily at low elevation sandy/dune areas adjacent to Lake Mead.

States: AZ, CA, (NV)

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (16): 322Ai, 322Aj, 322Av, (322Ay)

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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Codes]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pleuraphis rigida / Ambrosia dumosa [CEGL000955]	6	–	–	x	x
Pleuraphis rigida [CEPP006858]	17	x	–	x	x

Association Notes: The *Pleuraphis rigida / (Acamptopappus sphaerocephalus–Ericameria cooperi*) Association appears to be associated more with shrubland associations within the Mojave Mid-Elevation Mixed Desert Scrub Group (G296) in areas that especially have had past disturbance or grazing, while the *Pleuraphis rigida / Ambrosia dumosa* and *Pleuraphis rigida* sand dunes/flats

Associations are associated with sand dune/flat environments. Thus, the former association has been placed in a separate alliance in that G296.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 625.4 m, Range 284 – 1402 m
- Aspect: N (6), NW (4), SE (3), W (2), SW (8), S (5)
- Slope: Mean 3.0 degrees, Range 0 – 9 degrees
- Macro Topography: High level/summit (3), High slope (3), Low level/bottom (3), Lowslope (2), Midslope (2)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 1.3%, Range 0 – 5.4%
- Herb Cover: Mean 16.2%, Range 2 – 26%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 1.4%, Range 0 – 10%
- Fines Cover: Mean 93.9%, Range 87 – 100%
- Litter Cover: Mean 2.0%, Range 0 – 5%
- Geology: alluvium (1), dune sand (11), granodiorite (1), gravel (1), sandstone (1)
- Soil Texture: Fine sand (2), Loamy sand (1), Medium sand (2), Sand (10)

Environment: The alliance occurs at low to upper elevations, from valley bottoms to slope and dune summits at all aspects along dune fields, sand sheets, slopes, and sandy valley bottoms. Soils are primarily aeolian (wind-blown) sand.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent herbaceous layer, and the overall herbaceous cover ranges from 3 to 31 percent cover. The tree layer is typically sparse, and the shrub layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Pleuraphis rigida* is dominant or co-dominant in the herbaceous layer, and *Schismus* spp. are characteristically present. Those often present are *Oenothera deltoides* and *Stephanomeria exigua. Larrea tridentata* is a commonly associated emergent shrub at sparse cover.

Dynamics: The alliance is relatively rare in the Mojave and Sonoran deserts. It occurs as open to intermittent, herbaceous stands around dune margins and other sandy areas at low to mid-elevations. It also occurs on upland lower slopes, bajadas, and valleys at mid-elevations where wind-blown sand is present

Classification Comments

Pleuraphis rigida associations have been placed in various groups including the Mojave Mid-Elevation Mixed Desert Scrub (G296) and Mojave-Sonoran Bajada & Valley Desert Scrub (G295) Groups. Associations with *Pleuraphis rigida* primarily found in sand dune and sand flat areas now occur in North American Warm Semi-Desert Dune & Sand Flats Group (G675) in the USNVC hierarchy, based on the results of the classification and ordination analyses. While we have placed

the sand dune/flats associations in the G675 group, related grass and scrub types at mid-montane, usually elevations such as the *Pleuraphis rigida / (Acamptopappus sphaerocephalus–Ericameria cooperi*) Association is placed in the *Cylindropuntia acanthocarpa / Pleuraphis rigida* Alliance G296. Additional representation of this grassland vegetation is summarized by McAuliffe (2016).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G3

State (California): S2

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Matthews 2000, McAuliffe 2016, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=23

LAKE (n=1): LAKE0601

DEVA (n=0)

MOJA (n=15): MOJA0400, MOJA0549, MOJA0654, MOJA9189, MOJA9408, MOJA9556, MOJA9562, MOJA9657, MOJA9660, MOJA9662, MOJA9679, MOJC0728, MOJC0729, MOJC0730, MOJC0736

MOJN-Johnson (n=7): MOJJE144, MOJJE175, MOJJE238, MOJJE293, MOJJE321, MOJJE327, MOJJE650

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	52	28	0.5	0.2	2	–	–	–	x
	Petalonyx thurberi	29	11	0.2	0.1	1.5	–	–	–	–
Herb	*Pleuraphis rigida*	100	55	11	1	25	x	x	–	–
	Schismus	90	7.7	1.5	0.2	10	x	–	–	–
	Oenothera deltoides	52	1.1	0.3	0.2	3	–	–	–	x
	Stephanomeria exigua	52	0.6	0.1	0.2	0.5	–	–	–	x
	Panicum urvilleanum	38	2.7	0.5	0.2	3	–	–	–	–
	Cryptantha	38	2.0	0.4	0.6	1.5	–	–	–	–
	Chaenactis stevioides	33	0.6	0.1	0.2	1	–	–	–	–
	Cryptantha pterocarya	33	0.6	0.1	0.2	0.5	–	–	–	–
	Malacothrix glabrata	33	0.4	0.1	0.2	0.5	–	–	–	–
	Rafinesquia neomexicana	33	0.3	0.1	0.2	0.2	–	–	–	–
	Croton californicus	29	4.2	0.4	0.2	5	–	–	–	–

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

Common Name: Catclaw Acacia – Desert-lavender – Beloperone Desert Wash Shrubland
Group Assignment: G541; **Alliance Code:** A4187

Alliance Concept

The Catclaw Acacia – Desert-lavender – Beloperone Desert Wash Shrubland Alliance forms an open to continuous shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found primarily in arroyos and floodplains at all aspects. Soils are derived from a variety of substrates including alluvium, gneiss and sandstone, and textures are highly variable. Elevations range from approximately 150 to 1600 meters. *Acacia greggii (=Senegalia greggii)* is dominant or co-dominant in the shrub layer, and those that are often present include *Cylindropuntia acanthocarpa, Ephedra nevadensis, Eriogonum fasciculatum, Hymenoclea salsola, Larrea tridentata, Salazaria mexicana,* and *Stephanomeria pauciflora.* Dominant and characteristic herbs include *Bromus rubens* and *Erodium cicutarium,* and those often present include *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Acacia greggii* dominant or co-dominant. The overall shrub cover ranges from 5 to 74 percent.

Alliance Distribution

The alliance is well-defined in sampling at MOJA and LAKE, but was not found in DEVA. It is scattered throughout MOJA and LAKE in low to high elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (106): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az

Park Sampling Zones: LAKE: Boulder City, Echo Bay, Gold Butte, Katherine, Parashant, Pearce Ferry, Temple Bar, Willow Beach**; MOJA:** Baker-Halloran, (Castle Mtns), Cima Dome SE, Clark Mountain, Clark Mtn, Clark Mtn West, Clipper Vlly, Fenner Vlly, Fenner Vlly West, Granite Mtns, HackberryVontrigger, Ivanpah Vlly, Kelso Mtns, Lanfair Vlly, Mid Hills, Pachalka Spring, Piute Range, Providence Mtns, Turquoise Mountain, Vulcan Mine, West of Juniper Mine, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Acacia greggii Wash [CEGL005390]	11	x	–	x	x
Acacia greggii–(Ambrosia eriocentra–Salvia dorrii) [CEGL005737]	26	x	–	x	x
Acacia greggii–Eriogonum fasciculatum [CEPP005785]	7	x	–	x	x
Acacia greggii–Larrea tridentata–Hymenoclea salsola [CEGL009522]	39	x	–	x	x
Acacia greggii–Prunus fasciculata [CEGL005738]	22	–	–	x	x
Acacia greggii–Viguiera parishii [CEPP005786]	14	x	–	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1131 m, Range 196 – 1572 m
- Aspect: Flat, Variable (1), N (14), NE (3), E (3), NW (21), SE (20), SW (30), W (4), S (16)
- Slope: Mean 5.9 degrees, Range 0 – 40 degrees
- Macro Topography: Channel bed (9), Channel wall (1), High level/summit (2), High slope (2), Low level/bottom (4), Lowslope (1), Midslope (24)
- Tree Cover: Mean 0.3%, Range 0 – 2.7%
- Shrub Cover: Mean 19.8%, Range 4.8 – 74.2%
- Herb Cover: Mean 9.1%, Range 1 – 92.5%
- Large Rock: Mean 12.7%, Range 0 – 72%
- Small Rock: Mean 66.2%, Range 6 – 98.1%
- Fines Cover: Mean 17.0%, Range 0 – 93%
- Litter Cover: Mean 2.8%, Range 0 – 24%
- Geology: alkali-granite (alaskite) (6), alluvium (35), basalt (1), conglomerate (1), dacite (1), dolostone (dolomite) (1), gneiss (11), granite (1), granodiorite (13), limestone (4), plutonic rock (phaneritic) (5), rhyolite (8), sand (3), sandstone (15), schist (1)
- Soil Texture: Clay loam (3), Coarse sand (9), Fine sand (7), Loamy sand (14), Medium sand (38), Medium to very fine sandy loam (3), Sand (9), Sandy loam (10), Silty clay (1)

Environment: The alliance is found primarily in arroyos and floodplains at all aspects. Soils are derived from a variety of substrates including alluvium, gneiss and sandstone, and textures are highly variable. The alliance is found from low to high elevation.

Vegetation Description

Vegetation Structure: The Alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 5 to 74 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse.

Vegetation Floristics: *Acacia greggii (=Senegalia greggii)* is dominant or co-dominant in the shrub layer, and those that are often present include *Cylindropuntia acanthocarpa, Ephedra nevadensis, Eriogonum fasciculatum, Hymenoclea salsola, Larrea tridentata, Salazaria mexicana,* and *Stephanomeria pauciflora.* Dominant and characteristic herbs include *Bromus rubens* and *Erodium cicutarium,* and those often present include *Sphaeralcea ambigua.*

Dynamics: *Acacia greggii* is adapted to disturbance, and it occurs in areas with either alluvial or colluvial disturbance including intermittently flooded washes and rocky slopes above washes. Most stands are described from braided washes and slopes with intermittent drainages.

Classification Comments

Acacia greggii associations are currently placed in the Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope Group (G541) as well as other as well as other upland and riparian alliances of the USNVC hierarchy. For this Mojave Desert Network classification, we have described associations in one alliance in the G541 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Evens 2000, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=118
LAKE (n=18): LAKE0138, LAKE0236, LAKE0297, LAKE0616, LAKE9225, LAKE9328, LAKE9369, LAKE9372, LAKE9406, LAKE9426, LAKE9439, LAKE9444, LAKE9535, LMJOA034, LMJOA035, LMJOA052, LMJOA053, LMJOA054
DEVA (n=0)
MOJA (n=87): MOJA0200, MOJA0289, MOJA0303, MOJA0438, MOJA0509, MOJA0541, MOJA0691, MOJA9172, MOJA9215, MOJA9250, MOJA9335, MOJA9374, MOJA9401, MOJA9412, MOJA9416, MOJA9433, MOJA9460, MOJA9511, MOJA9522, MOJA9539, MOJA9573, MOJA9581, MOJA9624, MOJA9626, MOJA9633, MOJA9697, MOJA9805, MOJA9900, MOJA9916, MOJAE002, MOJAE004, MOJAE005, MOJAE006, MOJAE007, MOJAE050, MOJAE053, MOJAE055, MOJAE057, MOJAE059, MOJAE060, MOJAE061, MOJAE062, MOJAE063, MOJAE064, MOJAE065, MOJAE066, MOJAE067, MOJAE068, MOJAE069, MOJAE070, MOJAE076, MOJAE080, MOJAE082, MOJAE083, MOJAE089, MOJAE119, MOJAE120, MOJAE121, MOJAE122, MOJAE123, MOJAE124, MOJAE152, MOJAE153, MOJAE155, MOJAE156, MOJAE157, MOJAE158, MOJAE159, MOJAE168, MOJAE170, MOJAE172, MOJAE173, MOJAE174, MOJAE187, MOJAE188, MOJAE197, MOJC0096, MOJC0192, MOJC0239, MOJC0797, MOJC0940, MOJC1133, MOJC1134, MOJC1153, MOJC1155, MOJC1226, MOJC1227

MOJN-Johnson (n=13): MOJJE007, MOJJE016, MOJJE083, MOJJE098, MOJJE099, MOJJE221, MOJJE230, MOJJE347, MOJJE454, MOJJE503, MOJJE543, MOJJE588, MOJJE696
[CAMO (n=1): CAMO9106]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Acacia greggii*	100	28	5.4	1	25	x	–	–	–
	Hymenoclea salsola	69.8	10	1.9	0.2	15	–	–	–	x
	Ephedra nevadensis	60.4	1.9	0.4	0.2	6	–	–	–	x
	Eriogonum fasciculatum	58.5	3.1	0.7	0.2	7.3	–	–	–	x
	Larrea tridentata	56.6	5.8	1.2	0.2	21.7	–	–	–	x
	Salazaria mexicana	55.7	3.1	0.5	0.2	5.6	–	–	–	x
	Cylindropuntia acanthocarpa	55.7	1.5	0.3	0.1	4.5	–	–	–	x
	Stephanomeria pauciflora	51.9	0.9	0.2	0.2	2.1	–	–	–	x
	Phoradendron californicum	49.1	1.6	0.3	0.2	7	–	–	–	–
	Salvia dorrii	46.2	5.3	1.1	0.1	8	–	–	–	–
	Prunus fasciculata	43.4	4.9	1	0.2	9.1	–	–	–	–
	Yucca schidigera	41.5	0.9	0.2	0.2	2	–	–	–	–
	Thamnosma montana	40.6	0.7	0.1	0.2	1.5	–	–	–	–
	Viguiera parishii	39.6	4.2	0.8	0.2	18	–	–	–	–
	Ambrosia eriocentra	37.7	4	0.7	0.2	6.5	–	–	–	–
	Encelia virginensis	34.9	1	0.2	0.2	4.7	–	–	–	–
	Lycium andersonii	34.9	0.8	0.1	0.2	2	–	–	–	–
	Echinocereus engelmannii	33	0.4	0.1	0.2	0.5	–	–	–	–
	Gutierrezia microcephala	26.4	0.7	0.1	0.2	2	–	–	–	–
Herb	*Bromus rubens*	82.1	20	2	0.2	35	x	–	–	–
	Erodium cicutarium	80.2	12	0.9	0.2	6	x	–	–	–
	Sphaeralcea ambigua	53.8	4.5	0.3	0.1	7	–	–	–	x
	Eriogonum inflatum	41.5	3.2	0.1	0.2	1	–	–	–	–
	Achnatherum speciosum	36.8	2.9	0.2	0.2	5	–	–	–	–
	Dasyochloa pulchella	35.8	3.1	0.1	0.2	0.2	–	–	–	–
	Amsinckia	33	3	0.8	0.2	27	–	–	–	–
	Schismus	33	3.8	0.6	0.2	19.7	–	–	–	–
	Mirabilis laevis	31.1	1.5	0.1	0.2	1	–	–	–	–
	Penstemon palmeri	28.3	2.8	0.1	0.2	1	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Adenophyllum cooperi*	27.4	3.5	0.1	0.1	1.5	–	–	–	–
	Muhlenbergia porteri	26.4	2	0.1	0.2	0.5	–	–	–	–
Non-vascular	Cryptogamic crust	29.2	25	0.1	0.2	1	–	–	–	–

Common Name: Desert-willow – Smoketree Desert Wash Scrub Alliance
Group Assignment: G541; **Alliance Code:** A1044

Alliance Concept

The Desert-willow – Smoketree Desert Wash Scrub Alliance forms a sparse to intermittent tree canopy with a sparse to intermittent shrub understory. It is found on intermittently flooded channel beds and wash bottoms, but subterranean water is typically available based on preferred paths of subsurface moisture. The alliance is often found along washes with wide flood paths and natural "narrows" in valleys, where stands typically occur in the active wash channel or directly above. It is found at all aspects. Soils are derived from a variety of substrates and textures. Elevations range from approximately 201 to 1506 meters. The dominant and characteristic tree is *Chilopsis linearis*. Commonly associated shrubs include *Acacia greggii (=Senegalia greggii), Hymenoclea salsola, and Stephanomeria pauciflora,* and commonly associated herbs include *Bromus rubens and Erodium cicutarium.*

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent tree canopy of *Chilopsis linearis,* which ranges from 1.1 to 37 percent cover. The overall tree cover ranges from 1.1 to 37 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all LAKE and MOJA, while stands are scattered at low to mid elevation.

States: CA, NV

Ecoregion Sections and Subsection Codes: Mojave Desert (91): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Ay

Park Sampling Zones: LAKE: Gold Butte, Katherine, Lakeshore**; MOJA:** Brown Buttes, (Castle Mtns), Cima Dome NW, Cinder Cones, Clark Mtn, Clipper Vlly, Devil's Playground, Fenner Vlly West, Granite Mtns, Ivanpah Vlly, Kelso Dunes, Kelso Mtns, Mid Hills, New York Mtns, Piute Range, Providence Mtns, Van Winkle Mtn, Vulcan Mine, Zzyzx

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Chilopsis linearis [CEGL001164]	12	x	–	x	–
Chilopsis linearis / (Ambrosia eriocentra–Salvia dorrii) [CEGL005742]	14	x	–	x	–
Chilopsis linearis / Ericameria paniculata [CEGL005743]	17	x	–	x	–
Chilopsis linearis / Hymenoclea salsola [CEGL005744]	25	x	–	x	x
Chilopsis linearis / Prunus fasciculata [CEGL005745]	17	–	–	x	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Psorothamnus spinosus / Acacia greggii–(Hyptis emoryi) [CEPP006744]	1	–	–	–	x
Psorothamnus spinosus / Hymenoclea salsola–(Bebbia juncea–Ephedra californica) [CEPP006745]	13	x	–	x	x

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 993.9 m, Range 201 – 1506 m
- Aspect: N (9), NE (1), E (9), NW (18), SE (19), Flat, Variable (1), SW (21), SW (6), S (14)
- Slope: Mean 3.3 degrees, Range 0 – 8 degrees
- Macro Topography: Channel bed (11), High level/summit (1), Low level/bottom (4), Lowslope (2), Midslope (8)
- Tree Cover: Mean 8.3%, Range 1.1 – 37.1%
- Shrub Cover: Mean 11.9%, Range 1.6 – 33%
- Herb Cover: Mean 2.8%, Range 0.2 – 23%
- Large Rock: Mean 7.4%, Range 0 – 50%
- Small Rock: Mean 70.5%, Range 0 – 99%
- Fines Cover: Mean 17.4%, Range 0 – 90%
- Litter Cover: Mean 3.8%, Range 0 – 23%
- Geology: alkali-granite (alaskite) (3), alluvium (48), dune sand (1), gneiss (2), granodiorite (13), limestone (6), rhyolite (1), sandstone (15), schist (1), tephrite (basanite) (1)
- Soil Texture: Coarse sand (21), Fine sand (2), Loam (1), Loamy sand (3), Medium sand (42), Sand (20)

Environment: The alliance occurs primarily in channel beds and bottoms where flooding is intermittent but subterranean water is typically available. It is found throughout MOJA at mid to upper elevations, and it is found scattered in LAKE at low to mid elevations. It occurs at all aspects. Soils range from sand, loamy sand to loam derived from a variety of substrates.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to intermittent tree layer with a sparse to intermittent shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: The dominant and characteristic tree is *Chilopsis linearis*. Commonly associated shrubs include *Acacia greggii (=Senegalia greggii), Hymenoclea salsola, and Stephanomeria pauciflora,* and commonly associated herbs include *Bromus rubens and Erodium cicutarium.*

Dynamics: *Chilopsis linearis* and/or *Psorothamnus spinosus* is dominant or co-dominant in a two-tiered canopy. Stands typically occur in washes with wide flood paths and natural “narrows” in

valleys. Large-stature stands are found often within the active wash channel or directly above. Although the alliance is widely distributed, stands are localized and absent in many suitable habitats. The presence of faults in very old alluvium that create preferred paths for moisture and thus root systems have been found as optimum sites for *Chilopsis linearis* (Lancaster et al. 2014). The USFWS Wetland Inventory (1996) recognizes *Chilopsis linearis* as a FACW+ plant.

Psorothamnus spinosus is dependant on flooding for seedling establishment and adults are relatively short-lived. Thus, larger washes and fluvial disturbances are needed to maintain this alliance.

Classification Comments

The *Chilopsis linearis* and *Psorothamnus spinosus* associations are classified as both shrubland and woodland types in the USNVC hierarchy. For this Mojave Desert Network classification, we have classified the alliance as a woodland type due to its tall tree-like stature.

Classification Confidence: Moderate

Conservation Status Rank

Global: G4
State (California): S3

References

Evens 2000, Evens et al. 2012, Evens and Hartman 2007, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used for Description

MOJN: N=99
LAKE (n=6): LAKE0411, LAKE0430, LAKE0447, LAKE0617, LAKE9422, LAKE9433
MOJA (n=85): MOJA0158, MOJA0326, MOJA0351, MOJA0555, MOJA0566, MOJA0649, MOJA0801, MOJA0906, MOJA0927, MOJA9379, MOJA9431, MOJA9440, MOJA9508, MOJA9521, MOJA9530, MOJA9564, MOJA9591, MOJA9664, MOJA9915, MOJA9924, MOJAE011, MOJAE012, MOJAE047, MOJAE048, MOJAE049, MOJAE052, MOJAE054, MOJAE056, MOJAE058, MOJAE077, MOJAE078, MOJAE079, MOJAE090, MOJAE092, MOJAE096, MOJAE097, MOJAE098, MOJAE099, MOJAE100, MOJAE101, MOJAE102, MOJAE108, MOJAE109, MOJAE110, MOJAE111, MOJAE112, MOJAE113, MOJAE114, MOJAE115, MOJAE116, MOJAE117, MOJAE118, MOJAE125, MOJAE126, MOJAE127, MOJAE128, MOJAE129, MOJAE130, MOJAE131, MOJAE132, MOJAE133, MOJAE147, MOJAE148, MOJAE149, MOJAE150, MOJAE151, MOJAE154, MOJAE200, MOJAE206, MOJAE207, MOJAE209, MOJAE212, MOJAE213, MOJAE214, MOJAE216, MOJAE217, MOJAE218, MOJAE219, MOJAE231, MOJAE232, MOJAE242, MOJAE246, MOJAE249, MOJAE250, MOJC0009
MOJN-Johnson (n=8): MOJJE043, MOJJE255, MOJJE258, MOJJE259, MOJJE355, MOJJE358, MOJJE582, MOJJE597
[CAMO (n=2): CAMO9110, CAMO9123]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Chilopsis linearis*	92.3	92	7.9	2	37.1	x	x	–	–
Shrub	*Acacia greggii*	71.4	10	1.3	0.2	8.1	–	–	–	x
	Hymenoclea salsola	68.1	17	1.7	0.2	10	–	–	–	x
	Stephanomeria pauciflora	52.7	1.6	0.1	0.2	1.1	–	–	–	x
	Larrea tridentata	46.2	4.8	0.5	0.2	5	–	–	–	–
	Ambrosia eriocentra	40.7	7.4	0.9	0.2	10	–	–	–	–
	Viguiera parishii	39.6	4	0.6	0.2	7.1	–	–	–	–
	Cylindropuntia acanthocarpa	38.5	0.9	0.1	0.01	3	–	–	–	–
	Eriogonum fasciculatum	38.5	0.9	0.1	0.01	1.1	–	–	–	–
	Prunus fasciculata	37.4	7.2	1.3	0.2	20	–	–	–	–
	Brickellia incana	33	2.4	0.3	0.2	3.6	–	–	–	–
	Phoradendron californicum	33	0.8	0.1	0.2	1	–	–	–	–
	Bebbia juncea	31.9	3.6	0.3	0.01	3.6	–	–	–	–
	Gutierrezia sarothrae	30.8	1.4	0.1	0.2	2	–	–	–	–
	Salvia dorrii	27.5	2.5	0.4	0.1	6	–	–	–	–
	Ericameria paniculata	26.4	11	1.2	0.2	16	–	–	–	–
	Senecio flaccidus	25.3	2.6	0.2	0.2	4	–	–	–	–
Herb	*Bromus rubens*	84.6	17	0.7	0.2	7	x	–	–	–
	Erodium cicutarium	74.7	9.4	0.4	0.01	12	–	–	–	x
	Schismus	48.4	16	0.6	0.2	8	–	–	–	–
	Sphaeralcea ambigua	47.3	3.9	0.1	0.2	0.2	–	–	–	–
	Penstemon palmeri	34.1	5.4	0.2	0.01	1.5	–	–	–	–
	Oenothera caespitosa	28.6	3.1	0.1	0.2	0.2	–	–	–	–
	Eriogonum inflatum	27.5	3.4	0.1	0.2	1	–	–	–	–
	Mirabilis laevis	26.4	2.1	0.1	0.01	0.5	–	–	–	–
	Dasyochloa pulchella	26.4	2.9	0.1	0.2	0.2	–	–	–	–
Non-vasc	Cryptogamic crust	30.8	28	0.1	0.2	0.2	–	–	–	–

Common Name: Acton's Brittlebush – Virgin River Brittlebush – Netvein Goldeneye Shrubland
Group Assignment: G541; **Alliance Code:** A4163

Alliance Concept

The Acton's Brittlebush – Virgin River Brittlebush – Netvein Goldeneye Shrubland Alliance forms an open shrub layer. The emergent tree layer, when present, is sparse to open, and the herbaceous layer is also sparse to open. The alliance occurs usually in washes and sometimes on slopes with recent disturbance. Soils are often calcareous alluvium, though may be derived from other substrates including rhyolite, and they have a variety of textures. Elevations range from approximately 600 to 1650 meters. *Encelia actonii, Encelia virginensis,* and/or *Viguiera reticulata* is dominant or co-dominant in the shrub layer. *Hymenoclea salsola, Ambrosia dumosa, Larrea tridentata, Stephanomeria pauciflora* are often present in this alliance. *Bromus rubens, Eriogonum inflatum, Erodium cicutarium,* and *Sphaeralcea ambigua* are often to characteristically present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open shrub layer of *Encelia virginensis, Encelia actonii,* or *Viguiera reticulata,* which is dominant or co-dominant in the shrub layer. The overall shrub cover ranges from 8 to 40 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and MOJA within California, but was not sampled in LAKE. It is scattered throughout DEVA and MOJA in mid to upper elevations. It was also sampled in Red Rock Canyon National Conservation Area in Nevada.

States: CA, (NV)

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (27): 322Ab, 322Ad, 322Af, 322Aj, (322Ar); Southeastern Great Basin (19): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Owlshead Mtns, Panamint Mtns**; MOJA:** Clark Mtn West, Kelso Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Encelia actonii [CEGL005748]	11	–	x	–	–
Encelia virginensis [CEGL001335]	12	–	x	x	–
Viguiera reticulata [CEGL002962]	23	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1093.0 m, Range 598 – 1609 m
- Aspect: Flat, Variable (1), N (2), NE (4), E (6), NW (4), SE (4), SW (15), W (3), S (6)
- Slope: Mean 9.1 degrees, Range 0 – 42 degrees
- Macro Topography: Basin floor/wetland (1), Channel bed (4), High slope (4), Low level/bottom (1), Low- to midslope (1), Lowslope (3), Midslope (7)
- Tree Cover: Mean 0.1%, Range 0 – 2%
- Shrub Cover: Mean 15.4%, Range 7.9– 40%
- Herb Cover: Mean 4.5%, Range 0 – 18%
- Large Rock: Mean 15.8%, Range 0 – 65%
- Small Rock: Mean 73.1%, Range 0 – 100%
- Fines Cover: Mean 5.7%, Range 0 – 91.8%
- Litter Cover: Mean 3.2%, Range 0 – 31%
- Geology: alluvium (16), conglomerate (1), felsic volcanic rock (1), limestone (3), rhyolite (2), sandstone with dolostone (dolomite) (22)
- Soil Texture: Clay loam (4), Coarse sand (6), Fine sand (1), Loam (2), Loamy sand (6), Medium sand (11), Moderately fine clay loam (1), Sand (3), Sandy loam (4), Silt loam (2)

Environment: Acton's Brittlebush – Virgin River Brittlebush – Netvein Goldeneye Shrubland Alliance occurs at mid to high elevations usually in dry washes and sometimes on slopes with recent disturbance. The alliance occurs at all aspects. The soils are typically calcareous alluvium though may be derived from other substrates including rhyolite and limestone/dolomite, and textures range from sand to loam.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 8 to 40 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Encelia actonii, Encelia virginensis,* and/or *Viguiera reticulata* is dominant or co-dominant in the shrub layer. *Hymenoclea salsola, Ambrosia dumosa, Larrea tridentata,* and *Stephanomeria pauciflora* are often present in this alliance. *Bromus rubens, Eriogonum inflatum, Erodium cicutarium, and Sphaeralcea ambigua* are often to characteristically present in the herbaceous layer.

Dynamics: Stands of this alliance occur on gravelly and cobbley washes with intermittent flooding. The characteristic plants also can occur in other disturbed sites, and they increase with increasing disturbance and are replaced in areas lacking recurring disturbance. The two *Encelia* species can sometimes be difficult to tell apart.

Viguiera reticulata stands appear restricted to calcareous substrates (dolomite, limestone, and marble) where irregular flooding occurs. They are usually on small terraces adjacent to the most active parts of washes or directly above on colluvial slopes.

Classification Comments

Encelia actonii – Encelia virginensis – Viguiera reticulata Shrubland Alliance is similar to the *Hymenoclea salsola – Bebbia juncea* alliance; the former is typically found on calcareous alluvium in this desert region while the latter alliance has more varied geologic origins. If *Hymenoclea salsola* is co-dominant with *Encelia* spp. or *Viguiera reticulata* then the stands are classified to this mixed *Encelia actonii – Encelia virginensis – Viguiera reticulata* Shrubland Alliance.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S3

References

Buck-Diaz et al. 2012, Evens 2000, cf. Evens et al. 2012, Keeler-Wolf and Thomas 2000, cf. Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=46

LAKE (n=0)

DEVA (n=35): DEVA0137, DEVA0306, DEVA0467, DEVA0529, DEVA0607, DEVA0667, DEVA0668, DEVA9175, DEVA9188, DEVA9204, DEVA9252, DEVA9303, DEVA9397, DEVA9416, DEVA9425, DEVA9463, DEVA9528, DEVA9532, DEVA9541, DEVA9543, DEVA9615, DEVA9915, DEVA9927, DEVAS165, DEVAS175, DEVAS211, MOJC0372, MOJC0458, MOJC0468, MOJC0469, MOJC0613, MOJC0641, MOJC0654, MOJC0707, MOJC1045

MOJA (n=11): MOJAE177, MOJAE178, MOJAE183, MOJAE184, MOJAE185, MOJAE186, MOJAE189, MOJAE191, MOJAE192, MOJAE193, MOJC0295

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Stephanomeria pauciflora*	73	2.6	0.4	0.1	4	–	–	–	x
	Hymenoclea salsola	71	9.4	1.4	0.2	7.1	–	–	–	x
	Larrea tridentata	62	5.2	0.7	0.2	6	–	–	–	x
	Ambrosia dumosa	62	4.0	0.6	0.1	4	–	–	–	x
	Viguiera reticulata	60	17.6	2.3	1	12	–	–	–	x
	Lycium andersonii	42	2.1	0.4	0.2	5	–	–	–	–
	Eriogonum fasciculatum	40	2.4	0.3	0.1	5	–	–	–	–
	Echinocereus engelmannii	40	0.7	0.1	0.1	0.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Gutierrezia microcephala*	38	1.9	0.3	0.2	5	–	–	–	–
	Encelia actonii	36	9.4	1.4	0.1	15	–	–	–	–
	Encelia virginensis	36	6.6	1.0	0.2	6.5	–	–	–	–
	Salazaria mexicana	33	1.7	0.3	0.2	2.1	–	–	–	–
	Ephedra nevadensis	31	1.2	0.2	0.2	2	–	–	–	–
	Opuntia basilaris	29	0.5	0.1	0.1	0.5	–	–	–	–
	Ericameria paniculata	27	5.4	0.7	0.2	7	–	–	–	–
	Echinocactus polycephalus	27	0.4	0.1	0.1	0.5	–	–	–	–
Herb	*Bromus rubens*	88	23	1.6	0.2	15	x	–	–	–
	Eriogonum inflatum	78	6.8	0.2	0.2	1	x	–	–	x
	Sphaeralcea ambigua	61	4.3	0.2	0.1	1.1	–	–	–	x
	Erodium cicutarium	53	4.8	0.2	0.1	2	–	–	–	x
	Achnatherum speciosum	35	3.2	0.3	0.1	7	–	–	–	–
	Mirabilis laevis	43	2.1	0.1	0.2	0.5	–	–	–	–
	Schismus	27	2.9	0.2	0.1	3	–	–	–	–
	Amsinckia	27	1.3	0.1	0.1	0.5	–	–	–	–
Non-vasc	Cryptogamic crust	31	26	0.3	0.2	6	–	–	–	–

Common Name: California Joint Fir Scrub
Group Assignment: G541; **Alliance Code:** A2536

Alliance Concept

The California Joint Fir Scrub Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily in dry washes at all aspects. The soils are sandy alluvium derived primarily from granitoid substrates and sometimes rhyolite. Elevations range from approximately 750 to 1450 meters. *Ephedra californica* is dominant or co-dominant in stands with *Ambrosia dumosa, Cleome isomeris, Hymenoclea salsola,* and *Larrea tridentata,* which are also characteristic shrubs in the stands sampled. *Schismus* spp. are dominant herbs, and *Adenophyllum cooperi, Bromus rubens,*and *Erodium cicutarium* are characteristic herbs of stands. Cryptogamic crust is typically present in this alliance.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Ephedra californica* dominant or co-dominant. The overall shrub cover ranges from 10 to 25 percent.

Alliance Distribution

The alliance is highly localized in Budweiser Wash and Willow Springs Wash south of Granite Mountain in MOJA. There is one occurrence near Old Dad Mountain.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (29): 322Aj, 322Al

Park Sampling Zones: MOJA: Brown Buttes, Budweiser Wash, Granite Mtns, Old Dad Mtns, Van Winkle Mtn

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ephedra californica–Ephedra trifurca (alliance)	1	x	–	–	–
Ephedra californica–Hymenoclea salsola [CEGL002958]	32	x	x	–	–
Ephedra trifurca [CEPP006856]	1	x	–	–	–

Association Notes: One sample was classified to the alliance level only in which *Thamnosma Montana, Menodora spinescens*, *Krameria erecta*, and *Lycium andersonii* all had high cover, suggesting further variation within the alliance.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 961 m, Range 762 – 1402 m

- Aspect: N (1), E (2), NW (9), SE (4), SW (9), W (2), S (7)
- Slope: Mean 3.7 degrees, Range 2 – 27 degrees
- Macro Topography: Midslope (1)
- Tree Cover: Mean 0.03%, Range 0 – 1%
- Shrub Cover: Mean 14.3%, Range 9.8 – 24.6%
- Herb Cover: Mean 0.6%, Range 0.2 – 4%
- Large Rock: Mean 3.3%, Range 0.2 – 48%
- Small Rock: Mean 62.1%, Range 26 – 86%
- Fines Cover: Mean 33.6%, Range 10 – 70%
- Litter Cover: Mean 1.1%, Range 0.2 – 3%
- Geology: alluvium (19), granodiorite (1), rhyolite (9)
- Soil Texture: Coarse sand (5), Medium sand (23), Sand (1)

Environment: The alliance occurs at mid to high elevation washes in the western part of the MOJA, including in Budweiser Wash and Willow Springs Wash south of the Granite Mountains. There is also one occurrence on a rocky slope above a sandsheet near Old Dad Mountain. It occurs at a variety of aspects. The soils are sandy alluvium typically derived from granitoide substrates and sometimes rhyolite, and they have a sandy texture.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 10 to 25 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Ephedra californica* is dominant or co-dominant in stands with *Ambrosia dumosa, Cleome isomeris, Hymenoclea salsola,* and *Larrea tridentata,* which are characteristic species of stands sampled for this alliance. *Schismus* spp. are dominant herbs, and *Adenophyllum cooperi, Bromus rubens,* and *Erodium cicutarium* are characteristic herbs of stands. Cryptogamic crust is typically present in this alliance.

Dynamics: *Ephedra californica* stands occur in areas with shifting sandy alluvium in washes or with aeolian sand deposits and residual dunes in the southern Mojave Desert and other similar semi-desert settings in California. A related taxon, *Ephedra trifurca*, occurs in similar settings in the Colorado Desert and southern Mojave Desert.

Classification Comments

Ephedra californica Shrubland Alliance is related floristically to the *Ambrosia salsola* Shrubland Alliance, and stands with *Ambrosia salsola* co-dominant with *Ephedra californica* are classified in this *Ephedra* alliance. Generally, stands with *E. californica* dominant or co-dominant appear typically on finer-textured sandy soils, lower slope steepness, and lower elevations overall.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5
State (California): S3S5

References

Buck-Diaz et al. 2012, Evens 2000, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=34
LAKE (n=0)
DEVA (n=0)
MOJA (n=29): MOJA9525, 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=5): MOJJE057, MOJJE060, MOJJE074, MOJJE287, MOJJE875

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ephedra californica*	96.6	41	5.8	2.5	13	x	–	x	–
	Hymenoclea salsola	96.6	26	3.7	1.6	8.1	x	–	–	–
	Cleome isomeris	89.7	4.9	0.7	0.2	3	x	–	–	–
	Larrea tridentata	82.8	12	1.6	0.2	7.1	x	–	–	–
	Ambrosia dumosa	75.9	1.1	0.2	0.2	0.2	x	–	–	–
	Acacia greggii	48.3	1.4	0.2	0.2	1.1	–	–	–	–
	Lycium andersonii	44.8	1.3	0.2	0.2	1.1	–	–	–	–
	Cylindropuntia ramosissima	44.8	0.6	0.1	0.2	0.2	–	–	–	–
	Senecio flaccidus	37.9	2.1	0.4	0.2	2	–	–	–	–
	Psorothamnus arborescens	34.5	1.3	0.2	0.2	1.6	–	–	–	–
	Stephanomeria pauciflora	34.5	0.5	0.1	0.2	0.2	–	–	–	–
	Salazaria mexicana	31	0.7	0.1	0.2	1	–	–	–	–
Herb	*Schismus*	96.6	53	1.5	0.2	8	x	x	–	–
	Erodium cicutarium	96.6	18	0.5	0.2	2	x	–	–	–
	Bromus rubens	89.7	12	0.4	0.2	3	x	–	–	–
	Adenophyllum cooperi	75.9	7.4	0.2	0.2	1	x	–	–	–
Non-vascular	Cryptogamic crust	58.6	51	0.2	0.2	2	–	–	–	x

Common Name: Mojave Rabbitbrush Mojave Desert Wash Shrubland
Group Assignment: G541; **Alliance Code:** A2509

Alliance Concept

The Black-Stem Rabbitbrush Mojave Desert Wash Shrubland Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily in wash bottoms and on alluvial fans. Soils are derived from a variety of substrates and soils are generally sandy in texture. Elevations range from approximately 400 to 2050 meters. *Ericameria paniculata* is the dominant and characteristic shrub of this alliance and *Hymenoclea salsola* is often present. *Bromus rubens* is often present in this alliance.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ericameria paniculata* dominant or co-dominant. The overall shrub cover ranges from 4 to 65 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout DEVA and MOJA primarily at mid to high elevations, but occasionally at low elevations, and in LAKE at low to mid elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (42): 322Ab, 322Ae, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (17): 341Fa, 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Death Valley, Grapevine Mtns, Last Chance Range, Last Chance Vlly, Owlshead Mtns, Panamint Mtns, Saline Valley**; LAKE:** Echo Bay, Government Wash, Juniper Mine, Pearce Ferry**; MOJA:** Baker-Halloran, (Castle Mtns), Cima Dome NW, Cinder Cones, Clipper Vlly, Devil's Playground, Fenner Vlly West, HackberryVontrigger, Kelso Dunes, Kelso-Cima, Lanfair Vlly, New York Mtns, Old Dad Mtns, Providence Mtns, Van Winkle Mtn, Woods Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ericameria paniculata Wash [CEGL002706]	48	x	x	x	x
Ericameria paniculata–Hymenoclea salsola	21	x	x	x	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1025 m, Range 403 – 2028 m
- Aspect: (1), Flat, Variable (1), N (3), NE (4), E (8), NW (5), SE (13), SW (12), W (2), S (18)
- Slope: Mean 5.0 degrees, Range 0 – 43 degrees
- Macro Topography: Channel bed (18), Entire slope (1), High slope (1), Low level/bottom (7), Low- to midslope (1), Lowslope (2), Midslope (15)
- Tree Cover: Mean 0.1%, Range 0 – 1.5%
- Shrub Cover: Mean 15.7%, Range 4 – 65.2%
- Herb Cover: Mean 2.5%, Range 0 – 11.2%
- Large Rock: Mean 2.0%, Range 0 – 20%
- Small Rock: Mean 57.1%, Range 3 – 96%
- Fines Cover: Mean 36.3%, Range 0 – 95.6%
- Litter Cover: Mean 2.8%, Range 0 – 16%
- Geology: alluvium (25), conglomerate (4), dolostone (dolomite) (5), dune sand (2), gneiss (2), granite (1), granodiorite (3), limestone (1), mudstone (1), rhyolite (3), sandstone (10), tephrite (basanite) (1)
- Soil Texture: Coarse loamy sand (1), Coarse sand (1), Fine sand (2), Loamy sand (7), Medium sand (8), Sand (21), Sandy loam (6)

Environment: Black-Stem Rabbitbrush Scrub Alliance occurs at low to high elevations primarily in dry washes. The soils are derived from a variety of substrates (and are usually sandy in texture), though they are often calcareous. The alliance occurs at all aspects.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 4 to 65 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: The dominant and characteristic shrub is *Ericameria paniculata.* Those often present include *Hymenoclea salsola.* The herbaceous layer often includes *Bromus rubens*.

Dynamics: *Ericameria paniculata* occurs in actively flooded portions of gravelly and cobbelly washes that receive intermittent and/or seasonal flows.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S3

References

Evens 2000, Evens et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=69 [+1]
LAKE (n=6): LAKE0264, LAKE0514, LAKE0704, LAKE9182, LAKE9705, LAMEN081
DEVA (n=27): DEVA0109, DEVA0126, DEVA0203, DEVA0224, DEVA9118, DEVA9190, DEVA9211, DEVA9258, DEVA9266, DEVA9350, DEVA9418, DEVA9457, DEVA9646, DEVA9669, DEVAD009, DEVAD038, DEVAD058, DEVAD065, DEVAD073, DEVAD079, DEVAD081, DEVAD100, DEVAD160, DEVAS037, DEVAS038, MOJC0644, MOJC0702
MOJA (n=26): MOJA0145, MOJA9162, MOJA9239, MOJA9317, MOJA9372, MOJA9382, MOJA9402, MOJA9501, MOJA9515, MOJA9527, MOJA9601, MOJA9630, MOJA9631, MOJA9639, MOJA9670, MOJA9677, MOJAE091, MOJAE094, MOJAE095, MOJAE223, MOJC0012, MOJC0196, MOJC0204, MOJC0251, MOJC0344, MOJC0738
MOJN-Johnson (n=10): MOJJE188, MOJJE267, MOJJE274, MOJJE306, MOJJE394, MOJJE498, MOJJE524, MOJJE616, MOJJE646, MOJJE917
[CAMO (n=1): CAMO9102]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ericameria paniculata*	98.3	56	8.5	1.68	50	x	x	–	–
	Hymenoclea salsola	74.1	10	1.3	0.1	10	–	–	–	x
	Stephanomeria pauciflora	44.8	1.5	0.3	0.1	5	–	–	–	–
	Larrea tridentata	43.1	2.6	0.3	0.1	4	–	–	–	–
	Ambrosia dumosa	39.7	2	0.3	0.1	5	–	–	–	–
	Eriogonum fasciculatum	31	1.3	0.2	0.1	5	–	–	–	–
	Ambrosia eriocentra	29.3	1.8	0.3	0.2	4	–	–	–	–
	Acacia greggii	27.6	2	0.2	0.2	3	–	–	–	–
Herb	*Bromus rubens*	75.9	14	0.6	0.1	6	x	–	–	–
	Erodium cicutarium	48.3	6.2	0.2	0.1	2	–	–	–	–
	Schismus	41.4	7.5	0.3	0.2	3	–	–	–	–
	Eriogonum inflatum	32.8	4.4	0.1	0.1	0.5	–	–	–	–
	Cryptantha	31	4.5	0.2	0.3	1.2	–	–	–	–
	Amsinckia	31	2.6	0.1	0.1	2	–	–	–	–
	Sphaeralcea ambigua	31	3.1	0.1	0.1	2	–	–	–	–

Common Name: Apache Plume Desert Wash
Group Assignment: G541; **Alliance Code:** A3259

Alliance Concept

The Apache Plume Desert Wash Shrubland Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse, when present, and the herbaceous layer is usually open. The alliance is found primarily in washes at various aspects. Soils are derived from a variety of substrates including calcareous and volcanic alluvium, and textures include loam, loamy sand, and sandy loam. Elevations range from approximately 1450 to 1650 meters. The dominant or co-dominant shrub is *Fallugia paradoxa,* and other characteristic shrubs include *Prunus fasciculata.* Shrubs that are often present include *Artemisia ludoviciana, Cylindropuntia acanthocarpa, Ephedra nevadensis, Opuntia polyacantha* var. *erinacea,* and *Rhus trilobata.* Characteristic herbs include *Bromus rubens, Bromus tectorum,* and *Sphaeralcea ambigua,* and those often present include *Elymus elymoides.*

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Fallugia paradoxa* dominant or co-dominant. The shrub cover ranges from 13 to 95 percent.

Alliance Distribution

The alliance is represented by three samples in MOJA and one sample in DEVA at high elevations. This alliance was not sampled in LAKE but was mapped along the border area with Grand Canyon-Parashant National Monument.

States: (AZ); CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ad, 322Al, (322Av)

Park Sampling Zones: DEVA: Funeral Mtns**; LAKE:** (Parashant); **MOJA:** [Clark Mountains], Lanfair Vlly, New York Mtns, Providence Mtns

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Fallugia paradoxa Desert Wash [CEGL005298]	5	(x)	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1549 m, Range 1498 – 1644 m
- Aspect: E (1), NE (1), SW (1), S (2)

- Slope: Mean 10 degrees, Range 2 – 30 degrees
- Macro Topography: Channel bed (1), Low level/bottom (1), Lowslope (1), Midslope (2)
- Tree Cover: Mean 0.5%, Range 0 – 0.2%
- Shrub Cover: Mean 36.5%, Range 13.43 – 95.4%
- Herb Cover: Mean 6%, Range 2 – 14%
- Large Rock: Mean 17.4%, Range 0 – 77%
- Small Rock: Mean 34.4%, Range 5 – 81.8%
- Fines Cover: Mean 23.2%, Range 0.2 – 60%
- Litter Cover: Mean 24.8%, Range 4 – 87.8%
- Geology: alluvium (1), dolostone (dolomite) (1), rhyolite (3)
- Soil Texture: Loam (1), Loamy sand (2), Sandy loam (2)

Environment: The Apache Plume Shrubland Alliance grows in high elevation, mountain washes in DEVA and MOJA at a variety of aspects. Soils are derived from a variety of substrates including calcareous and volcanic alluvium, and textures include loamy sand to loam.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 13 to 95 percent. The tree layer, when present, is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Fallugia paradoxa* is dominant or co-dominant in the shrub layer, and *Prunus fasciculata* is also characteristically present. Shrubs that are often present include *Artemisia ludoviciana, Cylindropuntia acanthocarpa, Ephedra nevadensis, Opuntia polyacantha* var. *erinacea,* and *Rhus trilobata.* Characteristic herbs include *Bromus rubens, Bromus tectorum,* and *Sphaeralcea ambigua,* and those often present include *Elymus elymoides.*

Dynamics: *Fallugia paradoxa* stands occur in washes and wash terraces of higher elevation mountain drainages. In the Mojave Desert ecoregion, they typically occur on nutrient-poor limestone and volcanic substrates.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4?
State (California): S3

References

NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=5

LAKE (n=0)
DEVA (n=1): DEVA9396
MOJA (n=3): MOJA0127, MOJA0273, MOJA9694, MOJA9699; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	40	40	0.4	0.2	0.2	–	–	–	–
	Yucca brevifolia	20	25	0.1	0.2	0.2	–	–	–	–
	Juniperus osteosperma	20	25	0	0.01	0.01	–	–	–	–
Shrub	*Fallugia paradoxa*	100	42	18	3	45	x	–	x	–
	Prunus fasciculata	100	5.1	1.9	0.2	6	x	–	–	–
	Ephedra nevadensis	60	7.3	1.2	2	2	–	–	–	–
	Rhus trilobata	60	0.7	0.3	0.01	1	–	–	–	x
	Artemisia ludoviciana	60	0.8	0.1	0.2	0.2	–	–	–	x
	Cylindropuntia acanthocarpa	60	0.6	0.1	0.2	0.2	–	–	–	x
	Opuntia polyacantha var. erinacea	50	0.6	0.1	0.2	0.2	–	–	–	x
	Gutierrezia sarothrae	40	5.0	0.8	0.2	4	–	–	–	–
	Ephedra viridis	25	1.9	0.6	0.2	3	–	–	–	–
	Lycium andersonii	50	2.8	0.5	0.5	2	–	–	–	–
	Ambrosia eriocentra	50	2.1	0.3	0.5	1	–	–	–	–
	Lycium cooperi	50	1.5	0.2	0.2	1	–	–	–	–
	Atriplex canescens	50	1.0	0.1	0.2	0.5	–	–	–	–
	Salvia dorrii	50	1.0	0.1	0.2	0.5	–	–	–	–
	Ericameria linearifolia	50	0.3	0.1	0.2	0.2	–	–	–	–
	Yucca baccata	25	0.2	0.1	0.2	0.2	–	–	–	–
	Eriogonum fasciculatum	50	0.3	0.1	0.01	0.2	–	–	–	–
Herb	*Bromus rubens*	100	24	1.5	0.2	4	x	–	–	–
	Bromus tectorum	80	4.9	0.3	0.2	1	x	–	–	–
	Sphaeralcea ambigua	80	4.8	0.2	0.2	0.2	x	–	–	–
	Elymus elymoides	60	3.1	0.1	0.2	0.2	x	–	–	–
	Erodium cicutarium	40	8.8	1.4	0.2	7	–	–	–	–
	Muhlenbergia porteri	40	2.6	0.3	0.5	1	–	–	–	x
	Cryptantha	40	1.9	0.2	0.6	0.6	–	–	–	x
	Bouteloua eriopoda	40	2.2	0.2	0.2	1	–	–	–	x
	Achnatherum speciosum	40	4.2	0.1	0.2	0.2	–	–	–	x
	Amsinckia	40	0.6	0.1	0.2	0.2	–	–	–	x
	Aristida purpurea	40	0.6	0.1	0.2	0.2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Dasyochloa pulchella*	40	0.6	0.1	0.2	0.2	–	–	–	x
	Eriastrum	40	0.6	0.1	0.2	0.2	–	–	–	x
	Eriogonum inflatum	40	2.9	0.1	0.2	0.2	–	–	–	x
	Eriogonum palmerianum	40	0.6	0.1	0.2	0.2	–	–	–	x
	Galium	40	2.9	0.1	0.2	0.2	–	–	–	–
	Machaeranthera canescens	40	0.6	0.1	0.2	0.2	–	–	–	x
	Plantago patagonica	40	0.6	0.1	0.2	0.2	–	–	–	x
	Tridens muticus	40	2.5	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Lichen	60	43	3	0.4	14	–	–	–	x
	Unknown Moss	40	12	0.1	0.2	0.2	–	–	–	x

Common Name: Mojave-Sonoran Burrobrush – Sweetbush Desert Wash
Group Assignment: G541; **Alliance Code:** A4188

Alliance Concept

The Mojave-Sonoran Burrobrush – Sweetbush Desert Wash Alliance forms an open to intermittent shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is often found in dry washes or alluvial deposits, but soils may be derived from a variety of substrates. Soils tend to be sandy, but sometimes have high clay content. Elevations range from approximately 75 to 1900 meters. *Hymenoclea salsola* is often dominant or co-dominant in the shrub layer, though sometimes *Bebbia juncea* or *Senna armata* is dominant or co-dominant in the shrub layer. Other characteristic shrubs include *Larrea tridentata. Ambrosia dumosa* is often present in the shrub layer while *Bromus rubens* and *Erodium cicutarium* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Hymenoclea salsola, Bebbia juncea, Brickellia incana,* or *Senna armata* dominant or co-dominant with each other or with other shrubs such as *Larrea tridentata*. The overall shrub cover ranges from 2 to 60 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout DEVA, MOJA, and LAKE at all elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (149): 322Ab, 322Ac, 322Ad, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (12): 341Fa, 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA Black Mtns, CottonWood Mtns, Death Valley, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Last Chance Vlly, Owlshead Mtns, Panamint Mtns; **LAKE:** Boulder City, Bridge Canyon, Callville, Cottonwood Cove, Echo Bay, Gold Butte, Juniper Mine, Katherine, Lakeshore, Searchlight SE, Temple Bar, Willow Beach**; MOJA:** Baker-Halloran, Budweiser Wash, Cima Dome NW, Cima Dome SE, Cinder Cones, Clark Mtn West, Clipper Vlly, Devil's Playground, Halloran Spring, Ivanpah Mtns, Ivanpah Vlly, Kelso Mtns, Kelso-Cima, Lanfair Vlly, Marl Mtns, Mid Hills, Old Dad Mtns, Piute Range, Providence Mtns, Turquoise Mountain, Van Winkle Mtn, Vulcan Mine, Woods Mtns.

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ambrosia eriocentra - Brickellia spp. Sparse Desert Wash [CEPP005790]	1	–	–	x	–
Bebbia juncea [CEGL005391]	31	x	x	x	–
Hymenoclea salsola [CEGL005398]	74	x	x	x	x
Hymenoclea salsola–Bebbia juncea (alliance)	1	–	x	–	–
Hymenoclea salsola–(Ambrosia eriocentra–Brickelia incana) [CEGL002702]	17	–	–	x	x
Hymenoclea salsola–Eriogonum fasciculatum [CEPP006711]	6	–	–	x	x
Hymenoclea salsola–Larrea tridentata [CEGL005753]	57	x	x	x	x
Senna armata–Hymenoclea salsola Wash [CEPP006756]	28	x	x	x	x

Association Notes: Stands with *Brickellia incana* strongly dominant were not well sampled in the study area, though they exist in MOJA in actively flooded washes.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 890.2 m, Range 79 – 1867 m
- Aspect: N (15), NE (16), E (32), NW (32), SE (28), Flat, Variable (2), W (13), SW (44), S (29)
- Slope: Mean 4.0 degrees, Range 0 – 33 degrees
- Macro Topography: Basin floor/wetland (1), Channel bed (37), Channel wall (1), Entire slope (1), High level/summit (1), High slope (6), Low level/bottom (11), Lowslope (11), Midslope (38), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0.1%, Range 0 – 1.5%
- Shrub Cover: Mean 14.1%, Range 2.2 – 60.2%
- Herb Cover: Mean 3.4%, Range 0 – 22%
- Large Rock: Mean 3.7%, Range 0 – 50%
- Small Rock: Mean 77.4%, Range 7 – 99%
- Fines Cover: Mean 16.3%, Range 0 – 91%
- Litter Cover: Mean 2.2%, Range 0 – 12%
- Geology: alkali-granite (alaskite) (3), alluvium (80), andesite (1), basalt (3), conglomerate (6), dacite (2), diorite (1), dune sand (1), dolostone (dolomite) (1), gneiss (9), granite (2), granodiorite (9), gravel (3), limestone (1), plutonic rock (phaneritic) (1), rhyolite (13), sand (1), sandstone (20), schist (1), shale (2), tephrite (basanite) (2)
- Soil Texture: Clay (1), Clay loam (4), Coarse loamy sand (2), Coarse sand (21), Loam (4), Loamy sand (33), Medium sand (22), Medium to very fine sandy loam (1), Sand (29), Sandy loam (11)

Environment: This alliance occurs at low to high elevations and all aspects in our sample area. The alliance generally occurs in dry washes, intermittently flooded bajadas, and recently disturbed areas. The soils are generally alluvial, but may be derived from a variety of parent materials. The soil texture is most often sand, but ranges from coarse sand to clay loam.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 2 to 60 percent. The tree layer, when present, is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Hymenoclea salsola, Bebbia juncea,* or *Senna armata* is dominant or co-dominant with shrubs such as *Larrea tridentata.* Those often present include *Ambrosia dumosa. Bromus rubens* and *Erodium cicutarium* are often present in the herbaceous layer.

Dynamics: *Hymenoclea salsola, Bebbia juncea,* and *Senna armata* are widespread native shrubs associated commonly with semi-desert washes, but they also occur in other disturbed areas including in burned areas, heavily grazed areas, abandoned town and old farming sites, cleared sites, and roadsides. *Senna armata,* while not as wide-ranging, also occurs in washes, other disturbed areas, and areas with sheetflow such as pediment at the base of mountains. Depending on the intensity and regularity of seasonal water flows, and the time since the last major disturbance, cover in these stands can vary from trace to continuous in cover.

Classification Comments

Stands of this alliance include those where *Larrea tridentata* is co-dominant with *Hymenoclea salsola* on less active portions of washes and wash terraces. Stands also include those with *Bebbia juncea* or *Senna armata* dominant to co-codominant with *Hymenoclea salsola.*

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S4

References

Buck-Diaz et al. 2012, Evens 2000, Evens and Hartman 2007, Evens et al. 2012, Hart et al. 1979, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Root 1978, NatureServe 2012, Sawyer et al. 2009, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=215 [+1]
LAKE (n=35): LAKE0127, LAKE0130, LAKE0133, LAKE0141, LAKE0150, LAKE0209, LAKE0213, LAKE0240, LAKE0289, LAKE0334, LAKE0340, LAKE0341, LAKE0379, LAKE0401, LAKE0418, LAKE0419, LAKE0536, LAKE0607, LAKE9144, LAKE9152, LAKE9168, LAKE9195, LAKE9228, LAKE9231, LAKE9242, LAKE9243, LAKE9283, LAKE9319, LAKE9350, LAKE9359, LAKE9622, LAMEN046, LAMEN047, LAMEN019, LAMEN109

DEVA (n=55): DEVA0319, DEVA0333, DEVA0387, DEVA0503, DEVA0534, DEVA0628, DEVA0918, DEVA9214, DEVA9222, DEVA9286, DEVA9294, DEVA9337, DEVA9362, DEVA9365, DEVA9375, DEVA9406, DEVA9408, DEVA9432, DEVA9505, DEVA9513, DEVA9525, DEVA9533, DEVA9535, DEVA9605, DEVA9652, DEVA9807, DEVA9917, DEVAD003, DEVAD007, DEVAD015, DEVAD016, DEVAD020, DEVAD021, DEVAD029, DEVAD034, DEVAD036, DEVAD040, DEVAD075, DEVAD159, DEVAD206, DEVAD212, DEVAR060, DEVAS190, DEVAS194, MOJC0455, MOJC0536, MOJC0574, MOJC0674, MOJC0739, MOJC0910, MOJC0962, MOJC1032, MOJC1033, MOJC1034, MOJC1052
MOJA (n=72): MOJA0147, MOJA0204, MOJA0365, MOJA0383, MOJA0506, MOJA0514, MOJA9201, MOJA9205, MOJA9207, MOJA9282, MOJA9285, MOJA9312, MOJA9316, MOJA9334, MOJA9366, MOJA9368, MOJA9385, MOJA9518, MOJA9526, MOJA9542, MOJA9593, MOJA9560, MOJA9594, MOJA9600, MOJA9611, , MOJA9621, MOJA9655, MOJA9666, MOJA9667, MOJA9669, MOJA9673, MOJA9683, MOJA9800, MOJA9802, MOJAE013, MOJAE014, MOJAE015, MOJAE016, MOJAE018, MOJAE021, MOJAE160, MOJAE161, MOJAE162, MOJAE163, MOJAE182, MOJAE190, MOJAE224, MOJAE225, MOJAE226, MOJAE248, MOJAE251, MOJAE252, MOJAE253, MOJAE254, MOJAE255, MOJAE256, MOJAE257, MOJAE258, MOJAE259, MOJAE260, MOJAE261, MOJAE262, MOJAE263, MOJAE264, MOJC0005, MOJC0023, MOJC0193, MOJC0250, MOJC0735, MOJC0799, MOJC1049, MOJC1230
MOJN-Johnson (n=53): MOJJE001, MOJJE006, MOJJE014, MOJJE040, MOJJE080, MOJJE092, MOJJE094, MOJJE102, MOJJE121, MOJJE134, MOJJE149, MOJJE165, MOJJE182, MOJJE191, MOJJE196, MOJJE199, MOJJE277, MOJJE290, MOJJE325, MOJJE338, MOJJE390, MOJJE519, MOJJE529, MOJJE539, MOJJE544, MOJJE546, MOJJE562, MOJJE563, MOJJE586, MOJJE600, MOJJE624, MOJJE636, MOJJE642, MOJJE671, MOJJE674, MOJJE680, MOJJE691, MOJJE704, MOJJE722, MOJJE724, MOJJE749, MOJJE760, MOJJE768, MOJJE807, MOJJE826, MOJJE829, MOJJE907, MOJJE912, MOJJE919, MOJJE920, MOJJE921, MOJJE922, MOJJE924
[MOJA-McAuliffe (n=1): MOJAA018]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Hymenoclea salsola*	99	40	5.3	0.2	28	x	–	x	–
	Larrea tridentata	82	12	1.8	0.0	15	x	–	–	–
	Ambrosia dumosa	60	5.6	0.8	0.1	10	–	–	–	x
	Acacia greggii	41	2.9	0.4	0.0	4	–	–	–	–
	Bebbia juncea	38	8.8	1.2	0.1	30	–	–	–	–
	Eriogonum fasciculatum	35	1.4	0.2	0.1	3	–	–	–	–
	Stephanomeria pauciflora	30	0.7	0.1	0.1	1	–	–	–	–
	Opuntia basilaris	26	0.5	0.1	0.1	0.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Erodium cicutarium*	58	11	0.6	0.2	8	–	–	–	x
	Bromus rubens	53	8.4	0.5	0.1	7	–	–	–	x
	Schismus	47	8.7	0.4	0.2	6	–	–	–	–
	Eriogonum inflatum	45	6.1	0.1	0.06	2	–	–	–	–
	Amsinckia	39	2.8	0.2	0.2	5	–	–	–	–
	Cryptantha	36	6.1	0.4	0.3	3.6	–	–	–	–
	Chaenactis	27	3.7	0.3	0.2	16	–	–	–	–
	Salvia columbariae	26	1.5	0.1	0.1	1	–	–	–	–

Common Name: Desert Almond–Bladder Sage Scrub Alliance
Group Assignment: G541; **Alliance Code:** A4185

Alliance Concept

The Desert Almond–Bladder Sage Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer, when present, is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found primarily in washes and in canyon channel bottoms along hillsides at a variety of aspects. Soils are derived from a variety of substrates including alluvium, granodiorite, limestone and sandstone, and soil textures are often sand or sandy loam. Elevations range from approximately 750 to 1900 meters. *Prunus fasciculata, Prunus eremophila,* or *Salazaria mexicana* is dominant or co-dominant in the shrub canopy*,* and those shrubs often present include *Eriogonum fasciculatum* and *Hymenoclea salsola.* Sometimes, *Salvia dorrii* may be dominant or co-dominant with *Prunus fasciculata* and/or other shrubs. Rarely, *Keckiella antirrhinoides* is dominant instead, and *P. fasciculata* is characteristically present. Characteristic herbs include *Bromus rubens,* and those often present include *Achnatherum speciosum, Erodium cicutarium* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Prunus fasciculata, Prunus eremophila*, and/or *Salazaria mexicana* dominant or co-dominant. Sometimes, *Salvia dorrii* may be dominant or co-dominant with *Prunus fasciculata* and other shrubs. Rarely, *Keckiella antirrhinoides* is the dominant shrub, and *Prunus fasciculata* characteristically present. The overall shrub cover ranges from 5 to 48 percent.

Alliance Distribution

The alliance is well-defined in sampling in MOJA, including in the Clark, New York, and Providence mountains, and in DEVA in various mountain ranges. Samples of this alliance are less frequent in LAKE. The alliance is found at mid to high elevations.

States: AZ, CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (69): 322Ad, 322Af, 322Aj, 322Ak, 322Al, 322Av; Southeastern Great Basin (13): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Green Water Rng/Vlly, Last Chance Range, Panamint Dunes, Panamint Mtns**; LAKE:** Pearce Ferry, Temple Bar**; MOJA:** Baker-Halloran, (Castle Mtns), Clark Mtn, Clark Mtn West, Granite Mtns, HackberryVontrigger, Hart Peak, Ivanpah Mtns, Lanfair Vlly, Marl Mtns, Mid Hills, New York Mtns, Piute Range, Providence Mtns, Signal Hill, Solomons Knob, Vulcan Mine, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Keckiella antirrhinoides–Prunus fasciculata [CEPP006717]	2	x	–	x	–
Prunus eremophila [CEPP006740]	1	–	–	x	–
Prunus fasciculata [CEGL002704]	11	–	–	x	–
Prunus fasciculata - Salazaria mexicana (alliance)	1	x	–	–	–
Prunus fasciculata–(Purshia stansburiana–Viguiera reticulata) [CEGL006863]	10	–	x	x	–
Prunus fasciculata –Ambrosia eriocentra [CEGL005773]	13	–	–	x	–
Prunus fasciculata –Rhus trilobata [CEPP006741]	4	x	–	x	–
Salazaria mexicana [CEGL005293]	27	–	x	x	x
Hymenoclea salsola –Salazaria mexicana [CEGL002703]	8	–	x	x	x
Salvia dorrii Wash [CEGL005774]	14	–	–	x	x

Association Notes: One sample was classified to alliance level only in which *Prunus fasciculata* was co-dominant with *Ericameria laricifolia* and *Brickellia desertorum.*

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1364.0 m, Range 768 – 1883 m
- Aspect: N (12), NE (7), E (10), NW (13), SE (10), SW (24), W (7), S (7)
- Slope: Mean 9.1 degrees, Range 1 – 40 degrees
- Macro Topography: Channel bed (7), High slope (7), Lowslope (7), Midslope (27), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0.2%, Range 0 – 6%
- Shrub Cover: Mean 18.9%, Range 5.4 – 47.9%
- Herb Cover: Mean 7.6%, Range 0 – 39%
- Large Rock: Mean 16.3%, Range 0 – 93%
- Small Rock: Mean 65.9%, Range 4 – 99%
- Fines Cover: Mean 13.1%, Range 0 – 90%
- Litter Cover: Mean 3.7%, Range 0 – 40%
- Geology: alluvium (17), conglomerate (1), dolostone (dolomite) (5), gneiss (7), granodiorite (23), limestone (6), plutonic rock (phaneritic) (1), rhyolite (7), sand (1), sandstone (14)
- Soil Texture: Clay (1), Clay loam (7), Coarse loamy sand (2), Coarse sand (11), Fine Sand (1), Loam (2), Loamy sand (12), Medium sand (17), Medium silt (1), Medium to very fine sandy loam (1), Moderately fine sandy clay loam (1), Sand (11), Sandy loam (11), Silty clay (1)

Environment: The alliance is found at mid to high elevations at various aspects. The alliance primarily occurs on the sandy soils of upper washes, arroyos, and mountain canyons, which are derived from various materials including calcareous substrates.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 5 to 48 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Prunus fasciculata, Prunus eremophila* or *Salazaria mexicana* is dominant or co-dominant in the shrub layer. Sometimes, *Salvia dorrii* may be dominant or co-dominant with *Prunus fasciculata* and other shrubs. Rarely, *Keckiella antirrhinoides* is dominant instead, and *P. fasciculata* is characteristically present. Those shrubs that are often present include *Eriogonum fasciculatum* and *Hymenoclea salsola.* Characteristic herbs include *Bromus rubens,* and those often present include *Achnatherum speciosum, Erodium cicutarium* and *Sphaeralcea ambigua.*

Dynamics: *Prunus fasciculata* , *Salazaria mexicana,* and *Salvia dorrii* commonly occur in gravelly and rocky washes on upper bajadas into the mountains, occurring with related alliances of *Acacia greggii (=Senegalia greggii)* and *Baccharis sergiloides.* Both *Prunus fasciculata* and *Salazaria mexicana* vigorously resprout after fire, and these shrubs can expand in extent within a few years after a fire at the expense of other fire-sensitive plants, including *Juniperus osteosperma, Coleogyne ramosissima* and other related mid-elevation desert scrub species. Post-burn stands that occur along rocky montane slopes in the Mojave Desert ecoregion include those at the Mid Hills after the Hackberry Complex Fire.

Classification Comments

The *Prunus fasciculata, Salazaria mexicana* and *Salvia dorrii* alliances previously defined by Sawyer et al. (2009) and Thomas et al. (2004) have been merged into this broader *Prunus fasciculata –Salazaria mexicana* defined in this report, which is based on similarity in their floristics and ecology (and their proximate grouping in the ordination analyses). Some *Salvia dorrii* associations in upland setting are in the Columbia Plateau Scabland Shrubland Group (G307) in the USNVC hierarchy, which differ from the *Salvia dorrii* Wash association defined here for the Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope Group (G541).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: GNR
State (California): S3

References

Evens 2000, Evens et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2012, Sawyer et al. 2009, VegCamp and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=91

LAKE (n=3): LAKE0425, LAKE9709, LAKE9711
DEVA (n=17): DEVA9125, DEVA9455, DEVA9671, DEVA9802, DEVA9803, DEVA9804, DEVA9805, DEVAS418, DEVAS201, MOJC0058, MOJC0361, MOJC0466, MOJC0526, MOJC0593, MOJC0955, MOJC0990, MOJC1102
MOJA (n=62): MOJA0247, MOJA0270, MOJA0292, MOJA0409, MOJA0411, MOJA0587, MOJA0690, MOJA0808, MOJA9104, MOJA9107, MOJA9135, MOJA9143, MOJA9178, MOJA9267, MOJA9291, MOJA9293, MOJA9299, MOJA9348, MOJA9357, MOJA9359, MOJA9386, MOJA9387, MOJA9388, MOJA9430, MOJA9455, MOJA9504, MOJA9507, MOJA9510, MOJA9572, MOJA9618, MOJA9672, MOJA9692, MOJAE044, MOJAE051, MOJAE073, MOJAE074, MOJAE075, MOJAE166, MOJAE167, MOJAE169, MOJAE171, MOJAE175, MOJAE176, MOJAE179, MOJAE180, MOJAE181, MOJAE240, MOJAE241, MOJAE243, MOJAE244, MOJAE245, MOJAE247, MOJAN001, MOJC0015, MOJC0016, MOJC0078, MOJC0209, MOJC0266, MOJC0950, MOJC0979, MOJC0999, MOJC1210
MOJN-Johnson (n=9): MOJJE093, MOJJE272, MOJJE273, MOJJE560, MOJJE601, MOJJE643, MOJJE655, MOJJE886, MOJJE894
[CAMO (n=2): CAMO8101, CAMO9121]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	27	23	0.1	0.1	1.1	–	–	–	–
Shrub	*Prunus fasciculata*	74	18	3.8	0.2	25	x	–	–	–
	Salazaria mexicana	63	13	2.1	0.2	12.5	–	–	–	x
	Eriogonum fasciculatum	67	4.3	0.6	0.2	5	–	–	–	x
	Salvia dorrii	54	7.2	1.3	0.11	9	–	–	–	x
	Hymenoclea salsola	51	3.7	0.6	0.11	7	–	–	–	–
	Acacia greggii	46	3.6	0.7	0.2	6	–	–	–	–
	Cylindropuntia acanthocarpa	46	1.0	0.2	0.2	2	–	–	–	–
	Thamnosma montana	46	1.0	0.2	0.2	2	–	–	–	–
	Stephanomeria pauciflora	44	0.7	0.1	0.2	0.5	–	–	–	–
	Yucca baccata	44	1.8	0.3	0.2	5	–	–	–	–
	Ephedra nevadensis	43	1.9	0.3	0.2	4	–	–	–	–
	Echinocereus engelmannii	40	0.6	0.1	0.11	0.5	–	–	–	–
	Gutierrezia sarothrae	39	2.6	0.3	0.2	5	–	–	–	–
	Gutierrezia microcephala	39	2.3	0.4	0.2	8	–	–	–	–
	Ambrosia eriocentra	30	5.4	1	0.2	13	–	–	–	–
	Ephedra viridis	29	1.5	0.4	0.2	8	–	–	–	–
	Ericameria linearifolia	26	1	0.2	0.2	3	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Yucca schidigera*	26	1.1	0.2	0.1	3	–	–	–	–
	Artemisia ludoviciana	26	0.9	0.2	0.2	3.5	–	–	–	–
	Rhus trilobata	20	1.5	0.3	0.2	5	–	–	–	–
Herb	*Bromus rubens*	89	25	2.6	0.2	25	x	–	–	–
	Erodium cicutarium	67	12	1.7	0.11	30	–	–	–	x
	Sphaeralcea ambigua	62	4.4	0.4	0.1	4	–	–	–	x
	Achnatherum speciosum	61	6.5	0.3	0.1	3	–	–	–	x
	Eriogonum inflatum	39	2.7	0.1	0.2	1	–	–	–	–
	Amsinckia	35	1.2	0.1	0.11	1	–	–	–	–
	Penstemon palmeri	32	2.4	0.1	0.2	1	–	–	–	–
	Cryptantha	28	3.8	0.3	0.6	6	–	–	–	–
	Mirabilis laevis	27	1.6	0.1	0.2	0.5	–	–	–	–
	Elymus elymoides	26	0,8	0.1	0.2	0.5	–	–	–	–

Common Name: Smokebush Wash Scrub
Group Assignment: G541, G559; **Alliance Code:** A4186

Alliance Concept

The Smokebush Wash Scrub Alliance forms an open shrub layer. The emergent tree layer is sparse if present, and the herbaceous layer is sparse to open. The alliance is found primarily in alluvial fans, dry washes, lower slopes, and sand dunes, and often occurs in sites that experience disturbance from flooding to shifting substrates. Soils are derived from a variety of substrates including alluvium, dune sand, and sedimentary rock, and soil textures are sand to sandy loam. Elevations range from approximately 390 to 1610 meters. Dominant and characteristic shrubs include *Psorothamnus fremontii* or *P. polydenius* in the study area, and those that are often present include *Ambrosia dumosa, Larrea tridentata.* Herbs that are often present include *Sphaeralcea ambigua,* and commonly associated non-vascular plants include cryptogamic crust.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Psorothamnus arborescens, Psorothamnus fremontii,* or *Psorothamnus polydenius,* which can be dominant or co-dominant in the shrub layer. The overall shrub cover ranges from 2 to 28 percent cover.

Alliance Distribution

The alliance has been sampled in both LAKE and DEVA in various sites.

States: AZ, CA, NV

Ecoregion Sections and Subsection Codes: Mojave Desert (12), 322Ad, 322Av, 322Ay, 322Az, Southeastern Great Basin (10): 341Fc

Park Sampling Zones: DEVA: Eureka Valley, Joshua Flat, Last Chance Range**; LAKE:** Boulder City, Callville, Echo Bay, Pearce Ferry

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Psorothamnus fremontii–Psorothamnus polydenius (alliance)	1	–	x	–	–
Psorothamnus arborescens [none, new type]	2	–	x	–	–
Psorothamnus fremontii sand dunes/flats [CEPP006865]	2	x	–	–	–
Psorothamnus fremontii Wash [CEGL005154]	5	x	–	–	–
Psorothamnus fremontii–Ambrosia dumosa [CEPP006742]	4	x	–	–	–
Psorothamnus polydenius var. polydenius / Achnatherum hymenoides [CEGL001353]	8	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 799.4 m, Range 389 – 1612 m
- Aspect: N (6), NE (3), E (1), NW (2), SE (4), SW (3)
- Slope: Mean 10.1 degrees, Range 1 – 34 degrees
- Macro Topography: Channel bed (2), High level/summit (2), High slope (2), Low level/bottom (3), Lowslope (6), Midslope (4)
- Tree Cover: Mean 0.1%, Range 0 – 1%
- Shrub Cover: Mean 9.3%, Range 2.1 – 28.1%
- Herb Cover: Mean 3.5%, Range 0 – 12%
- Large Rock: Mean 8.8%, Range 0 – 90%
- Small Rock: Mean 48.6%, Range 0 – 98%
- Fines Cover: Mean 37.7%, Range 0 – 95.5%
- Litter Cover: Mean 0.8%, Range 0 – 5.2%
- Geology: alluvium (4), basalt (2), conglomerate (3), dolostone (dolomite) (1), dune sand (3), gneiss (2), sandstone (3), sedimentary (gypsum) (1), water (1)
- Soil Texture: Loamy sand (1), Sand (6), Sandy loam (4)

Environment: Stands occur in various settings including alluvial fans, dry washes, lower mountain slopes, and sand dunes at lower elevations. Stands in DEVA included *Psorothamnus polydenius* or *Psorothamnus arborescens* as the dominant, often found on sandy dunes and washes in Eureka Valley and the Saline Range, or on steep eroding slopes of the Last Chance Range and Saline Range. Stands in LAKE occur along sand dunes, in washes, and along alluvial fans and slopes with intermittent drainages in a variety of locations.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer, and shrub cover ranges from 2 to 28 percent cover. The tree layer is sparse if present, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Characteristic shrubs include *Psorothamnus* spp., including *Psorothamnus arborescens, Psorothamnus fremontii* or *Psorothamnus polydenius,* which are either dominant or co-dominant in the shrub layer. Those shrubs often present include *Ambrosia dumosa* and *Larrea tridentata,* and sometimes present is *Hymenoclea salsola.* The tree layer is typically absent or sparse in cover. The herbaceous layer typically or often includes *Sphaeralcea ambigua,* and sometimes includes *Cryptantha* spp*., Bromus rubens, and Eriogonum inflatum.* Commonly associated non-vascular plants include cyptogamic crust.

Dynamics: *Psorothamnus* spp. appear adapted to disturbance, including alluvial, colluvial and aeolian (shifting-sand) movement.

Classification Comments

Psorothamnus spp. associations are placed within the Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope Group (G541) and Cool Semi-Desert Shrub & Herb Wash-Arroyo Group (G559) in

the USNVC hierarchy. For the Mojave Network classification, we have combined the associations into one alliance in the G541 group. However, further review and analysis is needed since Intermountain Semi-Desert Steppe & Shrubland (G310) and Mojave-Sonoran Bajada & Valley Desert Scrub (G295) are other groups with similar floristic and environmental characteristics.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G4?
State (California): S3

References

cf. NatureServe 2012

Surveys (with Sample Sizes) Used for Description

MOJN: N=22
LAKE (n=11): ASGES1av, LAKE0308, LAKE0331, LAKE0513, LAKE9180, LAKE9262, LAKE9267, LAKE9332, LAKE9392, LAKE9603, LAKE9706
DEVA (n=11): DEVA0114, DEVA0449, DEVA0560, DEVA0561, DEVA0635, DEVA9904, DEVAD026, DEVAS064, DEVAS065, DEVAS096, DEVAS207
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	60	9.9	0.8	0.2	6	–	–	–	x
	Psorothamnus fremontii	55	28	2.3	2	8	–	–	–	x
	Ambrosia dumosa	55	5	0.5	0.06	3	–	–	–	x
	Psorothamnus polydenius	40	27	2.7	2	28	–	–	–	–
	Hymenoclea salsola	40	5.1	0.6	0.2	4	–	–	–	–
	Acacia greggii	30	0.9	0.1	0.2	1	–	–	–	–
	Opuntia basilaris	30	0.7	0.1	0.2	0.2	–	–	–	–
	Stephanomeria pauciflora	30	0.7	0.1	0.2	0.2	–	–	–	–
	Bebbia juncea	25	2	0.2	0.2	4	–	–	–	–
	Krameria erecta	25	1.2	0.1	0.2	2	–	–	–	–
	Encelia farinosa	25	1.3	0.1	0.2	1	–	–	–	–
Herb	*Sphaeralcea ambigua*	65	5.2	0.2	0.06	1	–	–	–	x
	Cryptantha	40	8.5	0.7	0.6	7.2	–	–	–	–
	Salsola	40	8.1	0.4	0.11	5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Bromus rubens*	40	3.3	0.2	0.2	1	–	–	–	–
	Eriogonum inflatum	35	0.9	0.1	0.2	0.2	–	–	–	–
	Achnatherum hymenoides	30	4.5	0.1	0.11	1	–	–	–	–
	Mentzelia	30	3	0.1	0.4	0.4	–	–	–	–
	Plantago ovata	25	1.5	0.1	0.2	1	–	–	–	–
	Dicoria canescens	25	4.1	0.1	0.1	1.11	–	–	–	–
	Chaenactis fremontii	25	1.6	0.1	0.2	1	–	–	–	–
	Antheropeas	25	1.1	0.1	0.2	0.2	–	–	–	–
	Camissonia refracta	25	0.8	0.1	0.2	0.2	–	–	–	–
	Cryptantha pterocarya	25	0.9	0.1	0.2	0.2	–	–	–	–
	Schismus	25	1	0.1	0.2	0.2	–	–	–	–
Non-vasc	Cryptogamic crust	50	50	0.2	0.2	2	–	–	–	x

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

Aloysia wrightii – Pericome caudata – Ephedra nevadensis Sparsely Vegetated Bedrock Cliff & Lava Field Alliance

Common Name: Sparsely Vegetated Bedrock Cliff & Lava Field
Group Assignment: G569; **Alliance Code:** A4025

Alliance Concept

Stands of sparsely vegetated rock outcrops in the North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation Group occur as a variable set of plants with sparse vegetation cover (<10% cover). The herbaceous, shrub layer and tree layers, if present, are sparse. Commonly associated are non-vascular plants including cryptogamic crust. Sites include bajadas, foothills, slopes to ridges. The type occurs on low to mid elevations at all aspects. Elevations range from approximately 100 to 1100 meters. Soils are rocky, and derived from a variety of substrates including basalt, conglomerate, gneiss, and sedimentary (gypsum), and textures include sand and silty clay.

Diagnostic Criteria: This type is characterized by non-vascular plants of cryptogamic crust and lichen, and the alluvial to colluvial, rocky substrate particularly defines the type. Vascular plants are variable and may include *Agave utahensis, Aloysia wrightii, Ephedra nevadensis, Nicotiana obtusifolia, Camissonia* spp., *Mentzelia* spp., and various other shrubs and herbs. The herbaceous cover ranges from 0 to 6 percent cover, and shrub cover ranges from 0 to 4 percent cover.

Alliance Distribution

The alliance occurs in all three park areas and was sampled in DEVA and LAKE at low to mid elevations on large volcanic rocky outcrops, hills, and bajadas. This type also was observed at MOJA in lava fields.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ab, 322Ad, 322At, 322Az

Park Sampling Zones: DEVA: Black Mtns, Green Water Rng/Vlly**; LAKE:** Boulder City, Gold Butte**; (MOJA)**

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Sparsely Vegetated Bedrock Cliff & Lava Field (alliance)	6	x	x	–	–

Association Notes: Too few stands of this alliance were documented to determine associations.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 608 m, Range 135 – 1102 m
- Aspect: NE (1), NW (1), Flat, Variable (1), SW (1), W (2)
- Slope: Mean 47 degrees, Range 27 – 62 degrees
- Macro Topography: High level/summit (1), High slope (2), Midslope (2)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 1.2%, Range 0 – 4%
- Herb Cover: Mean 1.5%, Range 0 – 6%
- Large Rock: Mean 73%, Range 0 – 96%
- Small Rock: Mean 5.6%, Range 1 – 13%
- Fines Cover: Mean 20.6%, Range 0 – 99%
- Litter Cover: Mean 0.2%, Range 0 – 1%
- Geology: basalt (1), conglomerate (2), gneiss (2), sedimentary (gypsum) (1)
- Soil Texture: Sand (1), Silty clay (1)

Environment: The alliance occurs at low to mid elevations on midslopes to summits at all aspects. Sites include bajadas, foothills, slopes to ridges. Soils are rocky, and derived from basalt, conglomerate, gneiss, and sedimentary (gypsum), and textures include sand and silty clay.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to open herbaceous layer, and the overall herbaceous cover ranges from 0 to 6 percent cover. The tree layer, if present, is sparse, and the shrub layer is sparse to open. Non-vascular plants are variable and often sparse to open.

Vegetation Floristics: Commonly associated plants are non-vascular including cryptogamic crust and lichen. Vascular plants are variable and may include *Agave utahensis, Aloysia wrightii, Ephedra nevadensis, Nicotiana obtusifolia, Camissonia* spp., *Mentzelia* spp., and various other shrubs and herbs.

Dynamics: The alluvial or colluvial, rocky substrate defines the type with little vascular vegetation cover, and non-vascular plants are characteristically present and variable in cover.

Classification Comments

This alliance is similar to the *Peucephyllum schottii – Pleurocoronis pluriseta* Scrub Alliance, which also occurs at low to mid elevation alluvial to colluvial, rocky settings. This may be a group-level concept with several alliances, and is poorly documented, needing significant further work and understanding to solidify the concept.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR
State (California): S4

References
VegCAMP and AIS 2013, NatureServe 2015

Surveys (with Sample Sizes) Used in Description
MOJN: N=6
LAKE (n=3): LAKE9212, LAKE9285, LAKE9286
DEVA (n=3): DEVA0393, DEVA9385, MOJC0902
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Agave utahensis*	33.3	2.46	0.1	0.2	0.2	–	–	–	–
	Ephedra nevadensis	33.3	2.46	0.1	0.2	0.2	–	–	–	–
	Galium stellatum	33.3	2.46	0.1	0.2	0.2	–	–	–	–
	Salvia mohavensis	33.3	2.46	0.1	0.2	0.2	–	–	–	–
Herb	*Bromus rubens*	33.3	12.5	0.7	1	3	–	–	–	–
	Erodium cicutarium	33.3	5.741	0.4	0.2	2	–	–	–	–
	Achnatherum speciosum	33.3	1.574	0.1	0.2	0.2	–	–	–	–
	Cirsium neomexicanum	33.3	1.574	0.1	0.2	0.2	–	–	–	–
	Nicotiana obtusifolia	33.3	1.574	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	33.3	2.963	0.1	0.2	0.2	–	–	–	–
Non-vasc	Cryptogamic crust	66.7	66.67	0.6	0.2	2	–	–	–	x

Common Name: Desert Holly Scrub
Group Assignment: G569, G300; **Alliance Code:** A0872

Alliance Concept

The Desert Holly Scrub Alliance forms a sparse to open shrub layer. The emergent tree layer, when present, is typically sparse and the herbaceous layer is sparse to open. The alliance is found on variety of landforms and aspects, including alkaline basins and mudhills, low-slope position desert pavement and washes, and skeletal volcanic and limestone slopes. Soils are derived from a variety of substrates including alluvium, rhyolite, sandstone, and limestone, and the soil texture is highly variable. Elevations range from approximately -77 to 1300 meters. *Atriplex hymenelytra* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Ambrosia dumosa*, *Larrea tridentata* or *Tidestromia* sp. The herbaceous layer is variable, but *Eriogonum inflatum, Chorizanthe rigida, Cryptantha* spp., and *Plantago ovata* are sometimes present.

Diagnostic Criteria: This alliance is characterized by a sparse to open shrub layer with *Atriplex hymenelytra* dominant or co-dominant with shrubs such as *Ambrosia dumosa, Larrea tridentata* or *Tidestromia oblongifolia.* The overall shrub cover ranges from 0.5 to 30 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and the northern portion of LAKE, and represented by three plots in MOJA localized to the Seventeen Mile Point area near Devil's Playground. The alliance is typically found at low to mid elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (105): 322Ab, 322Ac, 322Ad, 322Ae, 322Af, 322Ai, 322Aj, 322Am, 322Ar, 322Av, 322Ay, 322Az; Southeastern Great Basin (18): 341Fc, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Death Valley, Devil's Hole, 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:** Callville, Government Wash, Lakeshore, Temple Bar**; MOJA:** Cinder Cones, Cow Hole Mtns, Old Dad Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex hymenelytra [CEGL001317]	30	x	x	x	–
Atriplex hymenelytra (alliance)	2	–	x	–	–
Atriplex hymenelytra Sparse [CEPP005798]	24	x	x	–	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex hymenelytra–Ambrosia dumosa [CEGL005740]	20	x	x	–	–
Atriplex hymenelytra–Tidestromia oblongifolia [CEGL005741]	24	–	x	–	–
Atriplex hymenelytra–Larrea tridentata [CEGL001264]	25	x	x	x	–

Association Notes: Two stands are classified at the alliance level, in which *Atriplex hymenelytra* occurs at low cover with various shrubs and herbs.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 440.3 m, Range -77 – 1274 m
- Aspect: Flat, Variable (2), N (9), NE (11), E (11), NW (10), SE (10), SW (33), W (16), S (7), Flat (1)
- Slope: Mean 11.5 degrees, Range 0 – 49 degrees
- Macro Topography: Channel bed (1), Entire slope (4), High level/summit (6), High slope (4), Low level/bottom (7), Lowslope (15), Midslope (16), Toeslope (alluvial fan/bajada) (6)
- Tree Cover: Mean 0%, Range 0 – 0.1%
- Shrub Cover: Mean 5.8%, Range 0.5 – 30.3%
- Herb Cover: Mean 2.9%, Range 0 – 20%
- Large Rock: Mean 13.0%, Range 0 – 80%
- Small Rock: Mean 66.0%, Range 2.5 – 100%
- Fines Cover: Mean 16.3%, Range 0 – 96.6%
- Litter Cover: Mean 1.1%, Range 0 – 11%
- Geology: alluvium (43), basalt (2), conglomerate (6), granodiorite (1), gravel (1), limestone (5), rhyolite (15), sandstone (42), schist (1), sedimentary (gypsum) (6), tephrite (basanite) (2)
- Soil Texture: Clay loam (5), Coarse loamy sand (5), Coarse sand (2), Fine silty clay (1), Loam (4), Loamy sand (6), Medium sand (8), Medium silt loam (1), Medium to very fine sandy loam (23), Moderately coarse sandy loam (1), Moderately fine clay loam (2), Moderately fine silty clay loam (3), Sand (6), Sandy clay (1), Sandy loam (11), Silt (1), Silty clay (4)

Environment: The alliance is found on variety of landforms and aspects, including alkaline basins and mudhills, low-slope position desert pavement and washes, and skeletal volcanic and limestone slopes. Soils are derived from a variety of substrates including alluvium, rhyolite, sandstone, and limestone, and the soil texture is highly variable.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to open shrub layer and the overall shrub cover ranges from 0.5 to 30 percent. The tree layer is typically sparse, if present, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Atriplex hymenelytra* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Ambrosia dumosa*, *Larrea tridentata or Tridestromia* sp. The herbaceous layer is variable, but *Eriogonum inflatum, Chorizanthe rigida, Cryptantha* spp., and *Plantago ovata* are sometimes present. The composition of other strata is variable.

Dynamics: *Atriplex hymenelytra* stands often occur on harsh upland sites and are floristically simple. Stands may fluctuate in shrub cover depending on moisture availability in successive years, with shrub die-off in series of drier years. Severe degradation, colluvial, or alluvial disturbance of upland stands can result in sparse stands of *Atriplex hymenelytra* and/or *Tidestroemia oblongifolia,* or a lack of shrub cover and ephemeral annual herb cover.

Classification Comments

Stands can vary spatially and temporally in shrub cover from trace (0.5%) to higher in cover (20%), depending on site-dependent moisture availability, natural disturbances, and annual rainfall fluctuations. They also can vary in having *Tidestromia oblongifolia* dominant with trace cover of *Atriplex hymenelytra,* or vice versa. The association-level classification takes this variation into consideration (instead of describing two or more different alliances). However, *Atriplex hymenelytra* associations have been placed within the Intermountain Shadscale – Saltbush Scrub (G300) and the North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation (G569) groups in the revised USNVC hierarchy. With further introspection of the USNVC hierarchy, stands with low to trace cover are best placed in North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation (G569) while stands with higher cover may better placed in Mojave-Sonoran Bajada & Valley Desert Scrub (G295), as compared to the cool semi-desert group (G300) that it has additionally been placed in the USNVC. With G569 being nested now in the same division as G295, we have placed all stands in one group, G569.

Classifiction Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Annable 1985, Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=123
LAKE (n=13): LAKE0183, LAKE0397, LAKE0628, LAKE0702, LAKE9125, LAKE9149, LAKE9352, LAKE9353, LAKE9357, LAKE9364, LAKE9388, LAKE9420, LAKE9629
DEVA (n=106): DEVA0128, DEVA0368, DEVA0395, DEVA0429, DEVA0501, DEVA0627, DEVA9183, DEVA9194, DEVA9273, DEVA9284, DEVA9289, DEVA9332, DEVA9369, DEVA9383, DEVA9390, DEVA9391, DEVA9392, DEVA9394, DEVA9407, DEVA9428, DEVA9431, DEVA9460, DEVA9500, DEVA9517, DEVA9602, DEVA9618, DEVA9965, DEVAD084, DEVAD094, DEVAD195, DEVAD196, DEVAD197, DEVAD202, DEVAD226,

DEVAR003, DEVAR004, DEVAR030, DEVAR045, DEVAR049, DEVAR050, DEVAR053, DEVAR065, DEVAR079, DEVAR094, DEVAR109, DEVAS006, DEVAS007, DEVAS009, DEVAS010, DEVAS013, DEVAS016, DEVAS019, DEVAS103, DEVAS115, DEVAS153, MOJC0374, MOJC0420, MOJC0499, MOJC0540, MOJC0541, MOJC0542, MOJC0543, MOJC0559, MOJC0560, MOJC0562, MOJC0564, MOJC0584, MOJC0585, MOJC0586, MOJC0588, MOJC0590, MOJC0591, MOJC0592, MOJC0662, MOJC0663, MOJC0665, MOJC0689, MOJC0711, MOJC0712, MOJC0713, MOJC0740, MOJC0741, MOJC0742, MOJC0743, MOJC0744, MOJC0745, MOJC0746, MOJC0867, MOJC0868, MOJC0869, MOJC0874, MOJC0875, MOJC0895, MOJC0896, MOJC0897, MOJC0898, MOJC0899, MOJC0900, MOJC0901, MOJC1086, MOJC1087, MOJC1088, MOJC1182, MOJC1183, MOJC1184, MOJC1185
MOJA (n=4): MOJA9183, MOJC0153, MOJC0154, MOJC0253
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Atriplex hymenelytra*	100	54	2.6	0.11	20	x	x	–	–
	Larrea tridentata	49.2	11	0.7	0.1	10	–	–	–	–
	Ambrosia dumosa	47.6	9.9	0.7	0.11	10	–	–	–	–
	Tidestromia	29.8	9.1	0.2	0.1	3	–	–	–	–
Herb	*Eriogonum inflatum*	37.1	11	0.2	0.1	3	–	–	–	–
	Chorizanthe rigida	31.5	5.4	0.1	0.1	2	–	–	–	–
	Cryptantha	29.8	6.3	0.3	0.3	6.6	–	–	–	–
	Plantago ovata	25.8	5.4	0.4	0.1	15	–	–	–	–

Common Name: Warm Semi-Desert Ephemerally Vegetated Pavement
Group Assignment: G569; **Alliance Code:** A4024

Alliance Concept

The Rigid Spineflower–Hairy Desert-sunflower Desert Pavement Alliance forms a sparse to intermittent herbaceous layer. The shrub and tree layers are sparse. The alliance is found from basin floors to upper bajadas at all aspects, and they are often found on desert pavement and skeletal bajadas. Soils are derived from a variety of substrates and textures range from sand to sandy clay and silty clay. Elevations range from approximately -62 to 900 meters. Herbs are variable in presence and cover annually depending on rainfall and often include *Chorizanthe rigida, Cryptantha* spp. and *Geraea canescens.* Commonly associated emergent shrubs at sparse cover include *Larrea tridentata.*

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent herbaceous layer with various herbs, including *Chorizanthe rigida, Geraea canescens,* and/or *Cryptantha* species, having variable cover. The overall herbaceous cover ranges from 0 to 52 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout the valleys and bajadas in DEVA, MOJA and LAKE at low to mid elevations. It is also known from Joshua Tree National Park, Anza Borrego Desert State Park, and other areas in the Colorado and Sonoran Deserts of California.

States: CA, NV

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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Chorizanthe rigida–Geraea canescens Desert Pavement [CEGL009686]	14	x	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 214.6 m, Range -62 – 900 m
- Aspect: Flat, Variable (1), Flat, Variable (2), NE (1), NW (2), SW (2), W (1), SW (2), S (2)

- Slope: Mean 5.3 degrees, Range 0 – 23 degrees
- Macro Topography: Basin floor/wetland (2), Bottom to midslope (1), High level/summit (1), Low level/bottom (4), Lowslope (2), Midslope (1), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0.7%, Range 0 – 1.8%
- Herb Cover: Mean 7.8%, Range 0 – 51.6%
- Large Rock: Mean 12.8%, Range 0 – 98%
- Small Rock: Mean 50.7%, Range 1 – 90.8%
- Fines Cover: Mean 35.7%, Range 1 – 89.8%
- Litter Cover: Mean 0.8%, Range 0 – 4%
- Geology: alluvium (8), conglomerate (3), dune sand (1), rhyolite (1), sandstone (1)
- Soil Texture: Loamy sand (3), Sand (5), Sandy clay (1), Sandy loam (1), Silty clay (1)

Environment: The alliance occurs primarily on valley floors and bottoms but can also be found on low and mid slopes at low to mid elevations and all aspects. It is often found on desert pavements and bajadas with skeletal soil. Soils range from sand to sandy clay and silty clay and are derived from a variety of substrates.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to intermittent herbaceous layer, and the overall herbaceous cover ranges from 0 to 51.6 percent cover. The tree and shrub layers and non-vascular plants, if present, are sparse.

Vegetation Floristics: Herbs are variable in presence and cover annually and often include *Chorizanthe rigida, Cryptantha* spp. and *Geraea canescens.* The shrub layer is emergent, sparse, and often or sometimes includes *Larrea tridentata* or *Atriplex hymenelytra*.

Dynamics: 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.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4
State (California): S4

References

Evens et al. 2012, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in 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)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	64	50	0.4	0.2	1	–	–	–	x
	Atriplex hymenelytra	29	18	0.1	0.1	1	–	–	–	–
	Tidestromia	29	15	0.1	0.1	0.3	–	–	–	–
Herb	*Chorizanthe rigida*	86	7	0.4	0.1	2	x	–	–	–
	Geraea canescens	71	7.5	0.8	0.1	5	–	–	–	x
	Cryptantha	50	7.1	0.5	0.6	3	–	–	–	x
	Schismus	36	3.8	0.2	0.2	1	–	–	–	–
	Chaenactis	29	8.5	3.3	0.4	40	–	–	–	–
	Camissonia	29	3.8	0.2	0.4	2	–	–	–	–

Common Name: Schott's Pygmycedar – Bush Arrowleaf Scrub
Group Assignment: G569; **Alliance Code:** A3143

Alliance Concept

The Schott's Pygmycedar – Bush Arrowleaf Scrub Alliance forms a sparse to open shrub layer. The emergent tree layer is typically not present, and the herbaceous layer is sparse to open. The alliance is found primarily on steep slopes with exposed bedrock and drainage channel walls at various aspects. Soils are derived most commonly from basalt, limestone, sandstone, and calcareous gravel. Soil texture was highly variable ranging from sand to silt to clay loam. Elevations range from approximately 150 to 1300 meters. Dominant and characteristic shrubs include *Peucephyllum schottii* and/or *Pleurocoronis pluriseta,* and those that are often present include *Eriogonum fasciculatum, Eucnide urens,* and *Larrea tridentata.* Herbs that are sometimes present include *Bromus rubens, Cryptantha* spp., *Eriogonum inflatum, Sphaeralcea ambigua,* and *Nicotiana obtusifolia.*

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent shrub layer of *Peucephyllum schottii* dominant or co-dominant, or sometimes with *Eucnide urens* and/or *Pleurocoronis pluriseta* dominant to co-dominant. The overall shrub cover ranges from 0.3 to 12 percent.

Alliance Distribution

The alliance is well-defined in sampling at MOJA and LAKE. It is scattered throughout MOJA and LAKE at low to mid elevations with one sample occurring at high elevation.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (18): 322Ab, 322Ad, 322Am, 322Av, 322Ay, 322Az; Southeastern Great Basin (8): 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Grapevine Mtns, Green Water Rng/Vlly, Last Chance Range, Panamint Mtns**; LAKE:** Boulder City, Callville, Cottonwood Cove, Echo Bay, Government Wash, Katherine, Parashant, Temple Bar, Willow Beach

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Peucephyllum schottii [CEGL002722]	8	x	x	–	–
Peucephyllum schottii–Eucnide urens–Pleurocoronis pluriseta [CEGL005770]	18	x	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 598 m, Range 168 – 1274 m
- Aspect: N (7), NE (2), E (1), NW (5), SE (3), SW (2), S (4)
- Slope: Mean 42.8 degrees, Range 3 – 90 degrees
- Macro Topography: Backslope (3), Channel bed (4), Channel wall (5), High level/summit (1), High slope (3), Low level/bottom (1), Lowslope (1), Midslope (6), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 5.5%, Range 0.3 – 12.2%
- Herb Cover: Mean 2.3%, Range 0 – 10%
- Large Rock: Mean 69.3%, Range 0 – 100%
- Small Rock: Mean 26.2%, Range 0 – 92%
- Fines Cover: Mean 3.2%, Range 0 – 20%
- Litter Cover: Mean 0.9%, Range 0 – 6%
- Geology: alkali-granite (alaskite) (1), alluvium (3), basalt (4), conglomerate (1), dolostone (dolomite) (2), gravel (3), limestone (2), rhyolite (1), sandstone (9)
- Soil Texture: Clay loam (3), Loam (1), Loamy sand (1), Medium silt loam (1), Sand (2), Silt (1)

Environment: The alliance is found primarily on steep slopes with exposed bedrock and drainage channel walls at various aspects. Soils are derived most commonly from sandstone, but also a variety of other substrates including basalt, limestone, and gravel. Soil texture was highly variable ranging from sand to silt to clay loam. Elevations were typically low to mid, but there was one sample at high elevation.

Vegetation Description

Vegetation Structure: The Schott's Pygmycedar – Bush Arrowleaf Scrub Alliance forms a sparse to intermittent shrub layer and the overall shrub cover ranges from 0.3 to 12.2 percent. The tree layer is typically not present, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Dominant and characteristic shrubs include *Peucephyllum schottii* and/or *Pleurocoronis pluriseta,* and those that are often present include *Eriogonum fasciculatum, Eucnide urens,* and *Larrea tridentata.* Herbs that are sometimes present include *Bromus rubens, Cryptnatha* spp., *Eriogonum inflatum, Sphaeralcea ambigua,* and *Nicotiana obtusifolia.*

Dynamics: Stands of *Peucephyllum schottii* and *Pleurocoronis pluriseta* prefer steep slopes with intermittent colluvial disturbance, washes with intermittent alluvial disturbance, and canyon walls above arroyo channels. The *Peucephyllum schottii–Eucnide urens–Pleurocoronis pluriseta* Association is often found on steep slopes and cliffs with calcareous parent material, while the *Peucephyllum schottii* Association is often found on steep slopes, cliffs, and channel walls with basalt and sandstone parent material.

Classification Comments

This alliance is usually a fine-scale matrix type adjacent to stands of *Larrea tridentata–Ambrosia dumosa, Larrea tridentata–Encelia farinosa*, *Acacia greggii (=Senegalia greggii),* and *Hymenoclea salsola* Alliances and other related sparsely vegetated stands on cliffs and rockwalls. Stands are not clearly aligned with one USNVC group and could be considered in lower elevation G295 Mojave-Sonoran Bajada & Valley Desert Scrub, G541 Warm Semi-Desert Shrub & Herb Dry Wash & Colluvial Slope, and G569 North American Warm Semi-Desert Cliff, Scree & Pavement Sparse Vegetation groups. Currently, we have placed associations of this alliance in G569 since most stands occur on steep rockwalls with sparse cover.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G3?

State (California): S3?

References

Evens et al. 2012, NatureServe 2010, NatureServe 2012, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=26

LAKE (n=15): LAKE0703, LAKE9106, LAKE9116, LAKE9123, LAKE9139, LAKE9192, LAKE9215, LAKE9220, LAKE9223, LAKE9358, LAKE9409, LAKE9437, LAKE9438, LAKE9527, LAKE9627

DEVA (n=11): DEVA0386, DEVA9287, DEVA9472, DEVA9491, DEVA9823, DEVA9926, DEVAD061, DEVAD105, DEVAD227, DEVAS116, MOJC0925

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Peucephyllum schottii*	92	27	1.6	0.1	5	x	–	–	–
	Larrea tridentata	62	6.6	0.4	0.1	3	–	–	–	x
	Eucnide urens	62	11	0.3	0.1	2	–	–	–	x
	Pleurocoronis pluriseta	50	7.8	0.4	0.2	3	–	–	–	x
	Eriogonum fasciculatum	50	3.1	0.1	0.1	0.3	–	–	–	x
	Encelia farinosa	46	6.4	0.3	0.1	3	–	–	–	–
	Ambrosia dumosa	42	3.5	0.2	0.1	2	–	–	–	–
	Hymenoclea salsola	27	2.5	0.2	0.2	5	–	–	–	–
	Lepidium fremontii	27	2.7	0.2	0.2	2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Bromus rubens*	42	8.4	0.5	0.2	8	–	–	–	–
	Cryptantha	35	14	0.5	0.6	6	–	–	–	–
	Eriogonum inflatum	35	6.7	0.1	0.11	0.2	–	–	–	–
	Sphaeralcea ambigua	31	4.8	0.1	0.2	0.5	–	–	–	–
	Nicotiana obtusifolia	31	4.8	0.1	0.2	0.5	–	–	–	–

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

M512. North American Warm Desert Ruderal Scrub & Grassland Macrogroup

G677. North American Warm Desert Ruderal Scrub & Grassland Group

Brassica tournefortii - Malcolmia africana Ruderal Desert Forb Alliance

Common Name: Tournefort's Mustard and Other Ruderal Desert Forb
Group Assignment: G677; **Alliance Code:** A4166

Alliance Concept

The Tournefort's Mustard and Other Ruderal Desert Forbs Alliance form an open to intermittent herbaceous layer. The shrub layer is open and the tree layer, when present, is sparse. The alliance is found on low level bottoms, roadsides, sand dunes, lake shorelines, and washes at flat or variable aspects, typically in disturbed areas. Soils are sandy to clay loam derived from conglomerate. Elevation is from lake level (197 to) 895 meters. Dominant herbs include *Brassica tournefortii* or *Malcolmia africana*. Associated herbs in one stand sampled include *Antheropeas* spp.*, Cryptantha* spp.*, Erodium cicutarium, Gilia* spp.*, Ipomopsis polycladon, Plantago ovata,* and *Schismus* spp.*,* and associated emergent shrubs include *Gutierrezia sarothrae.*

Diagnostic Criteria: This alliance is characterized by an open herbaceous layer dominated by *Brassica tournefortii* or *Malcolmia africana.* In the stand sampled at LAKE, *M. africana* is dominant. The overall herbaceous cover is 22 percent cover.

Alliance Distribution

The alliance is localized in LAKE at mid elevation at the airstrip near North Pierce Ferry Rd where it was sampled once in the study area. It also occurs at lower elevations along the lake shorelines, sand dunes, and washes in LAKE. It also has been observed in MOJA adjacent to roads in the southern portion of the park, including near Interstate 40 and Kelbaker Road.

States: AZ, (CA, NV)

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

Park Sampling Zones: LAKE: (Callville, Echo Bay, Katherine) Pearce Ferry; **MOJA:** (Granite Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Brassica tournefortii - Malcolmia africana Ruderal Herbaceous [CEPP006727]	1	x	(x)	(x)	–

Association Notes: Stands with *Brassica tournefortii* also appear to occur in the warm deserts of California, Arizona and Nevada, especially adjacent to roads.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 895 m
- Aspect: Flat, Variable (1)
- Slope: 0 degrees
- Macro Topography: Low level/bottom (1)
- Tree Cover: 0%
- Shrub Cover: 2%
- Herb Cover: 22%
- Large Rock: 0%
- Small Rock: 4%
- Fines Cover: 96%
- Litter Cover: 0%
- Geology: conglomerate (1)
- Soil Texture: Clay loam (1)

Environment: The alliance was sampled once at mid elevation in LAKE. A stand of *Malcolmia africana* occurs at the air strip near North Pierce Ferry Rd on the bottomland with a flat aspect. Soil is clay loam derived from conglomerate. *Brassica tournefortii* has established as a highly invasive plant at LAKE; occurring abundantly on sand dunes, shoreline beaches, and washes with sandy to gravelly soils (Newton 2012). Stands have been observed in MOJA with *Brassica tournefortii* dominant especially along roadsides and washes (J. Evens per. Obs. 2009), and invasion of *Malcolmia africana* has recently been observed in DEVA along roadsides and road construction areas (J. Cipra, pers. Com. 2013).

Stands of this alliance in the Mojave, Colorado, and Sonoran deserts are found in areas disturbed by fire, clearing, and roads. Recurrent disturbance magnifies the abundance of non-native mustards and other non-native annuals.

Vegetation Description

Vegetation Structure: The alliance forms an open herbaceous layer, and the overall herbaceous cover is 22 percent cover. The shrub layer is sparse to open. The tree layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: Dominant herbs include *Brassica tournefortii* or *Malcolmia africana,* and characteristic herbs include *Antheropeas* spp.*, Cryptantha* spp.*, Erodium cicutarium, Gilia* spp.*, Ipomopsis polycladon, Plantago ovata,* and *Schismus* spp. The shrub layer is emergent and typically or often includes *Gutierrezia sarothrae*.

Dynamics: *Malcolmia africana* dominates the herbaceous layer particularly in disturbed areas, and emergent shrubs and trees may be present at low cover. Highly localized stands occurs in LAKE, and individuals have been observed in DEVA. Stands with *Brassica tournefortii* are beginning to expand in desert areas of the southwest United States, including at MOJA and JOTR. Efforts to control and eradicate current extent are important for limiting the spread and impact of these non-native mustards in these desert parks. Some weed management treatments, including hand-pulling and herbicides, have been explored (Barrows et al. 2009, Newton 2012, Marushia 2009).

Classification Comments

Stands of non-native mustards have been observed both in the warm deserts of Arizona and California and in Mediterranean California. Stands of *Brassica nigra* and *Hirschfeldia incana* have particularly spread in Mediterranean California (Buck Diaz et al. 2012, Keeler-Wolf and Evens 2006), while *Brassica tournefortii* has begun to spread from the Coachella Valley and east of the San Bernarindo Mountains in California (Marushia 2009), and it has become locally abundant in the U.S. desert southwest (Minnich and Sanders 2000). More localized occurrences of *Malcolmia africana* have been observed, including the Mojave Desert. Further review of USNVC groups may be necessary to determine the best placement of these stands since three groups of ruderal (semi-natural) herbaceous stands exist with related concepts: California Ruderal Grassland & Forb Meadow Group (G497), North American Warm Desert Ruderal Scrub & Grassland Group (G677), and Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group (G600).

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR
State (California): GNR

References

Buck-Diaz et al. 2012, Marushia 2009, Newton 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=1): LAKE9424
DEVA (n=0)
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Gutierrezia sarothrae*	100	100	2	2	2	x	x	–	–
Herb	*Malcolmia africana*	100	87	20	20	20	x	x	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Schismus*	100	4.3	1	1	1	x	–	–	–
	Cryptantha	100	2.6	0.6	0.6	0.6	x	–	–	–
	Gilia	100	2.6	0.6	0.6	0.6	x	–	–	–
	Antheropeas	100	0.9	0.2	0.2	0.2	x	–	–	–
	Erodium cicutarium	100	0.9	0.2	0.2	0.2	x	–	–	–
	Ipomopsis polycladon	100	0.9	0.2	0.2	0.2	x	–	–	–
	Plantago ovata	100	0.9	0.2	0.2	0.2	x	–	–	–

Common Name: Red Brome or Mediterranean Grass Semi-natural Grasslands
Group Assignment: G497, G677, G600

Alliance Concept

The Red Brome or Mediterranean Grass Semi-natural Grasslands forms an open to continuous herbaceous layer. The shrub layer is open and the tree layer, when present, is sparse. The alliance is found primarily in disturbed areas, including on low and midslopes with no aspect preference. Soils are derived from a variety of substrates and textures range from sand to clay loam. Elevations range from approximately 350 to 1400 meters. *Bromus rubens, Schismus arabicus, Schismus barbatus* and/or *Erodium cicutarium* are dominant in the herbaceous layer, and sometimes natives such as *Eriogonum deflexum* can be co-dominant. Herbs often present at low cover are *Chaenactis* spp., and *Cryptantha* spp. Commonly associated shrubs at sparse cover include *Larrea tridentata* and *Ambrosia dumosa.*

Diagnostic Criteria: This alliance is characterized by an open to continuous herbaceous layer with *Bromus rubens, Erodium cicutarium, Schismus arabicus,* and/or *Schismus barbatus* dominant. Sometimes *Eriogonum deflexum* can be co-dominant with one or more of these non-native herbs. The overall herbaceous cover ranges from 4 to 31 percent cover in the stands sampled.

Alliance Distribution

The alliance occurs at all three Parks at low to upper elevations. The alliance was sampled in DEVA at mid elevations in the Greenwater Valley and east of the Grapevine Mountains at high elevations. It was sampled in MOJA at Henry's Spring at mid elevations. It was sampled in LAKE at low elevations on a road cut on Northshore Road and near the lake north of Echo Bay.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Ac, 322Ad, 322Aj, 322Ay, 322Az

Park Sampling Zones: DEVA: Green Water Rng/Vlly, Nevada Triangle**; LAKE:** Echo Bay, Gold Butte, Lakeshore**; MOJA:** Baker-Halloran

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Bromus rubens–Erodium cicutarium–Chaenactis spp.	3	–	x	–	–
Bromus rubens–Schismus (arabicus, barbatus) (alliance)	1	–	–	x	–
Schismus (arabicus, barbatus)–Eriogonum (deflexum) Semi-natural	3	x	–	–	–

Association Notes: One sample was classified to alliance level only in which *Bromus rubens* was co-dominant with *Schismus* spp.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 740 m, Range 367 – 1337 m
- Aspect: E (1), SE (1), SW (2), S (1)
- Slope: Mean 9.4 degrees, Range 2 – 21 degrees
- Macro Topography: Lowslope (1), Midslope (4)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0.9%, Range 0 – 2.1%
- Herb Cover: Mean 16.6%, Range 4 – 31%
- Large Rock: Mean 1%, Range 0 – 3%
- Small Rock: Mean 69.6%, Range 43 – 92%
- Fines Cover: Mean 22.6%, Range 5– 40%
- Litter Cover: Mean 6.8%, Range 0 – 25%
- Geology: alluvium (3), rhyolite (1), sandstone (1), water (2)
- Soil Texture: Clay loam (1), Loamy sand (1), Sand (1), Sandy loam (1)

Environment: The alliance was sampled at all three Parks. It is found primarily in disturbed areas. It is occurs at most elevations, including low to midslopes with no aspect preference. Soils range from sand to clay loam and substrates are variable.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous herbaceous layer, and the overall herbaceous cover ranges from 4 to 31 percent cover in the stands sampled. The shrub layer is sparse to open. The tree layer and non-vascular plants, when present are sparse.

Vegetation Floristics: *Bromus rubens, Schismus arabicus, Schismus barbatus* and/or *Erodium cicutarium* are strongly dominant in the herbaceous layer, and sometimes natives such as *Eriogonum deflexum* can be co-dominant in some years. Herbs often present at low cover are *Chaenactis* spp., and *Cryptantha* spp. Commonly associated shrubs at sparse cover include *Larrea tridentata* and *Ambrosia dumosa.*

Dynamics: Depending on the site history, *Bromus rubens, Erodium cicutarium,* and/or *Schismus* spp. can strongly dominate desert locales. These species have Cal-IPC ratings of high, limited, and limited, respectively. When they invade desert and semi-desert stands, they can convert them to semi-natural grasslands especially in sites experiencing frequent and/or high intensity fires or in cleared and/or grazed areas. *Bromus rubens* and *Schismus* spp. can also shorten fire-return intervals in warmer and drier portions of California by producing abundant and continuous cover of long-lasting fine fuels. They also promote fires that are hot and fast, including in areas where fires previously were infrequent due to insufficient fuels.

Bromus rubens and *Schismus* spp. can create carpets, produce abundant seed early in the growing season, and compete with native plants. Abundance of these species and other non-native grasses appear to be precipitation and temperature driven, and also disturbance driven. Janes (1969) found that the dominance of non-native grasses was based on rainfall totals: *Bromus rubens* at <20 cm, *Bromus diandrus*, and *Bromus hordeaceus* together at 20-80 cm, and *Bromus hordeaceus* at >80 cm. *Bromus rubens* and *Schismus* spp. occur in areas where the other bromes do not grow. They invade native desert and semi-desert stands, and convert them to semi-natural grasslands with frequent fire. However, stands have some conservation value as habitat for wildlife and for native plants, which may be rare or regionally distributed.

Classification Comments

Stands with *Bromus rubens, Erodium cicutarium,* and *Schismus* spp. occur in the warm and cool deserts of California and Nevada and in Mediterranean California. Further review of the USNVC groups is needed to determine the best placement for these stands since three groups of ruderal herbaceous stands exist with related concepts: California Semi-natural Grassland & Forb Meadow (G497), North American Warm Desert Semi-natural & Planted Scrub & Grassland (G677), and Great Basin & Intermountain Semi-natural Dry Shrubland & Grassland (G600).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: GNR

State (California): GNR

References

Buck-Diaz et al. 2012, cf. Evens and San 2005, Evens et al. 2012, cf. Klein and Evens 2005, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=7

LAKE (n=3): ERVILCav, LAKE9701, LMJOA047; DEVA (n=3): DEVA0603, DEVA0604, DEVAS145;

MOJA (n=1): MOJA9177; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Larrea tridentata*	57.1	20	0.2	0.11	0.5	–	–	–	x
	Ambrosia dumosa	57.1	13	0.1	0.08	0.2	–	–	–	x
	Tamarix ramosissima	28.6	19	0.3	0.3	1.72	–	–	–	–
	Hymenoclea salsola	28.6	7.9	0.1	0.2	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Stephanomeria pauciflora*	28.6	5.1	0	0.05	0.2	–	–	–	–
Herb	*Bromus rubens*	71.4	24	6.8	0.2	20	–	–	–	x
	Erodium cicutarium	71.4	6.8	2.1	0.01	10	–	–	–	x
	Schismus	57.1	14	2.6	0.2	13	–	–	–	x
	Chaenactis	57.1	7	1.8	0.4	10	–	–	–	x
	Cryptantha	57.1	2.8	0.5	0.33	2.2	–	–	–	x
	Eriogonum deflexum	42.9	16	0.7	0.44	3.7	–	–	–	–
	Amsinckia	42.9	1.9	0.5	0.2	2	–	–	–	–
	Sphaeralcea ambigua	42.9	0.2	0	0.02	0.2	–	–	–	–
	Salsola	28.6	3.3	0.3	0.92	1	–	–	–	–
	Eriogonum	28.6	0.4	0.1	0.4	0.4	–	–	–	–
	Langloisia setosissima	28.6	0.8	0.1	0.2	0.49	–	–	–	–
	Mentzelia	28.6	0.3	0.1	0.22	0.4	–	–	–	–
	Dalea	28.6	0.2	0.1	0.2	0.2	–	–	–	–
	Eschscholzia	28.6	0.2	0.1	0.2	0.2	–	–	–	–
	Phacelia fremontii	28.6	0.2	0.1	0.2	0.2	–	–	–	–
	Plantago ovata	28.6	0.6	0	0.12	0.2	–	–	–	–
	Salvia columbariae	28.6	0.2	0	0.11	0.2	–	–	–	–
	Camissonia brevipes	28.6	0.6	0	0.1	0.2	–	–	–	–
	Cryptantha micrantha	28.6	0.6	0	0.08	0.2	–	–	–	–
	Rafinesquia neomexicana	28.6	0.1	0	0.06	0.2	–	–	–	–
	Chorizanthe brevicornu	28.6	0.6	0	0.03	0.2	–	–	–	–
	Malacothrix glabrata	28.6	0.6	0	0.01	0.2	–	–	–	–

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 canescens Scrub Alliance

Common Name: Fourwing Saltbush Scrub
Group Assignment: G300, G559; **Alliance Code:** A0869, A3266

Alliance Concept

The Fourwing Saltbush Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer, when present, is typically sparse, when present, and the herbaceous layer is sparse to open. The alliance is found primarily on valley floors and dry washes at various aspects. Soils are derived from a variety of substrates including alluvium and sandstone, and textures include clay loam, sand and silt. Elevations range from approximately 0 to 2250 meters. *Atriplex canescens* is the dominant or co-dominant in the shrub canopy, and *Kraschenninikovia lanata* is often present. *Mentzelia albicaulis* and *Salsola spp.* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Atriplex canescens* dominant or co-dominant with shrubs such as *Krascheninnikovia lanata*. The overall shrub cover ranges from 6 to 60 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and represented by two plots each in MOJA and LAKE. It is scattered throughout DEVA and is found in the northeast portion of MOJA and the northern portion of LAKE. The alliance occurs at low to high elevations.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ab, 322Ai, 322Aj, 322Az, Southeastern Great Basin (13): 341Fb, 341Fc, 341Fe, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Death Valley, Joshua Flat, Last Chance Range, Nelson Range, Panamint Mtns**; LAKE:** Callville, Overton**; MOJA:** Baker-Halloran, (Castle Mtns), Clark Mountain

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex canescens [CEGL001281]	9	–	x	x	x
Atriplex canescens Desert Wash [CEGL003470]	3	x	x	–	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex canescens–Krascheninnikovia lanata [CEGL001285]	7	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1294 m, Range 33 – 2222 m
- Aspect: Flat, Variable (7), N (2), E (1), SE (1), W (1), SW (1), S (4)
- Slope: Mean 1.3 degrees, Range 0 – 5 degrees
- Macro Topography: Basin floor/wetland (1), Channel bed (2), Low level/bottom (11), Lowslope (2), Midslope (1), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0%, Range 0 – 0.2%
- Shrub Cover: Mean 14.0%, Range 6.2 – 60.2%
- Herb Cover: Mean 5.0%, Range 0 – 23%
- Large Rock: Mean 0.01%, Range 0 – 0.2%
- Small Rock: Mean 19%, Range 0 – 69%
- Fines Cover: Mean 74.1%, Range 25 – 98%
- Litter Cover: Mean 6.6%, Range 1 – 31%
- Geology: alluvium (9), conglomerate (1), landslide (2), rhyolite (1), sandstone (4), sedimentary (gypsum) (1)
- Soil Texture: Clay loam (1), Loamy sand (1), Sand (6), Sandy loam (3), Silt (1), Silt loam (1), Silty clay (3)

Environment: The Four wing Saltbush Scrub Alliance occurs in dry washes and valley floors at low to high elevation. The alliance occurs at all aspects, in most soil textures, and in a variety of geologic conditions.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 6 to 60 percent. The tree layer, when present, is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Atriplex canescens* is the dominant and characteristic shrub of this alliance, and *Kraschenninikovia lanata* is often present. *Mentzelia albicaulis* and *Salsola spp.* are often present in the herbaceous layer.

Dynamics: *Atriplex canescens* is tolerant of alkaline, saline, and gypsum soils, often occurring around alkaline dry lake beds, adjacent sand dunes and low hills, and near alkaline springs. It is the most rapidly evolving shrub in North America with different ploidy levels, regional ecotypes, and

infraspecific variation. Some varieties appear similar to other saltbush species and some are introgressing with other species.

Classification Comments

Atriplex canescens associations are placed within the Intermountain Shadscale – Saltbush Scrub (G300) and the Cool Semi-Desert Shrub & Herb Wash-Arroyo (G559) groups in the revised USNVC hierarchy. For the Mojave Network classification we have combined the *Atriplex canescens* shrubland associations into one alliance in the G300 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S4

References

Evens and Hartman 2007, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, NatureServe 2012, Peterson 1984, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=19
LAKE (n=2): LAKE0124, LAKE9413
DEVA (n=14): DEVA0136, DEVA0228, DEVA9122, DEVA9153, DEVA9162, DEVA9231, DEVA9321, DEVA9322, DEVA9325, DEVA9331, DEVA9356, DEVA9906, DEVAD109, DEVAS014
MOJA (n=2): MOJA9139, MOJA9651
MOJN-Johnson (n=1): MOJJE509
[CAMO (n=1): CAMO9134]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Atriplex canescens*	100	65	9.8	2	45	x	x	–	–
	Krascheninnikovia lanata	61.1	8.7	1.3	0.2	10	–	–	–	x
	Picrothamnus desertorum	33.3	2.2	0.3	0.1	3	–	–	–	–
Herb	*Mentzelia albicaulis*	55.6	3.6	0.2	0.1	2	–	–	–	x
	Salsola	50	8.1	0.2	0.2	2	–	–	–	x
	Eriogonum deflexum	44.4	8.6	0.3	0.2	3	–	–	–	–
	Achnatherum hymenoides	44.4	2.9	0.2	0.2	1	–	–	–	–
	Chaenactis fremontii	27.8	6	0.5	0.2	5	–	–	–	–
	Bromus rubens	27.8	2.9	0.1	0.2	1	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eriogonum nidularium*	27.8	1.2	0.1	0.1	0.2	–	–	–	–
	Sphaeralcea ambigua	27.8	1.2	0.1	0.1	0.2	–	–	–	–
Non-vascular	Cryptogamic crust	27.8	28	0.1	0.2	1	–	–	–	–

Common Name: Shadscale Scrub
Group Assignment: G300; **Alliance Code:** A0870

Alliance Concept

The Shadscale Scrub Alliance forms a sparse to intermittent shrub layer. The emergent tree layer, when present is typically sparse, and the herbaceous layer is sparse to open. The alliance is found everywhere from high slopes to canyon bottoms at all aspects. Soils are derived from a variety of substrates and include almost all soil textures. Elevations range from approximately 400 to 2200 meters. *Atriplex confertifolia* is dominant or co-dominant in the shrub layer, and *Lycium andersonii* is frequently present. *Eriogonum inflatum, Bromus rubens, Sphaeralcea ambigua* and *Xylorhiza tortifolia* are frequently present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent shrub layer with *Atriplex confertifolia* dominant or co-dominant. The overall shrub cover ranges from 0.25 to 48 percent.

Alliance Distribution

The alliance is extremely well-defined in sampling at DEVA, poorly defined at LAKE, and not documented in MOJA. It is distributed throughout DEVA at mid to high elevations, and is represented by three plots in the northern portion of LAKE at low elevation.

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (20): 322Ab, 322Ad, 322Ae, 322Az; Southeastern Great Basin (74): 341Fa, 341Fb, 341Fc, 341Fd, 341Fe, 341Ff, 341Fg

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Funeral Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Last Chance Vlly, Nelson Range, Nevada Triangle, Panamint Mtns**;** **LAKE:** Echo Bay

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex confertifolia (alliance)	12	–	x	–	–
Atriplex confertifolia Great Basin [CEGL001294]	4	–	x	–	–
Atriplex confertifolia–Ambrosia dumosa [CEGL005739]	15	–	x	–	x
Atriplex confertifolia–Atriplex canescens [CEPP005795]	0	–	(x)	–	–
Atriplex confertifolia–Ephedra nevadensis [CEGL001303]	15	–	x	–	–
Atriplex confertifolia–Krascheninnikovia lanata [CEGL001301]	8	–	x	–	–
Atriplex confertifolia–Lepidium fremontii [CEPP005796]	12	–	x	–	–
Atriplex confertifolia–Lycium andersonii [CEGL001308]	25	–	x	–	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found, “(x)” indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex confertifolia–Picrothamnus desertorum [CEGL001295]	2	–	x	–	–
Atriplex confertifolia–Suaeda moquinii [CEPP005797]	3	x	–	–	–

Association Notes: Twelve samples were classified to the alliance level only. Some of these samples had another shrub such as *Grayia spinosa* or *Larrea tridentata* co-dominating, suggesting further variation, but this variation is not adequately documented to denote additional associations. The *Atriplex confertifolia–Atriplex canescens* Provisional Association is present in DEVA in basins and along playa edges but was not sampled.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1413.3 m, Range 405 – 2162 m
- Aspect: Flat, Variable (1), N (11), NE (9), E (9), NW (10), SE (17), Flat, Variable (1), W (8), SW (13), S (9)
- Slope: Mean 16.5 degrees, Range 0 – 36 degrees
- Macro Topography: Basin floor/wetland (1), Entire slope (1), High level/summit (2), High slope (15), Low level/bottom (4), Lowslope (3), Midslope (18), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0.1%, Range 0 – 2%
- Shrub Cover: Mean 12.2%, Range 0.4 – 47.6%
- Herb Cover: Mean 6.0%, Range 0 – 17%
- Large Rock: Mean 15.9%, Range 0 – 92%
- Small Rock: Mean 63.8%, Range 0 – 100%
- Fines Cover: Mean 13.3%, Range 0 – 98%
- Litter Cover: Mean 1.6%, Range 0 – 9%
- Geology: alluvium (15), dolostone (dolomite) (7), granodiorite (2), limestone (2), peraluminous granite (1), rhyolite (25), sandstone (40), shale (6)
- Soil Texture: Clay (1), Clay loam (5), Fine sand (1), Loam (9), Loamy sand (7), Medium sand (2), Medium silt loam (6), Medium to very fine sandy loam (3), Moderately coarse sandy loam (1), Moderately fine clay loam (1), Moderately fine sandy clay loam (13), Moderately fine silty clay loam (5), Sand (3), Sandy loam (14), Silt loam (2), Silty clay (3)

Environment: The Shadscale Scrub Alliance occurs at low to high elevations at all aspects and landforms. The soils are variously derived, though often calcareous or volcanic, and encompass the majority of soil textures.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 0.25 to 48 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Atriplex confertifolia* is the dominant and characteristic shrub of this alliance andis often accomanied by *Lycium andersonii. Eriogonum inflatum, Bromus rubens, Sphaeralcea ambigua,* and *Xylorhiza tortifolia* are frequently present in the herbaceous layer.

Dynamics: *Atriplex confertifolia* exist in various settings including alkaline basins, across intermountain flats, and on rocky uplands. *A. confertifolia* has infraspecific variation, including different ploidy levels, which appears to enable plants to occupy a variety of ecological settings. Plants often prefer well-drained, moderately saline soils where groundwater is below the rooting zone, and they can occur in drier and colder sites than both *A. canescens* and *A. polycarpa*.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Annable 1985, Keeler-Wolf and Thomas 2000, MacMahon and Wagner 1985, McHargue 1973, NatureServe 2010, NatureServe 2012, Paysen et al. 1980, Peterson 1984, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=97
LAKE (n=3): LAKE9299, LMJOA038, LMJOA039
DEVA (n=93): DEVA0104, DEVA0200, DEVA0648, DEVA9139, DEVA9143, DEVA9152, DEVA9171, DEVA9208, DEVA9225, DEVA9230, DEVA9240, DEVA9256, DEVA9274, DEVA9329, DEVA9336, DEVA9355, DEVA9424, DEVA9439, DEVA9440, DEVA9509, DEVA9520, DEVA9530, DEVA9547, DEVA9573, DEVA9608, DEVA9649, DEVA9653, DEVA9657, DEVA9913, DEVAD076, DEVAD169, DEVAD187, DEVAR017, DEVAR028, DEVAR034, DEVAR071, DEVAR078, DEVAR091, DEVAR132, DEVAR135, DEVAS074, DEVAS081, DEVAS131, DEVAS169, DEVAS188, DEVAS204, DEVAS205, DEVAS229, MOJC0059, MOJC0060, MOJC0064, MOJC0171, MOJC0175, MOJC0177, MOJC0178, MOJC0180, MOJC0181, MOJC0257, MOJC0258, MOJC0259, MOJC0261, MOJC0334, MOJC0336, MOJC0360, MOJC0419, MOJC0447, MOJC0450, MOJC0451, MOJC0459, MOJC0460, MOJC0485, MOJC0486, MOJC0487, MOJC0492, MOJC0495, MOJC0496, MOJC0571, MOJC0595, MOJC0608, MOJC0609, MOJC0611, MOJC0618, MOJC0655,

MOJC0690, MOJC0703, MOJC0704, MOJC0705, MOJC0706, MOJC0837, MOJC0838, MOJC0839, MOJC0972, MOJC0973
MOJA (n=0)
MOJN-Johnson (n=1): MOJJE615

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Atriplex confertifolia*	100	32	3.7	0.2	25	x	–	x	–
	Lycium andersonii	55	6.1	0.7	0.2	5	–	–	–	x
	Ambrosia dumosa	47	7.1	0.9	0.11	20	–	–	–	–
	Ephedra nevadensis	47	5.6	0.6	0.2	4	–	–	–	–
	Lepidium fremontii	36	3.4	0.3	0.11	3	–	–	–	–
	Opuntia basilaris	32	1.9	0.3	0.2	15	–	–	–	–
	Krascheninnikovia lanata	31	3.4	0.4	0.2	4.5	–	–	–	–
	Echinocactus polycephalus	31	1.5	0.2	0.1	3	–	–	–	–
	Larrea tridentata	29	3.4	0.4	0.1	7	–	–	–	–
	Picrothamnus desertorum	27	2.2	0.3	0.2	10	–	–	–	–
	Eriogonum fasciculatum	27	2.1	0.3	0.11	5	–	–	–	–
	Acamptopappus shockleyi	27	1.9	0.2	0.2	5	–	–	–	–
	Hymenoclea salsola	26	2.1	0.3	0.1	6.5	–	–	–	–
	Psorothamnus arborescens	25	1.8	0.2	0.11	3	–	–	–	–
Herb	*Eriogonum inflatum*	71	12	0.4	0.1	3	–	–	–	x
	Xylorhiza tortifolia	53	7.7	0.3	0.11	3	–	–	–	x
	Bromus rubens	52	7.3	0.3	0.11	6	–	–	–	x
	Sphaeralcea ambigua	51	7.2	0.3	0.11	4	–	–	–	x
	Achnatherum speciosum	35	6	0.3	0.11	3	–	–	–	–
	Achnatherum hymenoides	32	3.5	0.2	0.11	3	–	–	–	–
Non-vasc	Cryptogamic crust	25	19	0.2	0.2	5	–	–	–	–

Common Name: Cattle Saltbush Shrubland
Group Assignment: G300; **Alliance Code:** A3174

Alliance Concept

The Cattle Saltbush Shrubland Alliance forms a sparse to intermittent shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily in drainages, valley bottoms, alluvial fans, and slopes at all aspects. Soils are derived from a variety of substrates including alluvium and sandstone. Soil texture is highly variable. Elevations range from approximately -69 to 1500 meters. The dominant and characteristic shrub is *Atriplex polycarpa* in relatively simple shrubland stands, and those shrubs often present include *Larrea tridentata. Schismus* spp. is often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent shrub layer with *Atriplex polycarpa* dominant. The overall shrub cover ranges from 2 to 42 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and the northern portion of MOJA. The alliance is represented by one sample at LAKE at low elevation. The plots are scattered throughout DEVA and northern MOJA at low to high elevation.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (34); 322Ab, 322Ac, 322Ad, 322Ae, 322Af, 322Ai, 322Aj, 322Ak, 322At; Southeastern Great Basin (6): 341Fc

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Eureka Valley, Funeral Mtns, Jail Canyon, Last Chance Vlly, Owlshead Mtns, Saline Valley**; LAKE:** Gold Butte**; MOJA:** Baker, Baker-Halloran, Cima Dome NW, Cinder Cones, Clark Mtn West, Cow Hole Mtns, Crucero Hill, Ivanpah Vlly

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Atriplex polycarpa [CEGL001318]	41	x	x	x	x
Atriplex polycarpa (alliance)	2	–	x	–	–

Association Notes: Two stands are classified at the alliance level include *Atriplex polycarpa* at trace cover along with *Larrea tridentata* and *Suaeda moquinii*.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 625.5 m, Range -69 – 1491 m

- Aspect**:** Flat, Variable (5), Flat (2), N (4), NE (3), E (3), NW (4), SE (4), SW (11), S (4)
- Slope: Mean 2.0 degrees, Range 0 – 12 degrees
- Macro Topography: Channel bed (2), High level/summit (1), High slope (2), Low level/bottom (14), Lowslope (5), Midslope (8)
- Tree Cover: Mean 0%, Range 0 – 1%
- Shrub Cover: Mean 12.1%, Range 1.6 – 42.1%
- Herb Cover: Mean 3.3%, Range 0 – 11%
- Large Rock: Mean 0.5%, Range 0 – 9%
- Small Rock: Mean 43.0%, Range 0 – 97%
- Fines Cover: Mean 48%, Range 0 – 99%
- Litter Cover: Mean 3.5%, Range 0 – 23%
- Geology: alluvium (26), diorite (1), dune sand (3), felsic volcanic rock (1), granodiorite (1), rhyolite (1), sandstone (4), tephrite (basanite) (3)
- Soil Texture: Clay (1), Clay loam (1), Coarse sand (1), Fine silty clay (1), Loam (4), Loamy sand (7), Medium silt (1), Medium to very fine sandy loam (1), Sand (9), Sandy clay (2), Sandy loam (2), Silt loam (3), Silty clay (1)

Environment: The alliance is found primarily in drainages, valley bottoms, alluvial fans, and slopes at all aspects. Soils are derived from a variety of substrates including alluvium and sandstone. The alliance occurs at low to high elevations.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to intermittent shrub layer and the overall shrub cover ranges from 1.6 to 42 percent. The tree layer, when present, is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: The dominant and characteristic shrub is *Atriplex polycarpa* in relatively simple shrubland stands, and those shrubs often present include *Larrea tridentata. Schismus* spp. is often present in the herbaceous layer.

Dynamics: Similar to other saltbush species, *Atriplex polycarpa* occurs in a variety of environmental settings from alkaline basins, wash terraces, and mudhills, to lava beds and lower foothill slopes. Sites are typically above the seasonal inundation zone of playas, where alliances with *Allenrolfea occidentalis* and *Suaeda moquinii* occur, and occur in drier areas with intermittent flooding or lower water tables.

Classification Comments

Stands of *Atriplex polycarpa* co-dominant with *Larrea tridentata* are classified in the *L. tridentata* alliance. Stands of this alliance typically have *A. polycarpa* dominant.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S4

References

Keeler-Wolf and Thomas 2000, Peterson 1984, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=43
LAKE (n=1): LAKE0276
DEVA (n=22): DEVA0413, DEVA0515, DEVA0801, DEVA9180, DEVA9290, DEVA9316, DEVA9317, DEVA9374, DEVA9414, DEVA9415, DEVA9446, DEVA9502, DEVA9546, DEVA9626, DEVA9962, DEVAD022, DEVAD023, DEVAR027, DEVAR055, MOJC0038, MOJC0046, MOJC0055
MOJA (n=17): MOJA0106, MOJA0306, MOJA0603, MOJA9163, MOJA9181, MOJA9307, MOJA9345, MOJA9516, MOJA9528, MOJA9602, MOJA9605, MOJA9607, MOJA9645, MOJA9653, MOJC0022, MOJC0026, MOJC0864
MOJN-Johnson (n=3): MOJJE505, MOJJE506, MOJJE507

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Atriplex polycarpa*	100	72	9	0.5	40	x	x	–	–
	Larrea tridentata	65	10	0.8	0.01	5	–	–	–	x
	Ambrosia dumosa	27.5	2.5	0.3	0.2	4	–	–	–	–
	Suaeda moquinii	27.5	4.4	0.3	0.1	3.5	–	–	–	–
Herb	*Schismus*	55	13	0.7	0.2	6	–	–	–	x
	Cryptantha	35	8.1	0.2	0.6	1.5	–	–	–	–
	Amsinckia	35	2.7	0.1	0.2	1	–	–	–	–
	Camissonia	32.5	4.8	0.2	0.4	1	–	–	–	–
	Bromus rubens	30	4.2	0.3	0.2	3	–	–	–	–
	Chorizanthe rigida	27.5	1.9	0.1	0.2	0.2	–	–	–	–
	Chaenactis	25	2	0.1	0.4	0.4	–	–	–	–

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

Common Name: Intermountain Shale Badlands Cold Desert
Group Assignment: G570; **Alliance Code:** A4052

Alliance Concept

The Intermountain Shale Badlands Cold Desert Alliance forms a sparse to open shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found on rare gypsum rock outcrops. Stands are often small and occur at various aspects. The alliance generally grows on gypsum-derived soils that are sandy or loamy. Elevations range from approximately 400 to 900 meters. *Ephedra torreyana* and *Psorothamnus fremontii* are characteristically present at sparse cover, and those shrubs often present include *Acacia greggii (=Senegalia greggii), Ambrosia dumosa, Atriplex confertifolia, Larrea tridentata, Lepidium fremontii,* and *Stephanomeria pauciflora.* Often present herbs include *Arctomecon californica, Enceliopsis argophylla, Eriogonum inflatum, Phacelia pulchella,* and *Schismus* spp. Cryptogamic crust is often the dominant or characteristic layer of non-vascular vegetation.

Diagnostic Criteria: This alliance is characterized by a sparse to open shrub layer typically with *Psorothamnus fremontii* and *Ephedra torreyana* at sparse cover, and there is a sparse to continuous cover of cryptogamic crust. The overall shrub cover ranges from less than one to 8 percent.

Alliance Distribution

The alliance is well-defined in sampling at LAKE. It was not found at the other parks. It occurs at low to mid elevations.

States: AZ, NV

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

Park Sampling Zones: LAKE: Callville, Callville Bay, Echo Bay, Frenchman Mountain, Overton, Overton Beach, (Parashant), Temple Bar, Willow Beach

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ephedra torreyana–(Atriplex spp.) / Non-vascular Gypsum Sparse [CEGL002349]	9	x	–	–	–
Psorothamnus fremontii / Cryptogamic Crust (Gypsum) [CEPP006743]	15	x	–	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 535.8 m, Range 435 – 881 m
- Aspect: Flat, Variable (1), N (1), NE (2), E (4), NW (1), SE (1), W (2), S (2)
- Slope: Mean 9.1 degrees, Range 0 – 45 degrees
- Macro Topography: High level/summit (5), High slope (2), Low level/bottom (5), Lowslope (4)
- Tree Cover: Mean 0.1%, Range 0 – 1.1%
- Shrub Cover: Mean 3.9%, Range 0.4 – 8.3%
- Herb Cover: Mean 1.9%, Range 1 – 3.7%
- Large Rock: Mean 7.9%, Range 0 – 50%
- Small Rock: Mean 29.3%, Range 0 – 98%
- Fines Cover: Mean 61.5%, Range 2 – 96%
- Litter Cover: Mean 0.4%, Range 0 – 2%
- Geology: gravel (1), sedimentary (gypsum) (23)
- Soil Texture: Clay loam (1), Loamy sand (1), Sand (3), Sandy loam (1)

Environment: The alliance is found on gypsum rock outcrops at low to mid elevations. Sites include bottoms, lowslopes to hill summits with variable aspect. Soil textures vary from sand to clay loam.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to open shrub layer and the overall shrub cover ranges from >1 to 8 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are sparse to continuous.

Vegetation Floristics: *Psorothamnus fremontii and Ephedra torreyana* are characteristically present at sparse cover, and those shrubs often present at sparse cover include *Acacia greggii (=Senegalia greggii), Ambrosia dumosa, Atriplex confertifoliaLarrea tridentata, Lepidium fremontii,* and *Stephanomeria pauciflora.* Herbs often present include *Arctomecon californica, Enceliopsis argophylla, Eriogonum inflatum, Phacelia pulchella, and Schismus* spp. Cryptogamic crust is often the dominant or characteristic layer of non-vascular vegetation.

Dynamics: Stands occur on rare gypsum outcrops in LAKE that include uncommon and rare plants such as *Arctomecon californica* and *Enceliopsis argophylla*.

Classification Comments

This type is placed in a cool semi-desert formation and division within the USNVC hierarchy because stands often occur outside of the Mojave Desert into the eastern and northern Colorado Plateau in Utah. One comparable association with *Ephedra torreyana* (e.g., Ephedra torreyana – (Atriplex canescens, Atriplex confertifolia) Sparse Vegetation Association) is currently placed in *Ephedra torreyana* Shrubland Alliance within Colorado Plateau Blackbrush – Mormon-tea Shrubland (G312) in the USNVC hierarchy. This association is somewhat similar to the associations noted here for LAKE, which are on sparsely vegetated gypsum sites.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4?
State (Arizona/Nevada): G3?

References

NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=24
LAKE (n=24): ANLEVFav, ARCABPav, ARCAGBav, ARCAGHav, ARCARDav, ARCASHav, ARCAVFav, LAKE0109, LAKE0132, LAKE0196, LAKE0197, LAKE0294, LAKE0608, LAKE9185, LAKE9248, LAKE9253, LAKE9295, LAKE9313, LAKE9403, LAKE9511, LAKE9512, LAKE9515, LAKE9609, LAKE9610
DEVA (n=0)
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ephedra torreyana*	79.2	11	0.4	0.04	1	x	–	–	–
	Psorothamnus fremontii	75	18	0.8	0.12	3	x	–	–	–
	Atriplex confertifolia	58.3	8.6	0.4	0.06	1.26	–	–	–	x
	Ambrosia dumosa	58.3	8.2	0.3	0.2	1.18	–	–	–	x
	Larrea tridentata	54.2	8.8	0.3	0.1	4	–	–	–	x
	Lepidium fremontii	54.2	5.1	0.2	0.02	1	–	–	–	x
	Acacia greggii	50	4	0.2	0.08	1.68	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Stephanomeria pauciflora*	50	2.2	0.1	0.04	0.46	–	–	–	x
	Atriplex hymenelytra	37.5	4.2	0.1	0.02	1	–	–	–	–
	Suaeda moquinii	25	3.6	0.2	0.12	2	–	–	–	–
	Isocoma acradenia	25	3	0.2	0.04	3	–	–	–	–
	Peucephyllum schottii	25	5.2	0.1	0.04	1.84	–	–	–	–
	Petalonyx parryi	25	1.4	0.1	0.2	0.38	–	–	–	–
Herb	*Eriogonum inflatum*	70.8	7.6	0.2	0.2	0.52	–	–	–	x
	Phacelia pulchella	66.7	4.6	0.1	0.02	0.48	–	–	–	x
	Schismus	62.5	3.8	0.1	0.02	0.44	–	–	–	x
	Arctomecon californica	58.3	10	0.2	0.2	1.16	–	–	–	x
	Enceliopsis argophylla	58.3	12	0.2	0.04	1	–	–	–	x
	Anulocaulis leiosolenus	41.7	5	0.1	0.04	1.26	–	–	–	–
	Plantago ovata	41.7	2.7	0.1	0.1	0.21	–	–	–	–
	Pleuraphis rigida	41.7	2.7	0.1	0.02	0.44	–	–	–	–
	Bromus rubens	41.7	2.2	0.1	0.02	0.25	–	–	–	–
	Eriogonum deflexum	37.5	3.9	0.1	0.04	1	–	–	–	–
	Sphaeralcea ambigua	37.5	2.7	0.1	0.1	0.26	–	–	–	–
	Cryptantha	33.3	6.2	0.2	0.06	0.6	–	–	–	–
	Camissonia multijuga	33.3	1.4	0	0.02	0.2	–	–	–	–
	Chorizanthe rigida	29.2	1.9	0.1	0.02	0.2	–	–	–	–
	Camissonia brevipes	29.2	0.6	0	0.02	0.2	–	–	–	–
	Camissonia	25	2.3	0.1	0.04	0.4	–	–	–	–
Non-vasc	Cryptogamic crust	70.8	70	17	0.2	70	–	–	–	x

Common Name: Intermountain Talus Sparse Scrub Alliance
Group Assignment: G570; **Alliance Code:** A4050

Alliance Concept

The Intermountain Talus Sparse Scrub Alliance forms an open/sparse shrub layer in the four samples conducted in the project area. The emergent tree layer is sparse, and the herbaceous layer is also sparse. The alliance is found on a steep bedrock outcrops. The soils are derived from sandstone (limestone) and volcanic parent material. The elevation was 1483–2573 meters. *Ericameria cuneata* or *Ephedra viridis* is characteristically present at variable cover with other shrubs such as *Artemisia tridentata, Symphoricarpos* sp.*, Brickellia californica, Brickellia longifolia, Fraxinus anomalus* and *Gutierrezia sarothrae.* Herbs are variable and include *Achnatherum parishii, Arabis* sp.*, Linanthus pungens,* and *Elymus elymoides,* and they usually have low cover. Lichen has low to moderate cover on the bedrock.

Diagnostic Criteria: This alliance is characterized by a sparse shrub layer with *Ericameria cuneata, Ephedra viridis,* or *Brickellia* spp. characteristically present. The overall shrub cover is 0.4–10 percent.

Alliance Distribution

The alliance was sampled in the Saline Range and the Last Chance Range in northern DEVA. It also was sampled in the Castle Mountains National Monument. The alliance was found at mid to high elevation.

States: CA

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

Park Sampling Zones: DEVA: Last Chance Range, Joshua Flat; **MOJA:** (Castle Mtns)

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ericameria cuneata ssp. spathulata [CEPP006704]	1	–	x	(x)	–
Ephedra viridis – Chrysothamnus viscidiflorus – Rhus trilobata Talus Sparse Scrub (alliance)	2	–	x	–	–

Association Notes: Two stands sampled on carbonate rock in the Last Chance Range had trace cover of shrubs including *Ephedra viridis* and *Linanthus pungens*. These were placed at the alliance level.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 1483–2573 m

- Aspect: N (1), NW (2)
- Slope: Mean 27.7; Range 12–42 degrees
- Macro Topography: Backslope (1), High slope (2)
- Tree Cover: Mean 0.3%; Range 0.1–0.6%
- Shrub Cover: Mean 4.3%; Range 0.4–10.4%
- Herb Cover: Mean 0.7%; Range 0.2–1%
- Large Rock: Mean 44.7%, Range 0–96%
- Small Rock: Mean 52.7%; Range 4–94%
- Fines Cover: Mean 2.3%; Range 0–5%
- Litter Cover: Mean 0.03%; Range 0-0.1%
- Geology: sandstone/dolostone (dolomite) (3)
- Soil Texture: Sandy loam (1)

Environment: The alliance was found on steep bedrock outcrops often with a north or northwestern aspect. The soil is derived from sandstone (calcareous) or volcanic parent material.

Vegetation Description

Vegetation Structure: The Alliance formed an open shrub layer and the overall shrub cover is 0.4–10 percent. The emergent tree layer is sparse, and the herbaceous layer is also sparse. Non-vascular plants have open cover.

Vegetation Floristics: *Ericameria cuneata* or *Ephedra viridis* is characteristically present with other shrubs such as *Artemisia tridentata, Symphoricarpos* sp.*, Brickellia californica, Brickellia longifolia, Fraxinus anomalus* and *Gutierrezia sarothrae.* Herbs are variable and include *Achnatherum parishii, Arabis* sp.*, Linanthus pungens,* and *Elymus elymoides,* and they usually have low cover. Lichen has low to moderate cover on the bedrock.

Dynamics: *Ericameria cuneata* and *Brickellia* spp. occur commonly on bedrock outcrops in the Mojave Desert and southeastern Great Basin, occurring with other shrubs adapted to rocky colluvial settings including *Gutierrezia* spp. and *Prunus fasciculata*. Plants utilize moisture from cracks and pockets where soil accumulates, and can tolerate rockfall and movement, as generally they are occurring on unstable substrates.

Classification Comments

None.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR

State (California): SNR

References

None

Surveys (with Sample Sizes) Used in Description

MOJN: N=3
LAKE (n=0)
DEVA (n=1): DEVA9111, DEVA9138, DEVAS216
MOJA (n=0)
MOJN-Johnson (n=0)
[CAMO (n=1): CAMO9127]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	67	44.4	0.1	0.1	0.2	–	–	–	–
	Fraxinus anomala	33	33.3	0.1	0.2	0.2	–	–	–	–
	Juniperus osteosperma	33	11.1	0.1	0.2	0.2	–	–	–	–
	Pinus longaeva	33	11.1	0.1	0.1	0.2	–	–	–	–
Shrub	*Symphoricarpos*	67	25.9	2.0	0.1	6	–	–	–	–
	Ephedra viridis	67	10.0	0.1	0.1	0.2	x	–	–	–
	Ericameria cuneata	33	12.8	1.3	4	4	x	–	–	–
	Eriogonum gilmanii	33	16.7	0.2	0.2	0.2	–	–	–	–
	Unknown Shrub	33	13.3	0.1	0.2	0.2	–	–	–	–
	Artemisia tridentata ssp. vaseyana	33	3.3	0.1	0.2	0.2	–	–	–	–
	Brickellia longifolia	33	0.7	0.1	0.2	0.2	–	–	–	–
	Gutierrezia sarothrae	33	0.7	0.1	0.2	0.2	–	–	–	–
	Krascheninnikovia lanata	33	0.7	0.1	0.2	0.2	–	–	–	–
	Monardella linoides	33	0.7	0.1	0.2	0.2	–	–	–	–
	Ribes cereum	33	0.7	0.1	0.2	0.2	–	–	–	–
	Artemisia nova	33	0.7	0.1	0.1	0.1	–	–	–	–
Herb	*Elymus elymoides*	67	14.1	0.2	0.2	0.2	x	–	x	–
	Linanthus pungens	67	9.7	–	–	–	–	–	–	–
	Unknown Forb (herbaceous, not grass nor grasslike)	33	24.2	0.1	0.1	0.2	–	–	–	–
	Achnatherum parishii	33	11.1	0.1	0.1	0.2	–	–	–	–
	Arabis	33	11.1	0.1	0.2	0.2	x	–	x	–
	Lomatium nevadense	33	6.7	0.1	0.2	0.2	x	–	x	–
	Penstemon	33	6.7	0.1	0.2	0.2	–	–	–	–
	Phlox	33	6.7	0.1	0.2	0.2	–	–	–	–
	Poa fendleriana	33	6.7	0.1	0.2	0.2	–	–	–	–
	Koeleria macrantha	33	3.0	0.0	0.1	0.1	–	–	–	–
Non-vasc	Unknown Lichen	33	33.3	1.3	4	4	x	x	–	–

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

Common Name: Bitterbrush – Big Sagebrush Mesic Steppe & Shrubland
Group Assignment: G302; **Alliance Code:** A3179

Alliance Concept

The Bitterbrush – Big Sagebrush Mesic Steppe & Shrubland Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is open. The alliance is found primarily on moderate slopes, valley bottoms, and in burned areas at high elevation. Soils are derived from a variety of substrates including alluvium, granodiorite, sandstone and textures include loamy sand, sandy clay, and sandy loam. Elevations range from approximately 1500 to 1800 meters. In this region, *Purshia glandulosa* (= *Purshia tridentata* var. *glandulosa*) is dominant or co-dominant in the shrub layer, and *Artemisia tridentata* and *Ephedra nevadensis* are often present. Shrubs that are often present include *Prunus fasciculata, Salvia dorrii,* and *Yucca baccata.* Commonly associated emergent trees at sparse cover include *Yucca brevifolia*. Herbs often present include *Bromus tectorum, Achnatherum hymenoides, Elymus elymoides, Bromus rubens,* and *Amsinckia tessellata.*

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Purshia glandulosa* (=*Purshia tridentata* var. *glandulosa*) dominant or co-dominant with shrubs such as *Artemisia tridentata*. The overall shrub cover ranges from 6 to 19 percent.

Alliance Distribution

The alliance is well-defined in sampling in the eastern portion of MOJA. The alliance was found in the northeastern portion of DEVA of the Last Chance Range and Grapevine Mountains, and has been observed in the Cottonwood and Panamint Mountains. It was not found in LAKE. This alliance only occurs at high elevation.

States: CA, NV

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

Park Sampling Zones: DEVA: Cottonwood Mtns, Grapevine Mtns, Last Chance Range, Nevada Triangle, (Panamint Mtns)**; MOJA:** Mid Hills, New York Mtns, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Purshia glandulosa [CEPP006747]	6	–	x	x	x
Purshia glandulosa–Artemisia tridentata [CEPP006746]	5	–	x	–	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1596 m, Range 1503 – 1756 m
- Aspect: N (2), NE (2), E (2), NW (1), SE (1), S (2), W (1)
- Slope: Mean 6.5 degrees, Range 1 – 20 degrees
- Macro Topography: Entire slope (1), High level/summit (1), Low level/bottom (1), Lowslope (1), Midslope (4)
- Tree Cover: Mean 0.5%, Range 0 – 1%
- Shrub Cover: Mean 11.7%, Range 5.6 – 19%
- Herb Cover: Mean 10.2%, Range 2 – 16%
- Large Rock: Mean 5.9%, Range 0 – 13%
- Small Rock: Mean 68.3%, Range 55 – 80%
- Fines Cover: Mean 17.8%, Range 0.2 – 42%
- Litter Cover: Mean 3.1%, Range 2.5 – 4%
- Geology: alluvium (1), andesite (1), granodiorite (6), sandstone (1)
- Soil Texture: Loamy sand (3), Moderately coarse loamy sand (1), Sandy clay (1), Sandy loam (3)

Environment: The alliance is found primarily on moderate slopes, valley bottoms, and in burned areas. Soils are derived from a variety of substrates including alluvium, granodiorite, sandstone and textures include loamy sand, sandy clay, and sandy loam. The alliance only occurs at high elevation.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 6 to 19 percent. The tree layer is typically sparse, and the herb layer is sparse to open.

Vegetation Floristics: In this region, *Purshia tridentata* var. *glandulosa* (=*Purshia glandulosa*) is dominant or co-dominant in the shrub layer, and *Artemisia tridentata* and *Ephedra nevadensis* are often present. Shrubs that are often present include *Prunus fasciculata, Salvia dorrii,* and *Yucca baccata.* Commonly associated emergent trees at sparse cover include *Yucca brevifolia*. Herbs often present include *Bromus tectorum, Achnatherum hymenoides, Elymus elymoides, Bromus rubens,* and *Amsinckia tessellata.*

Dynamics: *Purshia tridentata* var. *glandulosa* stands occur in a matrix with *Artemisia tridentata* and *Pinus monophylla* alliance stands. Some stands in the Midhills of MOJA have evidence of past fire,

and *P. tridentata* var. *glandulosa* has resprouted and germinated along with *Gutierrezia microcephala* readily after fire.

Classification Comments
None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank
Global: G4
State (California): S3

References
Evens et al. 2012, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description
MOJN: N=11 [+1]
LAKE (n=0); DEVA (n=5): DEVA0309, DEVA9212, DEVA9237, DEVA9592, DEVAD068; MOJA (n=3): MOJA9353, MOJA9671, MOJC0013; MOJN-Johnson (n=3): MOJJE433, MOJJE602, MOJJE604
[MOJA-McAuliffe (n=1): MOJAA034]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	60	40	0.2	0.2	0.5	–	–	–	x
	Juniperus osteosperma	40	30	0.3	0.5	1	–	–	–	–
Shrub	*Purshia glandulosa*	89	36	6.7	2	20	x	–	x	–
	Artemisia tridentata	78	2.2	0.3	0.2	1	–	–	–	x
	Ephedra nevadensis	80	2.7	0.4	0.2	1	x	–	–	–
	Ephedra viridis	44	2.4	0.5	0.2	2	–	–	–	–
	Yucca baccata	33	3	0.5	0.2	4	–	–	–	x
	Atriplex canescens	33	4.2	0.3	0.2	2	–	–	–	–
	Chrysothamnus viscidiflorus	33	1.5	0.2	0.2	1	–	–	–	–
	Eriogonum fasciculatum	33	0.9	0.2	0.1	1	–	–	–	–
	Prunus fasciculata	33	0.9	0.1	0.2	0.5	–	–	–	x
	Salvia dorrii	33	1.0	0.1	0.2	0.5	–	–	–	x
Herb	*Bromus tectorum*	67	18.9	3.8	0.2	20	–	–	–	–
	Bromus rubens	56	2.1	0.4	0.2	2	x	–	–	–
	Elymus elymoides	56	2.5	0.3	0.2	1	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Achnatherum hymenoides*	56	2.4	0.1	0.2	0.5	–	–	–	x
	Amsinckia	56	1.1	0.1	0.2	0.2	x	–	–	–
	Layia glandulosa	44	2.8	0.3	0.2	1	–	–	–	–
	Phacelia vallis-mortae	44	3.4	0.3	0.2	1	–	–	–	–
	Sphaeralcea ambigua	33	9.6	1.9	0.2	10	–	–	–	–
	Chamaesyce albomarginata	33	1.5	0.2	0.2	1	–	–	–	–
	Cryptantha circumscissa	33	1.2	0.2	0.2	1	–	–	–	–
	Stephanomeria exigua	33	2.2	0.2	0.2	1	–	–	–	–
	Eriastrum	33	0.8	0.1	0.2	0.2	–	–	–	–
	Phlox stansburyi	33	0.8	0.1	0.2	0.2	–	–	–	–
	Salvia columbariae	33	0.6	0.1	0.2	0.2	–	–	–	–

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

Common Name: Big Sagebrush – Mixed Shrub Dry Shrubland
Group Assignment: G303, G302; **Alliance Code:** A3198, A3194, A3183, 3182

Alliance Concept

The Big Sagebrush – Mixed Shrub Dry Shrubland Alliance forms an open to intermittent shrub layer. The emergent tree layer, when present, is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found primarily in high mountain valleys, slopes and ridges at various aspects. Soils are derived from a variety of substrates including snadstone and granodiorite, and soil textures are various. Elevations range from approximately 1500 to 3050 meters. *Artemisia tridentata* is dominant or co-dominant in the shrub layer with various shrubs such as *Ericameria nauseosa, Ephedra nevadensis,* and *Ephedra viridis*. *Yucca brevifolia* is sometimes present at low cover in the tree layer. *Elymus elymoides, Sphaeralcea ambigua,* and *Achnatherum hymenoides* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Artemisia tridentata* dominant or co-dominant. The overall shrub cover ranges from 4 to 53 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and only sampled once in MOJA. The alliance occurs only at high elevations. The alliance was not found in LAKE.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (1): 322Al; Southeastern Great Basin (28): 341Fb, 341Fc, 341Fd, 341Fe, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Joshua Flat, Last Chance Range, Nelson Range, Panamint Mtns**; MOJA:** Mid Hills

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Artemisia tridentata [CEGL000991]	6	–	x	x	–
Artemisia tridentata–Mixed Shrub (alliance)	3	–	x	–	–
Artemisia tridentata / Pleuraphis jamesii [CEGL001005]	3	–	x	–	–

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Artemisia tridentata–Chrysothamnus viscidiflorus / (Poa secunda) [CEGL000999]	8	–	x	–	–
Artemisia tridentata–Ephedra nevadensis [CEGL001002]	7	–	x	–	x
Artemisia tridentata–Ericameria nauseosa [CEGL000998]	2	–	x	–	–
Artemisia tridentata–Ericameria teretifolia [CEPP005793]	3	–	x	–	–
Artemisia tridentata var. parishii	1(4)	–	x	–	–

Association Notes: One stand was sampled by Root (1978) with *Artemesia tridentata* dominant in the shrub layer yet cover of this and other shrubs were not provided.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1978.2 m, Range 1521 – 3035 m
- Aspect: N (6), NE (3), E (5), NW (2), SE (4), SW (3), S (4)
- Slope: Mean 12.1 degrees, Range 0 – 30 degrees
- Macro Topography: Basin floor/wetland (1), Entire slope (2), High level/summit (5), High slope (2), Lowslope (1), Midslope (9)
- Tree Cover: Mean 0.3%, Range 0 – 3%
- Shrub Cover: Mean 23.8%, Range 4 – 53%
- Herb Cover: Mean 6.0%, Range 0 – 30%
- Large Rock: Mean 21.1%, Range 0 – 75%
- Small Rock: Mean 59.6%, Range 15 – 100%
- Fines Cover: Mean 13.1%, Range 0 – 81%
- Litter Cover: Mean 5.7%, Range 0.2 – 26%
- Geology: alluvium (2), dolostone (dolomite) (1), granodiorite (2), limestone (2), rhyolite (3), sandstone (15), shale (2)
- Soil Texture: Clay loam (3), Fine sandy clay (1), Medium silt loam (3), Moderately fine sandy clay loam (1), Sandy clay (1), Sandy loam (3), Silt loam (1), Silty clay (1)

Environment: The alliance is found primarily in high mountain valleys, slopes and ridges at various aspects. Soils are derived from a variety of substrates including snadstone and granodiorite, and soil textures are various. Big Sagebrush Alliance is only found at higher elevations.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 4 to 53 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Artemisia tridentata* is dominant or co-dominant in the shrub layer, and *Ephedra nevadensis* and *Ephedra viridis* is often present. *Yucca brevifolia* is sometimes present at

low cover in the tree layer. *Elymus elymoides, Sphaeralcea ambigua,* and *Achnatherum hymenoides* are often present in the herbaceous layer.

Dynamics: *Artemisia tridentata* ssp. *tridentata* usually does not tolerate saturated soils or alkaline conditions. Soils are often deep, lacking well-developed hardpans and rock fragments. *A. tridentata* is inhibited by fires of short return interval and may take more than a decade to re-establish after fire, and non-native grass invasion can threaten stands with increasing fuels that carry fires. Also, over-grazing can be detrimental in degrading both shrub cover and perennial grass cover.

Classification Comments

Associations with *Artemisia tridentata* ssp. *tridentata, A. t.*ssp. *wyomingensis,* and *A. t. xericensis* are currently placed in the Intermountain Mesic Tall Sagebrush Steppe & Shrubland (G302) Group (including *Artemisia tridentata* ssp. *tridentata – Artemisia tridentata* ssp. *xericensis* Mesic Steppe & Shrubland Alliance (A3183), and *Artemisia tridentata* ssp. *wyomingensis* Mesic Steppe Shrubland Alliance (A3182)) and the Intermountain Dry Tall Sagebrush Steppe & Shrubland (G303) Group (including *Artemisia tridentata* – Mixed Shrub Dry Steppe & Shrubland Alliance (A3198) and *Artemisia tridentata* ssp. *tridentata – Artemisia tridentata* ssp. *xericensis* Dry Steppe & Shrubland Alliance (A3194)) of the USNVC hierarchy. For the Mojave Network classification, we have combined associations with *A. t.* ssp. *tridentata* into one alliance (A3198) in the G303 group.

Some stands sampled did not have the *Artemisia tridentata* identified to subspecies and have been placed in this alliance, though they may be sometimes var. *vaseyana* (subspecies and alliance) instead of ssp. *tridentata.*

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S5

References

Ferren and Davis 1991, Gordon and White 1994, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 2003b, Klein and Evens 2005, NatureServe 2012, Peterson 1984, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=33
LAKE (n=0)
DEVA (n=28): DEVA0133, DEVA9147, DEVA9150, DEVA9234, DEVA9238, DEVA9253, DEVA9257, DEVA9264, DEVA9330, DEVA9672, DEVA9910, DEVAD108, DEVAD114, DEVAD144, DEVAD252, DEVAR008, DEVAS040, DEVAS071, DEVAS076, DEVAS106, DEVAS148, DEVAS206, DEVAS235, MOJC0063, MOJC0452, MOJC0605, MOJC0606, MOJC0607
[DEVA (n=4): SLTN0635, SLTN0636, SLTN0648, SLTN0772]
MOJA (n=1): MOJC0019

MOJN-Johnson (n=4): MOJJE411, MOJJE447, MOJJE606, MOJJE608

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	36.4	33	0.2	0.05	1	–	–	–	–
Shrub	*Artemisia tridentata*	96	58	14	1	35	x	x	–	–
	Ephedra nevadensis	48	4.6	0.4	0.11	3.5	–	–	–	–
	Ephedra viridis	41	2.0	0.7	0.1	5	–	–	–	–
	Coleogyne ramosissima	33	2.8	0.5	0.2	4	–	–	–	–
	Opuntia polyacantha var. erinacea	33	0.4	0.1	0.1	0.5	–	–	–	–
	Chrysothamnus viscidiflorus	30	3.1	1.1	0.5	15	–	–	–	–
	Grayia spinosa	30	1.5	0.5	0.2	10	–	–	–	–
	Eriogonum fasciculatum	30	1.6	0.4	0.1	5	–	–	–	–
	Menodora spinescens	30	1.2	0.3	0.2	2	–	–	–	–
	Atriplex confertifolia	30	1.1	0.2	0.1	2	–	–	–	–
	Krascheninnikovia lanata	26	2.5	0.6	0.2	5	–	–	–	–
	Gutierrezia sarothrae	26	2.8	0.5	0.1	6	–	–	–	–
	Lycium andersonii	26	0.3	0.1	0.1	0.5	–	–	–	–
Herb	*Elymus elymoides*	59	5.7	0.3	0.1	2.2	–	–	–	x
	Sphaeralcea ambigua	52	4.5	0.2	0.1	1	–	–	–	–
	Achnatherum hymenoides	48	3.8	0.1	0.1	1	–	–	–	–
	Pleuraphis jamesii	37	8.7	0.5	0.2	5	–	–	–	–
	Bromus rubens	33	5.6	0.2	0.1	2	–	–	–	–
	Castilleja angustifolia	30	1.9	0.1	0.1	1	–	–	–	–
	Phlox stansburyi	26	1.3	0.1	0.1	0.2	–	–	–	–

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

Common Name: Mountain Big Sagebrush – Mixed Shrub Shrubland
Group Assignment: G304; **Alliance Code:** A3198

Alliance Concept

The Mountain Big Sagebrush – Mixed Shrub Shrubland Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found on a variety of landforms and aspects at mid to high elevations, though often on mountain slopes, drainages, and valley bottoms. Soils are derived from a variety of substrates and textures are highly variable. Elevations range from approximately 1500 to 3000 meters. *Artemisia tridentata* ssp. *vaseyana* is typically dominant or co-dominant in the shrub layer, and *Ephedra viridis* is characteristically present and can be co-dominant. *Chrysothamnus viscidiflorus, Ericameria laricifolia, Eriogonum fasciculatum,* and *Purshia glandulosa* are sometimes to often present. *Achnatherum hymenoides, Achnatherum speciosum, Bromus rubens, Bromus tectorum, Elymus elymoides, Phacelia vallis-mortae,* and *Poa secunda* are sometimes to often present in the herbaceous layer. *Pinus monophylla* and *Yucca brevifloia* are sometimes present as emergent trees at low cover.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Artemisia tridentata* ssp. *vaseyana* dominant or co-dominant with other shrubs including *Ephedra viridis*. The overall shrub cover ranges from 3 to 30 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA where it is distributed along mountain slopes and valleys at high elevations. The alliance was not sampled in LAKE or MOJA.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ac, 322Ad; Southeastern Great Basin (26): 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

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Artemisia tridentata ssp. vaseyana [CEPP005794]	7	–	x	–	–
Artemisia tridentata ssp. vaseyana–Ephedra viridis [CEPP006855; =*Artemisia tridentata – Ephedra spp.* CEGL001003]	24	–	x	–	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1895 m, Range 1511 – 2920 m
- Aspect: N (4), NE (5), E (5), NW (5), SE (3), SW (7), W (4), S (1)
- Slope: Mean 22.4 degrees, Range 1 – 39 degrees
- Macro Topography: High slope (14), Lowslope (3), Midslope (10), Step in slope (1)
- Tree Cover: Mean 0.4%, Range 0 – 3%
- Shrub Cover: Mean 17.8%, Range 3.2 – 27.8%
- Herb Cover: Mean 5.0%, Range 0 – 17%
- Large Rock: Mean 20.7%, Range 0 – 89%
- Small Rock: Mean 57.8%, Range 9 – 96%
- Fines Cover: Mean 14.5%, Range 0 – 86%
- Litter Cover: Mean 5.5%, Range 0 – 22%
- Geology: alluvium (3), conglomerate (1), dolostone (dolomite) (1), granodiorite (11), limestone (1), rhyolite (7), sandstone (7), shale (2)
- Soil Texture: Clay (1), Clay loam (2), Loam (2), Loamy sand (6), Medium to very fine sandy loam (2), Moderately fine sandy clay loam (1), Sand (2), Sandy loam (7), Silt (1), Silt loam (2), Silty clay (2)

Environment: The alliance is found on a variety of landforms and aspects at high elevations, though often on mountain slopes, drainages, and valley bottoms. Soils are derived from a variety of substrates and textures are highly variable. The alliance only occurs at high elevation.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 3 to 30 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Artemisia tridentata* ssp. *vaseyana* is dominant or co-dominant in the shrub layer, and *Ephedra viridis* is characteristically present and can be co-dominant. *Chrysothamnus viscidiflorus, Ericameria laricifolia, Eriogonum fasciculatum,* and *Purshia glandulosa* are sometimes to often present. *Achnatherum hymenoides, Achnatherum speciosum, Bromus rubens, Bromus tectorum, Elymus elymoides, Phacelia vallis-mortae,* and *Poa secunda* are sometimes to often present

in the herbaceous layer. *Pinus monophylla* and *Yucca brevifloia* are sometimes present as emergent trees at low cover.

Dynamics: *Artemisia tridentata* ssp. *vaseyana* occurs in a matrix with *Pinus monophylla* and *Juniperus osteosperma* stands in upper elevations of the Mojave Desert and southeastern Great Basin. The shrubland stands appear more prominently on the exposed southeast to western slopes and ridges while the woodland and forest stands are on more protected northerly slopes, ridgelines and lower slopes.

Classification Comments

Previous classifications of *Artemisa tridentata* co-dominant with *Ephedra viridis* were placed in the *Ephedra viridis* alliance (cf. Thomas et al. 2004 and Sawyer et al. 2009), though currently the USNVC and this report place these stands in the respective *Artemisia tridentata* alliances.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S5

References

Cheng 2004, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=31
LAKE (n=0)
DEVA (n=31): DEVA0478, DEVA0579, DEVA9110, DEVA9164, DEVA9166, DEVA9215, DEVA9219, DEVA9220, DEVA9221, DEVA9223, DEVA9269, DEVA9339, DEVA9340, DEVA9443, DEVA9456, DEVA9483, DEVA9484, DEVA9581, DEVA9582, DEVA9595, DEVA9662, DEVA9663, DEVA9827, DEVA9829, DEVAS092, DEVAS099, DEVAS146, MOJC0633, MOJC1068, MOJC1072
MOJA (n=0)
MOJN-Johnson (n=0):

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	36	26	0.2	0.2	2	–	–	–	–
	Yucca brevifolia	27	18	0.1	0.2	1	–	–	–	–
Shrub	*Ephedra viridis*	82	19	2.9	0.2	8	x	–	–	–
	Artemisia tridentata ssp. vaseyana	70	37	7.1	1	25	–	–	–	x
	Eriogonum fasciculatum	48	2.8	0.5	0.11	3	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Purshia glandulosa*	45	4.8	0.8	0.2	5	–	–	–	–
	Artemisia tridentata	30	11	1.9	1	13	–	–	–	–
	Chrysothamnus viscidiflorus	30	2.5	0.6	0.2	6	–	–	–	–
	Ericameria laricifolia	30	2.8	0.4	0.2	6	–	–	–	–
Herb	*Elymus elymoides*	67	8.2	0.2	0.11	1	–	–	–	x
	Bromus rubens	42	13	0.8	0.11	7	–	–	–	–
	Achnatherum speciosum	42	3.6	0.2	0.11	2	–	–	–	–
	Phacelia vallis-mortae	42	2.5	0.1	0.2	1	–	–	–	–
	Bromus tectorum	36	12.1	1.1	0.2	10	–	–	–	–
	Achnatherum hymenoides	30	2.3	0.1	0.2	0.5	–	–	–	–
	Poa secunda	27	5.0	0.1	0.2	5	–	–	–	–
	Unknown Lichen	33	27	1	0.4	20	–	–	–	–
Non-vasc	Cryptogamic crust	30	22	0.2	0.2	2	–	–	–	–

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

M170. Great Basin-Intermountain Dwarf Sagebrush Steppe & Shrubland Macrogroup

G308. Intermountain Low & Black Sagebrush Steppe & Shrubland Group

Artemisia arbuscula ssp. *arbuscula* Shrubland Alliance

Common Name: Little Sagebrush Scrub
Group Assignment: G308; **Alliance Code:** A3219

Alliance Concept

The Little Sagebrush Scrub Alliance forms an open shrub layer in the only sample from the project area. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse. The alliance is found on a high slope at a southwestern aspect. The soil is derived from sandstone. The elevation is 2753 meters. The dominant shrub is *Artemisia arbuscula*, and other shrubs with lower cover include *Ephedra viridis* and *Opuntia polyacantha* var. *erinacea. Gutierrezia sarothrae* all have one or more percent cover. *Achnatherum speciosum* is present in the understory.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Artemisia arbuscula* dominant. The overall shrub cover is 7 percent in the one stand sampled.

Alliance Distribution

The alliance is poorly-defined in sampling. The alliance was sampled once in the Panamint Mountains in DEVA, though it is also noted as occurring in the Cottonwood Mountains in DEVA and adjacent Inyo Mountains per Thomas et al. (2004).

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Ff (and 341Fc)

Park Sampling Zones: DEVA: Panamint Mtns (and CottonWood Mtns)

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Artemisia arbuscula ssp. arbuscula (alliance)	1	–	x	–	–

Association Notes: The only sample was not classified below the alliance level.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2753 m
- Aspect: SW (1)
- Slope: 5 degrees
- Macro Topography: High slope (1)
- Tree Cover: 0%; Shrub Cover: 7.1%; Herb Cover: 0.1%
- Large Rock: 25%; Small Rock: 55%; Fines Cover: 16%; Litter Cover: 3.1%
- Geology: sandstone (1); Soils: (unknown)

Environment: This alliance occurred on a high slope at southwest aspect at high elevation in DEVA. The soil is derived from sandstone.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover is 7 percent. There were no trees or Non-vascular plants, and the herbaceous layer is sparse.

Vegetation Floristics: The dominant shrub is *Artemisia arbuscula*, and other shrubs with lower cover include *Ephedra viridis*, *Opuntia polyacantha* var. *erinacea,* and *Gutierrezia sarothrae*. *Achnatherum speciosum* is present in the understory.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=0); DEVA (n=1): DEVAS048; MOJA (n=0) ; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Artemisia arbuscula*	100	42	3	3	3	x	–	x	–
	Ephedra viridis	100	28	2	2	2	x	–	–	–
	Gutierrezia sarothrae	100	14	1	1	1	x	–	–	–
	Opuntia polyacantha var. erinacea	100	14	1	1	1	x	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Tetradymia canescens*	100	1.5	0.1	0.11	0.11	x	–	–	–
Herb	Unknown Forb (herbaceous, not grass nor grasslike)	100	80	0.4	0.44	0.44	x	x	–	–
	Achnatherum hymenoides	100	20	0.1	0.11	0.11	x	–	–	–

Common Name: Black Sagebrush Scrub
Group Assignment: G308; **Alliance Code:** A3222

Alliance Concept

The Black Sagebrush Scrub Alliance forms an open shrub layer in the two samples from the project area. The emergent tree layer, if present, can include *Yucca brevifolia*, and the herbaceous layer is sparse to open. The alliance is found on south-facing slopes. The soil texture is a fine sandy loam. The elevation is 1400-1870 meters. The dominant and characteristic shrub is *Artemisia nova.* Other shrub species that are sometimes present include *Artemesia tridentata* ssp. *vaseyana, Coleogyne ramosissima, Ephedra viridis,* and *Atriplex confertifolia.* Scattered trees may be present including *Juniperus osteosperma, Pinus monophylla,* or *Yucca brevifolia.*

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Artemisia nova* dominant or co-dominant. The overall shrub cover ranges from 10-30%.

Alliance Distribution

The alliance was sampled twice in the study area in the Nelson Range and Cottonwood Mountains at DEVA. Stands also have been noted from the Funeral, Last Chance, and Panamint mountains (Peterson 1984, b) at DEVA and from Clark Mountain (Thomas et al. 2004) at MOJA.

States: CA

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

Park Sampling Zones: DEVA: Nelson Range, CottonWood Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Artemisia nova (alliance)	1	–	x	–	–
Artemisia nova [CEGL001417]	1	–	x	–	–

Association Notes: One stand classified to the alliance level has *Artemisia nova* co-dominant with *Atriplex confertifolia* in the shrub canopy, and *Achnatherum speciosum* dominant in the understory as sampled by Root (1978).

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1639 m, Range 1410-1868 m
- Aspect: S (1)
- Slope: 4 degrees

- Macro Topography: High slope (1)
- Tree Cover: 0%
- Shrub Cover: 30%
- Herb Cover: 0.2%
- Large Rock: 16%
- Small Rock: 20%
- Fines Cover: 48%
- Litter Cover: 15%
- Geology: alluvium (1), rhyolite (1)
- Soil Texture: Fine sandy loam (1)

Environment: Stands occur in mid to high elevation desert mounains in the region. Their substrates typically have some calcareous component, and they often have bare soil and rocks between shrubs.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover is 10 to 30 percent. The tree layer is sparse, if present, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Artemisia nova* is dominant and characteristic in the shrub layer, though it may sometimes co-dominate with other shrubs including *Atriplex confertifolia.* Overstory trees, such as *Juniperus osteosperma, Pinus monophylla* or *Yucca brevifolia,* can occur at sparse cover.

Dynamics: *Artemisia nova* occurs in a fine-scale matrix with other related sagebrush stands such as *Artemisia tridentata* var. *vaseyana.* Nutrient-poor soil appears to define where this alliance occurs.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S3

References

NatureServe 2012, Root 1978, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0)
DEVA (n=2): DEVA9966, DEVAR043
MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Juniperus osteosperma*	50	42	0.5	1	1	–	–	–	x
	Yucca brevifolia	50	50	0.3	0.5	0.5	–	–	–	x
	Pinus monophylla	50	8.3	0.1	0.2	0.2	–	–	–	x
Shrub	*Artemisia nova*	100	46	12	3	20	x	–	x	–
	Artemisia tridentata ssp. vaseyana	50	11	3.5	7	7	–	–	–	x
	Atriplex confertifolia	50	14	1.5	3	3	–	–	–	x
	Ephedra viridis	50	3.2	1	2	2	–	–	–	x
	Coleogyne ramosissima	50	1.6	0.5	1	1	–	–	–	x
	Acamptopappus shockleyi	50	2.3	0.3	0.5	0.5	–	–	–	x
	Echinocactus polycephalus	50	2.3	0.3	0.5	0.5	–	–	–	x
	Echinocereus engelmannii	50	2.3	0.3	0.5	0.5	–	–	–	x
	Ephedra nevadensis	50	2.3	0.3	0.5	0.5	–	–	–	x
	Ericameria nauseosa	50	2.3	0.3	0.5	0.5	–	–	–	x
	Eriogonum fasciculatum	50	2.3	0.3	0.5	0.5	–	–	–	x
	Eriogonum heermannii	50	2.3	0.3	0.5	0.5	–	–	–	x
	Lepidium fremontii	50	2.3	0.3	0.5	0.5	–	–	–	x
	Opuntia basilaris	50	2.3	0.3	0.5	0.5	–	–	–	x
	Psorothamnus fremontii	50	2.3	0.3	0.5	0.5	–	–	–	x
	Gutierrezia microcephala	50	0.3	0.1	0.2	0.2	–	–	–	x
	Opuntia polyacantha var. erinacea	50	0.3	0.1	0.2	0.2	–	–	–	x
	Purshia stansburiana	50	0.3	0.1	0.2	0.2	–	–	–	x
	Salvia dorrii	50	0.3	0.1	0.2	0.2	–	–	–	x
Herb	*Achnatherum speciosum*	50	30	1.5	3	3	–	–	–	x
	Eriogonum inflatum	50	5	0.3	0.5	0.5	–	–	–	x
	Pleuraphis jamesii	50	5	0.3	0.5	0.5	–	–	–	x
	Sphaeralcea ambigua	50	5	0.3	0.5	0.5	–	–	–	x
	Xylorhiza tortifolia	50	5	0.3	0.5	0.5	–	–	–	x
	Calochortus	50	10	0.1	0.2	0.2	–	–	–	x
	Elymus elymoides	50	10	0.1	0.2	0.2	–	–	–	x
	Eriogonum	50	10	0.1	0.2	0.2	–	–	–	x
	Lomatium	50	10	0.1	0.2	0.2	–	–	–	x
	Poa secunda	50	10	0.1	0.2	0.2	–	–	–	x
Non-vasc	Unknown Lichen	50	50	0.1	0.2	0.2	–	–	–	x

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

Common Name: Fremont's Chaffbush – Funeral Sage Scrub
Group Assignment: G300; **Alliance Code:** A4159

Alliance Concept

The Freemont's Chaffbush – Funeral Sage Scrub Alliance forms a sparse to open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found from alluvial fan toeslopes to summits all aspects. Soils are derived primarily from a limestone and dolomite, and textures range from sand to silty clay. Elevations range from approximately 650 to 1550 meters. The characteristic shrub is *Amphipappus fremontii* and/or *Salvia funerea,* and those that are often present include *Ambrosia dumosa, Atriplex confertifolia, Brickellia* spp., *Echinocactus polycephalus,* and *Lepidium fremontii. Eriogonum inflatum* is an herb that is often present. Commonly associated non-vascular plants include cryptogammic crust and unknown moss.

Diagnostic Criteria: This alliance is characterized by a sparse to open shrub layer with *Amphipappus fremontii* and/or *Salvia funerea* dominant or co-dominant. The overall shrub cover ranges from 0.7 to 19 percent.

Alliance Distribution

The alliance was sampled in DEVA at mid to upper elevations. It occurs in Eureka Valley, Joshua Flat, Cottonwood, Funeral, Grapevine, and Panamint Mountains and in the Last Chance Range.

States: CA

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

Park Sampling Zones: DEVA: CottonWood Mtns, Eureka Valley, Funeral Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Panamint Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Amphipappus fremontii (limestone) Shrubland [CEPP005791]	16	–	x	–	–
Salvia funerea Shrubland [CEPP006754]	10	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1060.5 m, Range 652 – 1530 m
- Aspect: N (2), NE (1), E (2), NW (4), SE (5), SW (3), W (2), S (2)
- Slope: Mean 31.1 degrees, Range 15 – 53 degrees
- Macro Topography: High level/summit (3), High slope (3), Lowslope (4), Midslope (8), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0%, Range 0 – 0.2%
- Shrub Cover: Mean 9.9%, Range 0. 7 – 19.2%
- Herb Cover: Mean 2.7%, Range 0 – 10%
- Large Rock: Mean 52.9%, Range 5 – 99%
- Small Rock: Mean 42.1%, Range 0.1 – 92%
- Fines Cover: Mean 2.9%, Range 0 – 10%
- Litter Cover: Mean 1.5%, Range 0 – 4%
- Geology: alluvium (5), conglomerate (1), dolostone (dolomite) (3), limestone (1), sandstone (11)
- Soil Texture: Clay loam (5), Loam (1), Loamy sand (2), Moderately fine sandy clay loam (1), Sand (1), Sandy loam (5), Silty clay (1)

Environment: This alliance occurs at mid to high elevations from toeslopes to summits at all aspects. It primarily occurs on shallow rocky, calcareous soils with exposed bedrock. Soil textures are variable and are derived primarily from limestone and dolomite.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to open shrub layer with *Amphipappus fremontii* and/or *Salvia funerea* dominant or co-dominant, and the overall shrub cover ranges from 0.7 to 19 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: The characteristic shrub is *Amphipappus fremontii* and/or *Salvia funerea,* and those that are often present include *Ambrosia dumosa, Atriplex confertifolia, Brickellia* spp., *Echinocactus polycephalus,* and *Lepidium fremontii. Eriogonum inflatum* is an herb that is often present. Commonly associated non-vascular plants include cryptogammic crust and unknown moss.

Dynamics: Both *Amphipappus fremontii* and *Salvia funerea* prefer rocky sites, and they are typically found on harsher, calcareous parent materials. Signs of desert bighorn sheep *(Ovis canadensis nelsoni*) are prevalent in the stands surveyed.

Classification Comments

Stands with *Amphipappus fremontii* and/or *Salvia funerea* dominant or co-dominant are found in both the Great Basin and Mojave Desert. The Group G296 has been tentatively assigned to this alliance because of where the surveys clustered in the classification analysis, though the Group G310

Intermountain Semi-Desert Steppe & Shrubland could also be considered. It appears related to the (*Buddleja utahensis, Eriogonum heermannii)* - *Gutierrezia* spp. Limestone Scrub Alliance which is also placed in G296.

Classification Confidence of Alliance: Moderate

Conservation Status Rank
Global: G3
State (California): S3

References
Keeler-Wolf and Thomas 2000

Surveys (with Sample Sizes) Used in Description
MOJN: N=26
LAKE (n=0)
DEVA (n=26): DEVA0462, DEVA0552, DEVA0597, DEVA0901, DEVA9117, DEVA9119, DEVA9243, DEVA9304, DEVA9360, DEVA9427, DEVA9469, DEVA9471, DEVA9477, DEVA9488, DEVA9542, DEVA9548, DEVA9555, DEVA9558, DEVA9822, DEVA9914, DEVA9924, DEVAS210, DEVAS212, DEVAS231, MOJC0061, MOJC0587
MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Amphipappus fremontii*	76	23	2.5	0.2	12	x	–	–	–
	Echinocactus polycephalus	71	2.2	0.2	0.11	1	–	–	–	x
	Atriplex confertifolia	62	10	1	0.2	5	–	–	–	x
	Salvia funerea	52	15	1.2	0.11	4	–	–	–	x
	Lepidium fremontii	52	2.6	0.3	0.2	2	–	–	–	x
	Ambrosia dumosa	48	6.5	0.8	0.2	5	–	–	–	x
	Eriogonum fasciculatum	43	3.5	0.4	0.1	3	–	–	–	–
	Larrea tridentata	43	3.1	0.2	0.1	2	–	–	–	–
	Brickellia microphylla	38	2.8	0.3	0.1	3	–	–	–	–
	Stephanomeria pauciflora	38	0.9	0.1	0.2	0.5	–	–	–	–
	Viguiera reticulata	29	2.2	0.2	0.11	2.5	–	–	–	–
	Opuntia basilaris	29	0.7	0.1	0.2	0.2	–	–	–	–
	Peucephyllum schottii	25	1	0.1	0.2	0.5	–	–	–	–
Herb	*Eriogonum inflatum*	52	3.8	0.1	0.2	0.5	–	–	–	x
	Gilia	48	7.1	0.3	0.33	1.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Xylorhiza tortifolia*	43	4.4	0.1	0.11	0.5	–	–	–	–
	Cryptantha	38	8.7	0.4	0.33	3	–	–	–	–
	Bromus rubens	38	4.5	0.2	0.1	3	–	–	–	–
	Cheilanthes parryi	38	3.1	0.1	0.2	0.5	–	–	–	–
	Sphaeralcea ambigua	33	2.9	0.1	0.1	1.5	–	–	–	–
	Chorizanthe brevicornu	33	1.6	0.1	0.1	0.2	–	–	–	–
	Achnatherum speciosum	29	4.1	0.2	0.2	2	–	–	–	–
	Chorizanthe rigida	29	1.7	0.1	0.2	0.2	–	–	–	–
Non-vascular	Cryptogamic crust	67	40	0.5	0.2	4	–	–	–	x
	Unknown Moss	48	19	0.2	0.2	1	–	–	–	x
	Unknown Lichen	43	17	0.2	0.4	1	–	–	–	–

Common Name: Blackbrush Mojave Desert Scrub
Group Assignment: G296, G312; **Alliance Code:** A3144, A3220

Alliance Concept

The Blackbrush Mojave Desert Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to intermittent. The alliance is found from toeslopes to summits at all aspects. Soils are derived from a variety of and textures are variable. Elevations range from approximately 750 to 2150 meters. *Coleogyne ramosissima* is dominant or co-dominant in stands. Shrubs that are often present include *Ephedra nevadensis, Eriogonum fasciculatum, Lycium andersonii,*and *Thamnosma montana. Bromus rubens* is a characteristic herb and those often present are *Achnatherum speciosum* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Coleogyne ramosissima* dominant or co-dominant. The overall shrub cover ranges from 6 to 43 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout the parks in mid to upper elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (69): 322Ad, 322Af, 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av; Southeastern Great Basin (42): 341Fb, 341Fc, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Funeral Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Nelson Range, Owlshead Mtns, Panamint Mtns**; LAKE:** Gold Butte, Juniper Mine, Pearce Ferry, Searchlight SE, Temple Bar, Willow Beach**; MOJA:** (Castle Mtns), Cima Dome NW, Cima Dome SE, Clark Mountain, Clark Mtn, Clark Mtn West, Granite Mtns, HackberryVontrigger, Ivanpah Mtns, Ivanpah Vlly, Kelso Mtns, Mescal Range, Mid Hills, Mineral Hill, Providence Mtns, Vulcan Mine, Woods Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Coleogyne ramosissima [CEGL001332]	37	–	x	x	x
Coleogyne ramosissima (alliance)	4	–	x	x	–
Coleogyne ramosissima–Ephedra spp. [CEGL005297]	59	–	x	x	x
Coleogyne ramosissima–Ericameria teretifolia [CEPP005999]	8	–	x	x	–
Coleogyne ramosissima–Eriogonum fasciculatum [CEGL001333]	40	x	x	x	x

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Coleogyne ramosissima–Larrea tridentata [CEGL002717]	16	x	x	x	x
Coleogyne ramosissima–Lycium andersonii [CEGL005746]	23	–	x	–	x
Coleogyne ramosissima / Pleuraphis jamesii [CEGL001334]	[1]	–	–	[x]	–

Association Notes: The *Coleogyne ramosissima–Ephedra* spp. Association was previously defined from sampling in Grand Canyon National Park to include *Ephedra fasciculata, Ephedra torreyana,* and *Ephedra viridis* as character taxa. The sampling in MOJN and Joshua Tree National Park includes *Ephedra nevadensis*, in which the association concept is being broadened by the USNVC to include this taxon as well.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1396.2 m, Range 772 – 2140 m
- Aspect: Flat, Variable (2), N (25), NE (35), E (28), NW (15), WNW (1), SE (20), SW (25), W (9), S (13)
- Slope: Mean 10.8 degrees, Range 0 – 90 degrees
- Macro Topography: High level/summit (9), High slope (16), Lowslope (6), Midslope (29), Step in slope (1), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 0.1%, Range 0 – 1.5%
- Shrub Cover: Mean 20.5%, Range 5.7 – 42.9%
- Herb Cover: Mean 7.5%, Range 0 – 41.4%
- Large Rock: Mean 10.1%, Range 0 – 85%
- Small Rock: Mean 68%, Range 0 – 97.5%
- Fines Cover: Mean 12.6%, Range 0 – 60%
- Litter Cover: Mean 3.4%, Range 0 – 25%
- Geology: alkali-granite (alaskite) (2), alluvium (25), conglomerate (1), dolostone (dolomite) (5), gneiss (4), granite (2), granodiorite (20), limestone (2), peraluminous granite (1), plutonic rock (phaneritic) (1), quartz monzonite (3), rhyolite (12), sand (1), sandstone (31), shale (1)
- Soil Texture: Clay loam (11), Coarse loamy sand (7), Coarse sand (1), Fine silty clay (2), Loam (3), Loamy sand (3), Medium loam (2), Medium silt loam (4), Medium to very fine sandy loam (5), Moderately coarse loamy sand (1), Moderately fine clay loam (1), Moderately fine sandy clay loam (4), Moderately fine silty clay loam (2), Sand (2), Sandy clay (5), Sandy loam (25), Silt loam (1), Silty clay (3)

Environment: The alliance occurs at mid to high elevations from toeslopes to summits and at all aspects. It primarily occurs on areas with shallow soils and abundant exposed bedrock. Soil textures are variable and are derived from a variety of substrates.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 5.7 to 42.9 percent. The tree layer is typically sparse, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Coleogyne ramosissima* is dominant or co-dominant in the shrub layer. Shrubs that are often present include *Ephedra nevadensis, Eriogonum fasciculatum, Lycium andersonii,*and *Thamnosma montana. Bromus rubens* is a characteristic herb and those often present are *Achnatherum speciosum* and *Sphaeralcea ambigua.*

Dynamics: *Coleogyne ramosissima* is sensitive to fire and slowly returns as a dominant to shrublands once burned. Fire spreads quickly and easily in closely spaced stands, and fire in stands with cover of non-native annual grasses are of significant threat to this alliance. Interestingly, *Coleogyne* stands in the Mojave Desert ecoregion can be species rich, in which the average richness is approximately 25.8 (± 8.9 standard deviation) for the sampling sites of 1,000 m^2 plots and stand-based assessments.

Classification Comments

Associations with *Coleogyne ramosissima* dominant or codominant are currently placed in two Groups in the USNVC hierarchy. Mojave Mid-Elevation Mixed Desert Scrub Group (G296) and Colorado Plateau Blackbrush – Mormon-tea Shrubland Group (G312). Similarities between these two groups and related alliances/associations need further review by the USNVC hierarchy working group, and are discussed by Esque et al. (In Review). For the Mojave Network classification, we have combined these associations into one alliance description in the G296 group.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5
State (California): S4

References

Annable 1985, Evens et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2010, NatureServe 2012, Peterson 1984, Root 1978, Sawyer et al. 2009, Shiflet 1994, Spolsky 1979, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=187 [+3]
LAKE (n=11): LAKE0271, LAKE0284, LAKE9112, LAKE9153, LAKE9176, LAKE9710, LAMEN040, LAMEN085, LAMEN087, LAMEN088, LAMEN110
DEVA (n=69): DEVA0113, DEVA9101, DEVA9148, DEVA9174, DEVA9176, DEVA9195, DEVA9197, DEVA9207, DEVA9261, DEVA9351, DEVA9354, DEVA9361, DEVA9370, DEVA9371, DEVA9376, DEVA9377, DEVA9378, DEVA9400, DEVA9402, DEVA9403, DEVA9458, DEVA9504, DEVA9506, DEVA9609, DEVA9612, DEVAD118, DEVAD123, DEVAD157, DEVAR036, DEVAR062, DEVAR082, DEVAR107, DEVAR117, DEVAR125,

DEVAR126, DEVAR140, DEVAR148, DEVAS055, DEVAS119, DEVAS127, DEVAS141, DEVAS203, DEVAS213, DEVAS228, MOJC0330, MOJC0331, MOJC0332, MOJC0333, MOJC0338, MOJC0339, MOJC0340, MOJC0341, MOJC0359, MOJC0448, MOJC0449, MOJC0453, MOJC0454, MOJC0465, MOJC0472, MOJC0473, MOJC0474, MOJC0610, MOJC0612, MOJC0635, MOJC0963, MOJC0964, MOJC0965, MOJC0992, MOJC0994
MOJA (n=33): MOJA0102, MOJA0257, MOJA0323, MOJA0444, MOJA0454, MOJA0503, MOJA0505, MOJA9137, MOJA9218, MOJA9236, MOJA9288, MOJA9342, MOJA9344, MOJA9347, MOJA9381, MOJA9389, MOJA9417, MOJA9447, MOJA9448, MOJA9519, MOJA9597, MOJA9609, MOJA9674, MOJA9689, MOJAJC03, MOJAJC04, MOJC0268, MOJC0948, MOJC0980, MOJC1075, MOJC1109, MOJC1147, MOJC1149
MOJN-Johnson (n=74): MOJJE002, MOJJE004, MOJJE008, MOJJE010, MOJJE011, MOJJE018, MOJJE023, MOJJE025, MOJJE026, MOJJE061, MOJJE082, MOJJE084, MOJJE088, MOJJE126, MOJJE133, MOJJE135, MOJJE136, MOJJE146, MOJJE152, MOJJE156, MOJJE164, MOJJE194, MOJJE195, MOJJE207, MOJJE372, MOJJE407, MOJJE421, MOJJE422, MOJJE444, MOJJE455, MOJJE510, MOJJE512, MOJJE527, MOJJE618, MOJJE619, MOJJE620, MOJJE621, MOJJE622, MOJJE623, MOJJE638, MOJJE639, MOJJE647, MOJJE653, MOJJE654, MOJJE656, MOJJE705, MOJJE738, MOJJE739, MOJJE753, MOJJE757, MOJJE758, MOJJE772, MOJJE820, MOJJE822, MOJJE823, MOJJE824, MOJJE825, MOJJE835, MOJJE836, MOJJE837, MOJJE838, MOJJE842, MOJJE850, MOJJE851, MOJJE855, MOJJE861, MOJJE885, MOJJE898, MOJJE902, MOJJE904, MOJJE905, MOJJE906, MOJJE929, MOJJE930
[CAMO (n=3): CAMO9108, CAMO9109, CAMO9132]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Coleogyne ramosissima*	100	41	8.6	0.5	35.3	x	–	x	–
	Ephedra nevadensis	71	5.3	1	0.2	4	–	–	–	x
	Eriogonum fasciculatum	66	3.4	0.6	0.11	3	–	–	–	x
	Thamnosma montana	56	1.7	0.3	0.1	8	–	–	–	x
	Lycium andersonii	53	3.5	0.6	0.1	5.5	–	–	–	x
	Hymenoclea salsola	44	2.2	0.5	0.2	10	–	–	–	–
	Larrea tridentata	37	3.6	0.6	0.2	6	–	–	–	–
	Grayia spinosa	34	2.7	0.5	0.2	5	–	–	–	–
	Krascheninnikovia lanata	31	1.2	0.2	0.1	4	–	–	–	–
	Ephedra viridis	28	1.8	0.3	0.2	3	–	–	–	–
	Yucca schidigera	27	2.1	0.4	0.2	3	–	–	–	–
	Salazaria mexicana	27	1.5	0.3	0.1	4.5	–	–	–	–
	Ambrosia dumosa	27	1.7	0.3	0.0	4	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Echinocereus engelmannii*	26	0.5	0.1	0.1	1	–	–	–	–
	Stephanomeria pauciflora	26	0.4	0.1	0.1	0.5	–	–	–	–
Herb	*Bromus rubens*	76	22	1.7	0.1	35	x	–	–	–
	Achnatherum speciosum	63	10	0.4	0.0	5	–	–	–	x
	Sphaeralcea ambigua	50	3.9	0.2	0.0	3	–	–	–	x
	Erodium cicutarium	39	5.7	0.4	0.1	8	–	–	–	–
	Amsinckia	35	3	0.2	0.1	2	–	–	–	–
	Xylorhiza tortifolia	31	4.3	0.1	0.1	3	–	–	–	–
	Eriogonum inflatum	26	2.3	0.1	0.1	3	–	–	–	–
Non-vasc	Cryptogamic crust	31	22	0.3	0.2	8	–	–	–	–

Common Name: Buckhorn Cholla / Big Galleta Grass Scrub
Group Assignment: G296; **Alliance Code:** A4156

Alliance Concept

The Buckhorn Cholla / Big Galleta Grass Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is open. The alliance is found from lowslopes to highslopes at variable aspect. Soils are rocky and derived from a variety of substrates and textures range from fine sand to clay loam. Elevations range from approximately 650 to 1600 meters. *Cylindropuntia acanthocarpa* (=*Opuntia acanthocarpa*) is a characteristic shrub and is dominant or co-dominant, though other desert cacti may be present and dominant. Other characteristic shrubs include *Echinocereus engelmannii, Ephedra nevadensis, Ferocactus cylindraceus,* and *Krameria erecta.* Emergent trees are sometimes present, including *Yucca brevifolia.* Shrubs that are often present include *Ambrosia dumosa, Encelia farinosa, Larrea tridentata, Opuntia basilaris, Viguiera parishii,* and *Yucca schidigera.* Herbs that are diagnostic include *Pleuraphis rigida,* and those often present include *Amsinckia tessellata, Bromus rubens, Eriogonum inflatum, Erodium cicutarium, Porophyllum gracile,* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Cylindropuntia acanthocarpa* (=*Opuntia acanthocarpa*) dominant or co-dominant, though other desert cacti may be present and dominant such as *Grusonia parishii*. *Pleuraphis rigida* and/or *Pleuraphis jamesii* are typically present at variable cover. The overall shrub cover ranges from 5 to 35 percent, and the herb cover ranges from 3 to 32 percent.

Alliance Distribution

The alliance was sampled at two Parks. It occurs in MOJA in Fenner and Lanfair Valley, including in the Ivanpah and Providence Mountains, and in the Paiute Range. It also occurs at Pearce Ferry and Temple Bar areas in LAKE. The alliance occurs at mid to upper elevations.

States: AZ, CA

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

Park Sampling Zones: LAKE: Pearce Ferry, Temple Bar**; MOJA:** Fenner Vlly West, HackberryVontrigger, Ivanpah Mtns, Lanfair Vlly, Mid Hills, Piute Range, Providence Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Pleuraphis rigida / (Acamptopappus sphaerocephalus, Ericameria cooperi) [CEPP006733]	28	x	–	x	x
Cylindropuntia acanthocarpa var. coloradensis [CEPP006729]	13	x	–	x	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1203.3 m, Range 664 – 1566 m
- Aspect: Flat, Variable (1), N (5), NW (5), E (5), SE (9), SW (5), S (7), W (2)
- Slope: Mean 5.5 degrees, Range 0 – 26 degrees
- Macro Topography: High slope (2), Lowslope (1), Low level/bottom (4), Midslope (3)
- Tree Cover: Mean 0.1%, Range 0 – 0.5%
- Shrub Cover: Mean 12.4%, Range 0.5 – 35%
- Herb Cover: Mean 13.7%, Range 3 – 32%
- Large Rock: Mean 6.5%, Range 0 – 27%
- Small Rock: Mean 57.7%, Range 10 – 94%
- Fines Cover: Mean 29.8%, Range 0 – 87.5%
- Litter Cover: Mean 2.8%, Range 0.2 – 10%
- Geology: alluvium (7), gneiss (1), gravel (1), sandstone (1), schist (2)
- Soil Texture: Clay loam (4), Fine sand (1), Loam (2), Loamy sand (2), Medium to very fine sandy loam (3), Sandy clay (1), Sandy loam (1)

Environment: The alliance occurs at mid to high elevations (approximately 650 to 1600 meters elevation range) on low to high slopes with variable aspect. Soils are often rocky and range from sand to clay loam derived from a variety of substrates. Sites often include disturbance from grazing and/or fire.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 5 to 35 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Cylindropuntia acanthocarpa* (=*Opuntia acanthocarpa*) is a characteristic and dominant to co-dominant shrub, though other desert cacti may be present and dominant such as *Grusonia parishii*. Other characteristic shrubs include *Echinocereus engelmannii, Ephedra nevadensis, Ferocactus cylindraceus,* and *Krameria erecta.* Shrubs that are often present include *Ambrosia dumosa, Encelia farinosa, Larrea tridentata, Opuntia basilaris, Viguiera parishii,* and *Yucca schidigera.* Emergent trees are sometimes present, including *Yucca brevifolia.* Herbs that are diagnostic include *Pleuraphis rigida*, and those often present include *Amsinckia tessellata, Bromus rubens, Eriogonum inflatum, Erodium cicutarium, Porophyllum gracile,* and *Sphaeralcea ambigua.*

Dynamics: Stands with *Pleuraphis rigida, Cylindropuntia acanthocarpa* (=*Opuntia acanthocarpa*) and/or other desert cacti occurs in a fine-scale matrix with other mid-elevation shrubland types in the Mojave Desert where soils are often shallow and sites are exposed and rocky. Stands may have experienced disturbance from grazing, clearing, and/or fire, whereby shrubs are sparse or lower in cover and includes disturbance-tolerant species.

Classification Comments

Additional representation of this vegetation is summarized by McAuliffe (2016). While this alliance is placed in Mojave Mid-elevation Mixed Desert Scrub (G296), it also is closely related to Intermountain Semi-Desert Steppe & Shrubland (G310) and Intermountain Semi-Desert Grassland (G311).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: GNR

State (California): S4

References

McAuliffe 2016, cf. Keeler-Wolf et al. 1998

Surveys (with Sample Sizes) Used in Description

MOJN: N=41 [+24]
LAKE (n=3): LAKE0177, LAKE0367, LAKE0449; DEVA (n=0)
MOJA (n=11): MOJA0159, MOJA0213, MOJA9584, MOJA9616, MOJA9627, MOJA9617, MOJA9636, MOJC0202, MOJC0205, MOJC1174, MOJC1222
MOJN-Johnson (n=27): MOJJE086, MOJJE091, MOJJE097, MOJJE116, MOJJE247, MOJJE250, MOJJE431, MOJJE530, MOJJE534, MOJJE536, MOJJE545, MOJJE553, MOJJE555, MOJJE557, MOJJE558, MOJJE634, MOJJE635, MOJJE649, MOJJE651, MOJJE652, MOJJE667, MOJJE689, MOJJE690, MOJJE702, MOJJE744, MOJJE892, MOJJE897
[MOJA-McAuliffe (n=24): MOJAA002, MOJAA003, MOJAA008, MOJAA009, MOJAA011, MOJAA015, MOJAA017, MOJAA027, MOJAA028, MOJAA047, MOJAA053, MOJAA054, MOJAA057, MOJAA058, MOJAA066, MOJAA067, MOJAA070, MOJAA071, MOJAA072, MOJAA073, MOJAA074, MOJAA075, MOJAA076, MOJAA078]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	33	33.3	0.1	0.01	0.5	–	–	–	–
Shrub	*Cylindropuntia acanthocarpa*	89	27	5.2	1	17	x	–	x	–
	Ephedra nevadensis	78	2.3	0.4	0.2	1	x	–	–	–
	Echinocereus engelmannii	78	1.4	0.3	0.2	0.5	x	–	–	–
	Ferocactus cylindraceus	67	9.4	1.9	0.5	5	x	–	–	–
	Yucca schidigera	67	1.8	0.3	0.01	1	–	–	–	x
	Krameria erecta	67	1.3	0.2	0.2	0.5	x	–	–	–
	Ambrosia dumosa	56	13.7	2.6	0.5	10	–	–	–	x
	Larrea tridentata	56	4.2	0.6	0.2	3	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Encelia farinosa*	44	4.4	0.7	0.2	4	–	–	–	x
	Viguiera parishii	44	2.3	0.4	0.2	3	–	–	–	x
	Opuntia basilaris	44	0.8	0.1	0.2	0.5	–	–	–	–
	Stephanomeria pauciflora	44	0.7	0.1	0.2	0.5	–	–	–	–
	Acacia greggii	44	0.4	0.1	0.01	0.5	–	–	–	–
	Eriogonum fasciculatum	33	1.7	0.4	0.5	3	–	–	–	–
	Ephedra viridis	33	1.9	0.2	0.2	0.5	–	–	–	–
	Opuntia polyacantha var. erinacea	33	0.6	0.1	0.2	0.5	–	–	–	–
Herb	*Pleuraphis rigida*	78	17.9	2.0	0.01	9	–	–	–	x
	Erodium cicutarium	67	7.7	0.7	0.2	3	–	–	–	x
	Bromus rubens	67	4.4	0.4	0.2	2	–	–	–	x
	Sphaeralcea ambigua	56	1.8	0.2	0.2	0.5	–	–	–	x
	Porophyllum gracile	56	1.9	0.1	0.2	0.5	–	–	–	x
	Amsinckia	56	1.2	0.1	0.2	0.2	–	–	–	–
	Eriogonum inflatum	56	1.5	0.1	0.2	0.2	–	–	–	x
	Gilia	44	4.0	0.3	0.6	1.2	–	–	–	–
	Mentzelia	44	2.4	0.2	0.4	0.8	–	–	–	–
	Muhlenbergia porteri	44	1.0	0.1	0.2	0.5	–	–	–	–
	Phacelia crenulata	44	1.0	0.1	0.2	0.2	–	–	–	–
	Schismus	33	3.6	0.3	0.2	2	–	–	–	–
	Chorizanthe brevicornu	33	2.9	0.3	0.2	2	–	–	–	–
	Astragalus nutans	33	3.5	0.3	0.2	1	–	–	–	–
	Plantago ovata	33	2.8	0.2	0.2	1	–	–	–	–
	Linanthus	33	1.4	0.1	0.4	0.4	–	–	–	–
	Adenophyllum porophylloides	33	1.3	0.1	0.2	0.5	–	–	–	–
	Dasyochloa pulchella	33	1.3	0.1	0.2	0.5	–	–	–	–
	Lepidium lasiocarpum	33	0.8	0.1	0.2	0.2	–	–	–	–
	Xylorhiza tortifolia	33	0.8	0.1	0.2	0.2	–	–	–	–
Non-vascular	Cryptogamic crust	33	33	0.8	0.2	7	–	–	–	–

Common Name: Death Valley Joint Fir Scrub
Group Assignment: G296; **Alliance Code:** A4157

Alliance Concept

The Death Valley Joint Fir Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically not present, and when present, is typically sparse. The herbaceous layer is sparse to open. The alliance is found on upland rocky slopes on various aspects. Soils are derived from a variety of substrates though often nutrient-poor including calcareous, granodiorite, and rhyolite/basalt, and textures are typically loamy sand or loam. Elevations range from approximately 900 to 1800 meters. The dominant and characteristic shrub is *Ephedra funerea* and those that are often present include *Ambrosia dumosa* and *Atriplex confertifolia.* Characteristic herbs include *Eriogonum inflatum* and those often present are *Bromus rubens, Sphaeralcea ambigua* and *Xylorhiza tortifolia.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ephedra funerea* dominant or co-dominant. The overall shrub cover ranges from 4 to 38 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA, and is represented by two plots in the Cinder Cones area of MOJA. It is occurs at mid to high elevations.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ephedra funerea [CEGL005750]	21	–	x	x	x
Ephedra funerea (alliance)	3	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1320.8 m, Range 915 – 1753 m
- Aspect: E (4), NW (1), SE (4), Flat, Variable (1), SW (4), W (2), S (3)
- Slope: Mean 13.9 degrees, Range 1 – 37 degrees

- Macro Topography: Channel bed (1), High level/summit (5), High slope (2), Low level/bottom (1), Lowslope (1), Midslope (1), Toeslope (alluvial fan/bajada) (1)
- Tree Cover: Mean 0%, Range 0 – 0.1%
- Shrub Cover: Mean 16.2%, Range 4.3 – 37.6%
- Herb Cover: Mean 3.1%, Range 0.2 – 10.2%
- Large Rock: Mean 26.5%, Range 0.4 – 53%
- Small Rock: Mean 56.1%, Range 40 – 94%
- Fines Cover: Mean 15.1%, Range 2 – 62.5%
- Litter Cover: Mean 2.7%, Range 0 – 10%
- Geology: alluvium (2), conglomerate (1), dolostone (dolomite) (3), granodiorite (3), rhyolite (5), sandstone (3)
- Soil Texture: Coarse loamy sand (2), Loam (2), Loamy sand (1), Sandy clay (1)

Environment: The alliance is found on upland rocky slopes at various aspects. Soils are derived from a variety of substrates though often nutrient-poor calcareous, granodiorite, and rhyolite/basalt substrates, and textures are often loamy sand or loam. The alliance occurred at mid to high elevation.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer with *Ephedra funerea* dominant or co-dominant, and the overall shrub cover ranges from 4 to 38 percent. The tree layer is typically not present, and the herb layer is sparse to open. Non-vascular plants are typically sparse, when present.

Vegetation Floristics: The dominant and characteristic shrub is *Ephedra funerea* and those that are often present include *Ambrosia dumosa* and *Atriplex confertifolia.* Characteristic herbs include *Eriogonum inflatum* and those often present are *Bromus rubens, Sphaeralcea ambigua* and *Xylorhiza tortifolia.*

Dynamics: *Ephedra funerea* typically occurs as a dominant along nutrient-poor slopes, including as calcareous and basalt slopes that are rugged and rocky. It can tolerate natural disturbance from rock-fall.

Classification Comments

This alliance is related to the Ephedra nevadensis - Lycium andersonii - Grayia spinosa Scrub Alliance and to other limestone adapted alliances with species such as Buddleja utahensis, Eriogonum heermanii, Mortonia utahensis, and Salvia funerea.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G3
State (California): S3

References

Keeler-Wolf and Thomas 2000, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=23

LAKE (n=0)

DEVA (n=17): DEVAD004, DEVAD005, DEVAD006, DEVAD046, DEVAD049, DEVAD056, DEVAR059, DEVAR061, DEVAR076, DEVAS057, DEVAS086, DEVAS152, DEVAS154, DEVAS171, MOJC0922, MOJC0923, MOJC0924

MOJA (n=2): MOJA9544, MOJA9545

MOJN-Johnson (n=4): MOJJE391, MOJJE393, MOJJE396, MOJJE770

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ephedra funerea*	100	33	4.9	1	15	x	–	x	–
	Ambrosia dumosa	55.6	9.9	1.4	0.1	13	–	–	–	x
	Atriplex confertifolia	55.6	4.6	0.6	0.1	5	–	–	–	x
	Lycium andersonii	44.4	3.9	0.5	0.11	5	–	–	–	–
	Eriogonum fasciculatum	44.4	1.9	0.1	0.1	0.5	–	–	–	–
	Larrea tridentata	38.9	3	0.6	0.1	5	–	–	–	–
	Hymenoclea salsola	38.9	1.1	0.3	0.1	5	–	–	–	–
	Krameria erecta	38.9	3.5	0.3	0.11	2	–	–	–	–
	Gutierrezia microcephala	33.3	1.7	0.2	0.1	2	–	–	–	–
	Echinocereus engelmannii	33.3	0.6	0.1	0.1	0.5	–	–	–	–
	Ericameria teretifolia	27.8	7.1	1.6	0.11	12	–	–	–	–
	Menodora spinescens	27.8	1.2	0.3	0.1	2	–	–	–	–
	Thamnosma montana	27.8	1	0.3	0.11	3	–	–	–	–
	Salazaria mexicana	27.8	0.8	0.1	0.2	0.5	–	–	–	–
Herb	*Eriogonum inflatum*	72.2	9.2	0.2	0.1	0.5	–	–	–	x
	Xylorhiza tortifolia	66.7	6.1	0.2	0.1	0.5	–	–	–	x
	Bromus rubens	55.6	14	0.3	0.1	3	–	–	–	x
	Sphaeralcea ambigua	50	5.2	0.1	0.1	0.5	–	–	–	x
	Achnatherum speciosum	38.9	6.7	0.3	0.2	2	–	–	–	–
	Erodium cicutarium	38.9	4	0.1	0.11	0.5	–	–	–	–

Common Name: Nevada Joint Fir – Desert-Thorn – Spiny Hop Sage Scrub
Group Assignment: G296; **Alliance Code:** A4245

Alliance Concept

The Nevada Joint Fir – Desert-Thorn – Spiny Hop Sage Scrub Alliance forms an open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is open. The alliance is found on a variety of slope positions at various aspects. Soils are typically shallow and derived from a variety of substrates including alluvium or rhyolite and textures range from clay loam to silt loam to loamy sand. Elevations range from approximately 800 to 1850 meters. Dominant and characteristic shrubs include *Ephedra nevadensis, Lycium andersonii, Lycium cooperi* or *Grayia spinosa* in the shrub layer, and other characteristic shrubs include *Lycium andersonii.* Shrubs that are often present include *Hymenoclea salsola. Bromus rubens* is a characteristic herb, and *Achnatherum speciosum* and *Sphaeralcea ambigua* are often present.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Ephedra nevadensis, Lycium andersonii, Lycium cooperi* or *Grayia spinosa* as the dominant or co-dominant. The overall shrub cover ranges from 2 to 28 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and MOJA. It is scattered throughout DEVA and MOJA in mid to upper elevations, but found only at Willow Beach in LAKE.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (19): 322Ab, 322Ac, 322Ad, 322Af, 322Ai, 322Aj, 322Al, 322Av; Southeastern Great Basin (15): 341Fa, , 341Fb, 341Fc, 341Fd, 341Fe, 341Ff, 341Fg

Park Sampling Zones: DEVA: CottonWood Mtns, Funeral Mtns, Grapevine Mtns, Green Water Range and Valley, Joshua Flat, Last Chance Range, Nevada Triangle, Nelson Range, Owlshead Mtns, Panamint Mtns, Saline Valley**; LAKE:** Willow Beach**; MOJA:** Cima Dome NW, Cinder Cones, Ivanpah Mtns, Lanfair Vlly, Mid Hills, Van Winkle Mtn, Vulcan Mine

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ephedra nevadensis - (Salazaria mexicana, Hymenoclea salsola) [CEGL005751]	10	–	x	x	x
Ephedra nevadensis - Ericameria cooperi [CEGL001253]	33	–	x	x	x
Ephedra nevadensis – Lycium andersonii – Grayia spinosa (alliance)	11	–	x	–	x
Ephedra nevadensis - Lycium andersonii [CEGL005752]	30	–	x	–	x

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Grayia spinosa - Larrea tridentata [CEGL001271]	5	–	x	x	x
Grayia spinosa - Lycium andersonii [CEGL001347]	26	–	x	x	x
Grayia spinosa - Lycium pallidum [CEGL001348]	1	–	x	–	–
Grayia spinosa / Picrothamnus desertorum [CEGL001345]	8	–	x	–	x
Grayia spinosa [CEGL002358]	6	–	x	–	x
Lycium andersonii [CEGL006857]	12	–	x	x	x
Lycium cooperi [CEPP006726]	2	x	–	x	–

Association Notes: Eleven samples were identified to the alliance level only. In two of these samples, *Ephedra* was not identified beyond the genus level, and in three samples **Ephedra nevadensis** was intermixed with various shrubs such as *Grayia spinosa, Lycium andersonii,* and *Thamnosma montana*. In two samples, *Lycium* was not identified beyond the genus level, and in two others *Lycium andersonii* was co-dominant with *Lycium pallidum* or *Ericameria cooperi*. In three others, *Grayia spinosa* was co-dominant with *Ambrosia dumosa* and graminoids.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1329 m, Range 816 – 1836 m
- Aspect: N (16), NE (20), E (16), NW (14), SE (11), SW (16), W (14), S (11), Flat, Variable (5)
- Slope: Mean 6.9 degrees, Range 0 – 29 degrees
- Macro Topography: Channel bed (1), High level/summit (2), High slope (7), Low level/bottom (7), Lowslope (6), Midslope (8), Step in slope (2), Toeslope (alluvial fan/bajada) (7)
- Tree Cover: Mean 0.1%, Range 0 – 1.5%
- Shrub Cover: Mean 14.7%, Range 2.2 – 28%
- Herb Cover: Mean 8.7%, Range 0.2 – 32%
- Large Rock: Mean 8.9%, Range 0 – 77.5%
- Small Rock: Mean 62.8%, Range 0 – 97.5%
- Fines Cover: Mean 18.5%, Range 0 – 94%
- Litter Cover: Mean 5.3%, Range 0 – 32%
- Geology: alluvium (24), gneiss (1), granodiorite (5), limestone (4), rhyolite (17), sandstone (9), shale (1) , dolostone (dolomite) (1), tephrite (basanite) (3)
- Soil Texture: Clay loam (4), Coarse loamy sand (2), Loam (5), Loamy sand (6), Medium sand (1), Medium silt loam (6), Moderately coarse sandy loam (1), Moderately fine sandy clay loam (3), Sandy clay (1), Sandy loam (16), Silt (1), Silt loam (1)

Environment: The alliance is found on a variety of slope positions at various aspects. Soils are typically shallow and derived from a variety of substrates including alluvium or rhyolite and textures range from clay loam to silt loam to loamy sand. The alliance occurrs at mid to high elevations.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer and the overall shrub cover ranges from 2 to 28 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Dominant and characteristic shrubs include *Ephedra nevadensis, Lycium andersonii, Lycium cooperi* or *Grayia spinosa* in the shrub layer, and other characteristic shrubs include *Lycium andersonii.* Shrubs that are often present include *Hymenoclea salsola. Bromus rubens* is a characteristic herb, and *Achnatherum speciosum* and *Sphaeralcea ambigua* are often present.

Dynamics: *S*tands are common and typically have high floristic diversity, and occur in a mosaic with other mid-elevation mixed desert scrub alliances of the Mojave Desert and southeastern Great Basin. *Ephedra nevadensis* stands appear to have shallower soils and rockier substrates. Stands with *Lycium* appear to have more disturbance and/or moisture from intermittent drainage flooding. *Grayia spinosa* stands appear to have deeper alluvial soils and they can tolerate disturbance.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G5

State (California): S3S4

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Klein and Evens 2005, NatureServe 2012, Peterson 1984, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013, Young et al. 1977, 2007

Surveys (with Sample Sizes) Used in Description

MOJN: N=144 [+7]
LAKE (n=1): LAKE9394
DEVA (n=55): DEVA0108, DEVA0353, DEVA0465, DEVA0575, DEVA0591, DEVA9210, DEVA9213, DEVA9229, DEVA9213, DEVA9254, DEVA9277, DEVA9327, DEVA9352, DEVA9441, DEVA9473, DEVA9576, DEVA9589, DEVA9590, DEVA9613, DEVA9905, DEVAR080, DEVAR083, DEVAR097, DEVAR108, DEVAR110, DEVAR111, DEVAR121, DEVAR133, DEVAR134, DEVAR149, DEVAR152, DEVAS039, DEVAS110, DEVAS126, DEVAS144, DEVAS149, DEVAS150, DEVAS193, DEVAS417, MOJC0176, MOJC0179, MOJC0262, MOJC0467, MOJC0471, MOJC0488, MOJC0497, MOJC0594, MOJC0597, MOJC0599, MOJC0600, MOJC0709, MOJC1004, MOJC1103

MOJA (n=11): MOJA0104, MOJA0394, MOJA0595, MOJA0596, MOJA0599, MOJA0921, MOJC0996, MOJA9329, MOJA9378, MOJA9502, MOJA9809
MOJN-Johnson (n=76): MOJJE012, MOJJE020, MOJJE062, MOJJE078, MOJJE089, MOJJE100, MOJJE101, MOJJE155, MOJJE240, MOJJE378, MOJJE384, MOJJE386, MOJJE388, MOJJE392, MOJJE531, MOJJE535, MOJJE538, MOJJE552, MOJJE556, MOJJE559, MOJJE611, MOJJE617, MOJJE625, MOJJE626, MOJJE627, MOJJE629, MOJJE637, MOJJE663, MOJJE666, MOJJE669, MOJJE675, MOJJE678, MOJJE679, MOJJE682, MOJJE683, MOJJE685, MOJJE687, MOJJE692, MOJJE693, MOJJE695, MOJJE698, MOJJE701, MOJJE706, MOJJE707, MOJJE708, MOJJE709, MOJJE710, MOJJE711, MOJJE712, MOJJE721, MOJJE725, MOJJE726, MOJJE740, MOJJE743, MOJJE745, MOJJE761, MOJJE764, MOJJE765, MOJJE767, MOJJE769, MOJJE819, MOJJE832, MOJJE834, MOJJE839, MOJJE840, MOJJE841, MOJJE859, MOJJE862, MOJJE863, MOJJE871, MOJJE874, MOJJE876, MOJJE877, MOJJE879, MOJJE916, MOJJE932
[CAMO (n=1): CAMO9129]
[MOJA-McAuliffe (n=6): MOJAA004, MOJAA005, MOJAA006, MOJAA007, MOJAA010, MOJAA046]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	SpeciesName	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	25	25	0.1	0.1	1.5	–	–	–	–
Shrub	*Lycium andersonii*	82	12	1.6	0.1	8	X	–	–	–
	Ephedra nevadensis	74	14	1.9	0.2	13	–	–	–	X
	Grayia spinosa	60	14	2.3	0.2	19	–	–	–	X
	Hymenoclea salsola	56	4.4	0.6	0.1	5	–	–	–	X
	Ericameria cooperi	44	6.1	0.9	0.1	8	–	–	–	–
	Krascheninnikovia lanata	41	2.8	0.4	0.1	6	–	–	–	–
	Eriogonum fasciculatum	40	2.3	0.4	0.1	4	–	–	–	–
	Larrea tridentata	38	5.2	0.8	0.01	11	–	–	–	–
	Coleogyne ramosissima	32	2.1	0.3	0.01	3	–	–	–	–
	Picrothamnus desertorum	28	2.5	0.4	0.1	5	–	–	–	–
	Ambrosia dumosa	26	1.9	0.3	0.2	4	–	–	–	–
	Tetradymia axillaris	26	1.6	0.3	0.1	5	–	–	–	–
	Thamnosma montana	26	1.1	0.1	0.1	3	–	–	–	–
	Psorothamnus arborescens	26	1	0.1	0.1	1	–	–	–	–
Herb	*Bromus rubens*	78	20	2.5	0.1	25	X	–	–	–
	Sphaeralcea ambigua	63	5.4	0.3	0.1	3	–	–	–	X
	Achnatherum speciosum	53	9.8	0.7	0.1	8	–	–	–	X
	Xylorhiza tortifolia	41	2.9	0.2	0.1	2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	SpeciesName	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Amsinckia*	40	1.4	0.1	0.1	2	–	–	–	–
	Eriogonum inflatum	35	4.9	0.2	0.1	3	–	–	–	–
	Oxytheca perfoliata	32	1.3	0.1	0.1	0.5	–	–	–	–

Common Name: Eastern Mojave Buckwheat–Parish's Goldeneye Scrub
Group Assignment: G296; **Alliance Code:** A3150

Alliance Concept

The Eastern Mojave Buckwheat–Parish's Goldeneye Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to continuous. The alliance is found on a variety of landforms from drainage channels to mid-elevation slopes to ridges at various aspects. Soils are derived from a variety of substrates including alkali-granite (alaskite), granodiorite, and rhyolite and textures vary greatly and include clay loam, sand, and silt loam. Elevations range from approximately 450 to 1900 meters. Dominant and characteristic shrubs include *Eriogonum fasciculatum* and/or *Viguiera parishii,* and those that are often present include *Ephedra nevadensis* and *Stephanomeria pauciflora. Achnatherum speciosum, Bromus rubens,* and *Sphaeralcea ambigua* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Eriogonum fasciculatum* and/or *Viguiera parishii* dominant or co-dominant. If *Yucca schidigera* is present, then its cover is less than two times (2x) the (combined) cover of the diagnostic shrub(s) of this alliance. The overall shrub cover ranges from 4 to 55 percent.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout the parks in low to high elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (96): 322Ac, 322Ad, 322Ae, 322Af, 322Aj, 322Ak, 322Al, 322Am, 322At, 322Av, 322Ay, 322Az; Southeastern Great Basin (19): 341Fa, 341Fb, 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Funeral Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Last Chance Range, Nelson Range, Owlshead Mtns, Panamint Mtns, Saline Valley**; LAKE:** Boulder City, Bridge Canyon, Cottonwood Cove, Gold Butte, Juniper Mine, Katherine, Pearce Ferry, Temple Bar, Willow Beach**; MOJA:** Cinder Cones, Clipper Vlly, Fenner Vlly, Granite Mtns, HackberryVontrigger, Ivanpah Mtns, Kelso-Cima, Lanfair Vlly, Marl Mtns, Mid Hills, New York Mtns, Piute Range, Providence Mtns, Signal Hill, Van Winkle Mtn, West of Juniper Mine, Woods Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Eriogonum fasciculatum (wash) [CEPP006706]	8	–	x	x	x
Eriogonum fasciculatum rock outcrop [CEGL001260]	36	x	x	x	x

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Eriogonum fasciculatum–Ericameria (laricifolia, linearifolia) [CEPP006705]	35	–	x	x	x
Viguiera parishii [CEGL002721]	15	x	–	x	x
Viguiera parishii–Eriogonum fasciculatum [CEGL005775]	42	x	–	x	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1157.9 m, Range 498 – 1889 m
- Aspect: N (24), NE (13), E (20), NW (13), SE (16), SW (22), W (8), S (12)
- Slope: Mean 17.6 degrees, Range 0 – 40 degrees
- Macro Topography: Channel bed (3), High level/summit (6), High slope (21), Low level/bottom (1), Lowslope (9), Midslope (31), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 0.1%, Range 0 – 3.4%
- Shrub Cover: Mean 17.1%, Range 4.3 – 55.4%
- Herb Cover: Mean 8.9%, Range 0 – 89.8%
- Large Rock: Mean 25.5%, Range 0 – 90%
- Small Rock: Mean 61.6%, Range 0 – 97.5%
- Fines Cover: Mean 7.3%, Range 0 – 50%
- Litter Cover: Mean 2.3%, Range 0 – 11%
- Geology: alkali-granite (alaskite) (22), alluvium (13), basalt (4), conglomerate (1) dacite (1), gneiss (11), granite (5), granodiorite (16), rhyolite (25), sandstone (14), schist (1), shale (1)
- Soil Texture: Clay (1), Clay loam (13), Coarse loamy sand (1), Coarse sand (1), Fine sand (1), Fine silty clay (1), Loam (1), Loamy sand (13), Medium sand (7), Medium to very fine sandy loam (2), Moderately coarse loamy sand (2), Moderately fine sandy clay loam (1), Moderately fine silty clay loam (4), Sand (4), Sandy clay (5), Sandy loam (19), Silt loam (1), Silty clay (1)

Environment: The alliance is found on a variety of landforms from drainage channels to mid-elevation slopes to ridges at various aspects. Soils are derived from a variety of substrates including alkali-granite (alaskite), granodiorite, and rhyolite and textures vary greatly and include clay loam, sand, and silt loam. Elevations range from low to high.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 4 to 55 percent. The tree layer is typically sparse to open, and the herb layer is sparse to continuous. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Eriogonum fasciculatum* and/or *Viguiera parishii* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Ephedra nevadensis* and *Stephanomeria pauciflora. Achnatherum speciosum, Bromus rubens,* and *Sphaeralcea ambigua* are often present in the herbaceous layer.

Dynamics: *Eriogonum fasciculatum* occurs commonly in mid-elevations of the Mojave Desert and in the Colorado and Sonoran deserts with a suite of desert species, including *Ambrosia dumosa, Ericameria* spp., *Viguiera parishii,* and *Yucca schidigera*. *Eriogonum fasciculatum* has broad ecological tolerances as a species with multiple subspecies recognized that occur in different ecoregions from the Central and South Coast of California to the Colorado, Sonoran, and Mojave deserts.

Classification Comments

This alliance was previously named as *Viguiera parishii* Shrubland Alliance (cf. Thomas et al. 2004, Keeler-Wolf et al. 2005). With further data collection and analysis in the region, we have redefined the alliance to include stands that have *Eriogonum fasciculatum* and/or *Viguiera parishii* dominant or co-dominant. *E. fasciculatum* also occurs with a variety of drought-deciduous shrubs in coastal scrub in southwestern to central California, in which a different alliance is defined based on its varied floristics and environmental settings. Stand of this alliance are often found intermixed with other semi-desert alliances in the Mojave Mid-elevation Mixed Desert Scrub Group (G296).

Additionally, the revised USNVC hierachy previously had placed semi-desert stands with *Eriogonum fasciculatum* and/or *Viguiera parishii* dominant within two groups: Sonoran Paloverde – Mixed Cacti Desert Scrub (G293) and Mojave Mid-Elevation Mixed Desert Scrub (G296). For this Mojave Desert Network classification, we have placed all of the related associations within one group (G296) and one alliance, since they are typically found at mid to upper elevations with other alliances.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S4

References

Evens and San 2005, Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, NatureServe 2012, cf. Sawyer et al. 2009, Thomas et al. 2004, cf. VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=134
LAKE (n=40): LAKE0115, LAKE0121, LAKE0229, LAKE0272, LAKE0398, LAKE0432, LAKE0521, LAKE0529, LAKE9246, LAKE9259, LAKE9282, LAKE9327, LAKE9343, LAKE9345, LAKE9374, LAKE9517, LAKE9519, LAKE9523, LAKE9532, LAMEN042, LAMEN043, LAMEN044, LAMEN045, LAMEN049, LAMEN050, LAMEN062, LAMEN064, LAMEN077, LAMEN078, LAMEN091, LAMEN092, LAMEN093, LAMEN101, LAMEN105, LAMEN106, LAMEN107, LMJOA049, LMJOA050, LMJOA051, LMJOA055

DEVA (n=29): DEVA0102, DEVA0342, DEVA0474, DEVA9107, DEVA9198, DEVA9218, DEVA9268, DEVA9296, DEVA9302, DEVA9305, DEVA9363, DEVA9404, DEVA9464, DEVA9475, DEVA9476, DEVA9482, DEVA9487, DEVA9489, DEVA9490, DEVA9523, DEVA9638, DEVA9645, DEVA9911, DEVA9923, DEVAS042, DEVAS094, DEVAS134, MOJC0634, MOJC0708
MOJA (n=45): MOJA0311, MOJA0571, MOJA0696, MOJA9180, MOJA9210, MOJA9211, MOJA9212, MOJA9283, MOJA9290, MOJA9319, MOJA9320, MOJA9367, MOJA9380, MOJA9391, MOJA9404, MOJA9427, MOJA9451, MOJA9535, MOJA9635, MOJA9637, MOJA9675, MOJA9687, MOJA9688, MOJA9902, MOJA9913, MOJAE081, MOJAE084, MOJAE085, MOJAE086, MOJAE087, MOJAE088, MOJAE093, MOJAE205, MOJAN002, MOJC0095, MOJC0190, MOJC0206, MOJC0208, MOJC0214, MOJC0215, MOJC0242, MOJC0252, MOJC0267, MOJC1175, MOJC1221
MOJN-Johnson (n=22): MOJJE030, MOJJE042, MOJJE048, MOJJE056, MOJJE096, MOJJE106, MOJJE109, MOJJE113, MOJJE117, MOJJE120, MOJJE140, MOJJE176, MOJJE249, MOJJE297, MOJJE414, MOJJE423, MOJJE533, MOJJE568, MOJJE603, MOJJE736, MOJJE882, MOJJE895

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Eriogonum fasciculatum*	99.1	26	3.4	0.2	10	x	–	–	–
	Viguiera parishii	59.1	11	1.6	0.12	10	–	–	–	x
	Ephedra nevadensis	56.5	4.3	0.6	0.04	5	–	–	–	x
	Stephanomeria pauciflora	52.2	1.4	0.2	0.04	1.1	–	–	–	x
	Larrea tridentata	48.7	4	0.5	0.2	4	–	–	–	–
	Yucca schidigera	46.1	2.7	0.4	0.1	4.2	–	–	–	–
	Ambrosia dumosa	44.3	4.5	0.6	0.2	5	–	–	–	–
	Acacia greggii	44.3	3	0.5	0.2	4.6	–	–	–	–
	Cylindropuntia acanthocarpa	40.9	2.5	0.4	0.01	4.5	–	–	–	–
	Krameria erecta	38.3	1.2	0.2	0.07	2	–	–	–	–
	Ferocactus cylindraceus	36.5	1.4	0.2	0.01	3	–	–	–	–
	Ephedra viridis	31.3	2.6	0.3	0.11	3	–	–	–	–
	Opuntia basilaris	31.3	0.5	0.1	0.01	0.5	–	–	–	–
	Salazaria mexicana	30.4	1.8	0.3	0.08	13	–	–	–	–
	Echinocereus engelmannii	29.6	0.5	0.1	0.12	0.5	–	–	–	–
	Ericameria laricifolia	27	5.1	0.6	0.02	5	–	–	–	–
	Thamnosma montana	25.2	0.6	0.1	0.11	1	–	–	–	–
Herb	*Bromus rubens*	60	18	1.6	0.11	15	–	–	–	x
	Sphaeralcea ambigua	58.3	3.6	0.2	0.02	2	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Achnatherum speciosum*	54.8	8.4	0.4	0.01	6	–	–	–	x
	Erodium cicutarium	48.7	4.3	0.3	0.2	4	–	–	–	–
	Amsinckia	41.7	4.7	0.6	0.11	20	–	–	–	–
	Mirabilis laevis	34.8	3.6	0.1	0.02	1	–	–	–	–
	Xylorhiza tortifolia	33.9	2.6	0.1	0.03	2	–	–	–	–
	Eriogonum inflatum	31.3	1.6	0.1	0.03	1	–	–	–	–
	Pleuraphis rigida	27.8	4.8	0.5	0.04	12	–	–	–	–
	Cryptantha	27	3.3	0.2	0.33	3	–	–	–	–
	Gilia	26.1	3.1	0.2	0.33	3	–	–	–	–
	Porophyllum gracile	26.1	6.2	0	0.01	0.5	–	–	–	–
Non-vasc	Unknown Lichen	40.9	33	0.4	0.4	6	–	–	–	–
	Cryptogamic crust	25.2	16	0.2	0.2	5	–	–	–	–

Common Name: Wright's Buckwheat – Heermann's Buckwheat – Utah Butterfly-bush Scrub
Group Assignment: G296; **Alliance Code:** A4167

Alliance Concept

The Wright's Buckwheat – Heermann's Buckwheat – Utah Butterfly-bush Scrub Shrubland Alliance forms an open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on slopes at a variety of aspects. Soils are derived from a variety of substrates including alluvium, conglomerate, granodiorite, limestone, sandstone, rhyolite, and shale and textures include clay loam, loamy sand, sandy loam, and silty clay. Elevations range from approximately 968 to 1896 meters. One or more shrub species is dominant or characteristic including *Buddleja utahensis, Eriogonum heermannii, Eriogonum wrightii* or *Hecastocleis shockleyi*. Other characteristic shrubs include *Eriogonum fasciculatum.* Herbs that are often present include *Achnatherum speciosum* and *Bromus rubens,* and those sometimes present include *Achnatherum hymenoides*, *Aristida purpurea, Castilleja* spp., *Cryptantha* spp., *Gilia* spp., and *Sphaeralcea ambigua.* Commonly associated non-vascular plants are cryptogamic crust and unknown moss.

Diagnostic Criteria: This alliance has an open shrub layer characterized by a variable component of shrubs including *Buddleja utahensis, Eriogonum heermannii, Eriogonum wrightii, Hecastocleis shockleyi,* and *Eriogonum fasciculatum*. The overall shrub cover ranges from 3 to 16 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at DEVA, and rarely sampled at LAKE and MOJA. It is found scattered throughout the parks in mid to upper elevations.

States: AZ, CA

Ecoregion Sections and Subsection Codes: Mojave Desert (2), Southeastern Great Basin (18): 322Al, 322Av, 341Fc, 341Fd, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Joshua Flat, Last Chance Range, Panamint Mtns**; LAKE:** Willow Beach**; MOJA:** New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
(Buddleja utahensis–Eriogonum heermannii)–Gutierrezia spp. limestone [CEPP005784]	11	–	x	–	–
Eriogonum heermannii [CEPP006707]	1	x	–	–	–
Eriogonum wrightii ssp. wrightii [CEPP006708]	2	–	–	x	x
Hecastocleis shockleyi	6	–	x	–	–

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1429.3 m, Range 968 – 1896 m
- Aspect: N (2), NE (4), NE (1), E (4), NW (5), SE (2), SW (1), W (1)
- Slope: Mean 32.7 degrees, Range 11 – 65 degrees
- Macro Topography: Channel wall (1), High level/summit (2), High slope (4), Lowslope (3), Midslope (9)
- Tree Cover: Mean 0.1%, Range 0 – 0.1%
- Shrub Cover: Mean 10.7%, Range 3 – 16.4%
- Herb Cover: Mean 3.0%, Range 0 – 15%
- Large Rock: Mean 58.5%, Range 6 – 98%
- Small Rock: Mean 35.3%, Range 0.2 – 89%
- Fines Cover: Mean 2.9%, Range 0.2 – 9%
- Litter Cover: Mean 2.7%, Range 0.2 – 8%
- Geology: alluvium (3), conglomerate (1), granodiorite (2), limestone (3), rhyolite (1), sandstone (7), shale (2)
- Soil Texture: Clay loam (3), Loamy sand (4), Sandy clay (1), Sandy loam (5), Silty clay (2)

Environment: Stands are found scattered in the region, often on nutrient-poor rocky substrates.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer, and the overall shrub cover ranges from 3 to 13 percent cover. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: One or more shrub species is dominant or characteristic including *Buddleja utahensis, Eriogonum heermannii, Eriogonum wrightii* or *Hecastocleis shockleyi*. Other characteristic shrubs include *Eriogonum fasciculatum.* Herbs that are often present include *Achnatherum speciosum* and *Bromus rubens,* and those sometimes present include *Achnatherum hymenoides*, *Aristida purpurea, Castilleja* spp., *Cryptantha* spp., *Gilia* spp., and *Sphaeralcea ambigua.* Commonly associated non-vascular plants are cryptogamic crust and unknown moss.

Dynamics: Stands are localized in the three parks, typically on nutrient-poor or on highly alkaline, calcareous soils such as dolostone and limestone, and they are often along steep slopes and ridges with colluvial disturbance. Plants that occur in this alliance are calcicoles, which are plants that tolerate soil with a high calcium carbonate content; or they may occur on other substrates that are nutrient-poor, making it difficult for plant growth.

Classification Comments

Stands with *Hecastocleis shockleyi* dominant or characteristically present are rare in DEVA, and they are related floristically and environmentally to those rare stands of *Eriogonum heermannii* and *Buddleja utahensis.* Other stands with *Eriogonum wrightii* dominant also are rare in MOJA, and often include rare plant species.

Classification Confidence: Moderate

Conservation Status Rank

Global: G3

State (California): S3

References

Buck-Diaz et al. 2012, Sawyer et al. 2009, Thomas et al. 2004, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used for Description

MOJN: N=20

LAKE (n=1): LAKE9443

DEVA (n=17): DEVA0442, DEVA0157, DEVA9131, DEVA9437, DEVA9438, DEVA9454, DEVA9468, DEVA9481, DEVA9554, DEVA9587, DEVA9588, DEVA9651, DEVA9670, DEVA9903, DEVAS196, DEVAS232, DEVAS234

MOJA (n=1): MOJA9424

MOJN-Johnson (n=1): MOJJE442

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Eriogonum fasciculatum*	78.9	6.1	0.6	0.11	3	X	–	–	–
	Hecastocleis shockleyi	47.4	9.9	1.2	0.11	6	–	–	–	–
	Gutierrezia sarothrae	47.4	9.7	1	0.2	4	–	–	–	–
	Buddleja utahensis	47.4	8.8	0.8	0.11	4	–	–	–	–
	Eriogonum heermannii	47.4	5.6	0.5	0.11	5	–	–	–	–
	Prunus fasciculata	47.4	2.3	0.1	0.11	1	–	–	–	–
	Atriplex confertifolia	47.4	1.3	0.1	0.11	1	–	–	–	–
	Scopulophila rixfordii	42.1	1	0.1	0.11	0.2	–	–	–	–
	Gutierrezia microcephala	36.8	7	0.6	0.11	3	–	–	–	–
	Ephedra nevadensis	36.8	3.7	0.4	0.2	2	–	–	–	–
	Ephedra viridis	36.8	2.7	0.3	0.11	2	–	–	–	–
	Lepidium fremontii	36.8	0.8	0.1	0.11	0.2	–	–	–	–
	Tetradymia axillaris	31.6	5.8	0.7	0.11	7	–	–	–	–
	Krascheninnikovia lanata	31.6	2.2	0.2	0.2	2	–	–	–	–
	Echinocactus polycephalus	31.6	1.7	0.1	0.11	1	–	–	–	–
	Brickellia microphylla	31.6	1.2	0.1	0.2	0.5	–	–	–	–
	Galium stellatum	26.3	0.7	0.1	0.2	0.5	–	–	–	–
	Echinocereus engelmannii	26.3	0.5	0	0.11	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Bromus rubens*	68.4	20	1.4	0.11	10	–	–	–	X
	Achnatherum speciosum	68.4	9.7	0.3	0.11	2	–	–	–	X
	Aristida purpurea	42.1	6.8	0.2	0.11	1	–	–	–	–
	Sphaeralcea ambigua	42.1	2.1	0.1	0.11	0.2	–	–	–	–
	Castilleja	36.8	2.3	0.1	0.11	0.2	–	–	–	–
	Gilia	31.6	4.2	0.2	0.33	1.2	–	–	–	–
	Achnatherum hymenoides	31.6	3.7	0.1	0.11	0.2	–	–	–	–
	Cryptantha	26.3	6.3	0.2	0.33	1.5	–	–	–	–
Non-vasc	Cryptogamic crust	57.9	31	0.6	0.2	4	–	–	–	X
	Unknown Moss	57.9	18	0.4	0.2	2	–	–	–	X
	Unknown Lichen	47.4	30	0.6	0.4	4	–	–	–	–

Common Name: California Juniper Mojave Scrub
Group Assignment: G296; **Alliance Code:** A0502

Alliance Concept

The California Juniper Mojave Scrub Alliance forms a sparse to open tree canopy with an open shrub understory. It is found from bottoms to summits and at all aspects. Soils are derived from a variety of substrates and textures range from sand to sandy loam and are often very shallow. Elevations range from approximately 900 to 1600 meters. The dominant tree is *Juniperus californica*. Commonly associated shrubs include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Ephedra nevadensis, Eriogonum fasciculatum, Yucca schidigera, Coleogyne ramosissima, Ferocactus cylindraceus,* and *Krameria erecta.* Commonly associated herbs include *Achnatherum speciosum* and *Porophyllum gracile.*

Diagnostic Criteria: This alliance is characterized by sparse to open tree canopy dominated by *Juniperus californica,* which ranges from 2 to 8 percent cover. The overall tree cover ranges from 2 to 8 percent cover.

Alliance Distribution

The alliance is found at mid to upper elevations in MOJA in the Granite, New York and Castle Mountains and in LAKE in the Newberry Mountains.

States: CA, NV

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

Park Sampling Zones: LAKE: Juniper Mine, Katherine, Spirit Mountain**; MOJA:** New York Mtns, Van Winkle Mtn

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Juniperus californica / Coleogyne ramosissima [CEPP006713]	4	x	–	x	–
Juniperus californica / Nolina bigelovii [CEPP006714]	3	x	–	–	–
Juniperus californica / Yucca schidigera / Pleuraphis rigida [CEPP006715]	3	x	–	x	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1241.9 m, Range 894 – 1575 m

- Aspect: N (2), NE (2), E (2), NW (1), SE (2), W (1)
- Slope: Mean 15.4 degrees, Range 3 – 30 degrees
- Macro Topography: High level/summit (1), Low level/bottom (1), Midslope (1)
- Tree Cover: Mean 4.7%, Range 1.85 – 8.3%
- Shrub Cover: Mean 19%, Range 12.5 – 28.4%
- Herb Cover: Mean 6.9%, Range 3 – 13%
- Large Rock: Mean 18.3%, Range 0 – 75%
- Small Rock: Mean 71.5%, Range 40 – 90%
- Fines Cover: Mean 3.2%, Range 0 – 10%
- Litter Cover: Mean 3.6%, Range 0.2 – 6.2%
- Geology: alkali-granite (alaskite) (7), alluvium (1), gneiss (1), rhyolite (1)
- Soil Texture: Coarse loamy sand (2), Sand (1), Sandy loam (2)

Environment: The alliance is found at mid to upper elevations often in washes with shallow soils with exposed bedrock. It is found on bottoms, midslopes, and summits at most aspects. Soils range from sand to sandy loam typically derived from alkali-granite but also alluvium, gneiss and rhyolite.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to open tree layer with a sparse to open shrub layer and sparse or open herbaceous understory.

Vegetation Floristics: The dominant tree is *Juniperus californica* in the overstory. Shrubs that are characteristic or often present include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Ephedra nevadensis, Eriogonum fasciculatum, Yucca schidigera*, *Coleogyne ramosissima, Ferocactus cylindraceus,*and *Krameria erecta.* Herbs that are characteristic or often present include *Achnatherum speciosum* and *Porophyllum gracile*.

Dynamics: *Juniperus californica* is dominant or co-dominant with *Pinus monophylla*. Stands may be open-grown trees with grassy understories or form a mixed canopy with other trees and shrubs.

Juniperus osteosperma woodland alliance occupies areas east of the distribution of *J. californica*. Overlap of the two alliances does occur and the identification of the two species can be difficult. Many stands of *Juniperus californica* are at risk of stand replacing fires due to the increased build-up of fine fuels from non-native annual grasses. *J. californica* stands were once extensive in Antelope Valley and the San Gabriel Mountains but have been lost or degraded due to increased fire and clearing for agriculture and urban development.

Classification Comments

Some associations in California with *Juniperus californica* dominant in the overstory have been placed in G198 California Conifer Forest & Woodland of the USNVC hierarchy, while other associations have been placed in G296 Mojave Mid-Elevation Mixed Desert Scrub Group. Further review is needed to determine if these stands should be combined in one group or if some associations should be reclassified to other alliances (based on the dominant plants in their respective

shrub layers); we currently have placed associations with *Juniperus californica* sampled in the Mojave Desert within this alliance in the G296 group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S4

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 1998, Keeler-Wolf et al. 2005, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=10

LAKE (n=7): LAKE0516, LAKE0613, LAMEN074, LAMEN079, LAMEN089, LAMEN097, LAMEN098

DEVA (n=0); MOJA (n=3): MOJA9909, MOJC1095, MOJC1150; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Juniperus californica*	100	92	4.3	1.9	7.6	x	x	–	–
	Pinus monophylla	30	4.1	0.2	0.5	1	–	–	–	–
Shrub	*Eriogonum fasciculatum*	100	18	2.7	0.5	6.3	x	–	–	–
	Yucca schidigera	80	7.5	1.4	0.2	3.1	x	–	–	–
	Cylindropuntia acanthocarpa	80	4.1	0.9	0.03	5	x	–	–	–
	Ephedra nevadensis	80	4	0.6	0.07	2.4	x	–	–	–
	Echinocereus engelmannii	80	1.3	0.2	0.03	0.5	x	–	–	–
	Coleogyne ramosissima	60	18	2.9	0.1	8.2	–	–	–	x
	Krameria erecta	50	2	0.3	0.2	1.2	–	–	–	x
	Ferocactus cylindraceus	50	0.9	0.2	0.1	0.6	–	–	–	x
	Nolina bigelovii	40	5.6	0.8	0.6	2.8	–	–	–	–
	Larrea tridentata	40	3.2	0.7	0.1	5	–	–	–	–
	Acacia greggii	40	1.1	0.2	0.2	1	–	–	–	–
	Opuntia polyacantha var. erinacea	40	1.5	0.2	0.4	0.7	–	–	–	–
	Gutierrezia sarothrae	40	1.3	0.2	0.03	1	–	–	–	–
	Thamnosma montana	40	0.7	0.1	0.2	0.6	–	–	–	–
	Stephanomeria pauciflora	40	0.7	0.1	0.01	0.5	–	–	–	–
	Lotus rigidus	40	0.2	0	0.01	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Quercus turbinella*	30	4	0.7	0.9	4.9	–	–	–	–
	Ericameria linearifolia	30	2.4	0.4	0.5	2.01	–	–	–	–
	Viguiera parishii	30	2	0.3	1	1.3	–	–	–	–
	Opuntia basilaris	30	0.3	0.1	0.2	0.2	–	–	–	–
Herb	*Achnatherum speciosum*	80	27	0.3	0.2	0.5	x	–	–	–
	Porophyllum gracile	50	12	0.1	0.03	0.5	–	–	–	x
	Bromus rubens	40	5.1	0.4	0.2	3	–	–	–	–
	Pleuraphis rigida	40	5.3	0.4	0.03	3	–	–	–	–
	Amsinckia	30	1.8	0.1	0.2	1	–	–	–	–
	Pectocarya recurvata	30	1.8	0.1	0.2	1	–	–	–	–
	Sphaeralcea ambigua	30	1.2	0.1	0.2	0.5	–	–	–	–
	Chorizanthe brevicornu	30	0.8	0.1	0.2	0.2	–	–	–	–
	Erodium cicutarium	30	0.8	0.1	0.2	0.2	–	–	–	–
	Mirabilis laevis	30	1	0	0.04	0.2	–	–	–	–
Non-vascular	Standing snag	50	50	0.3	0.3	0.9	–	–	–	x
	Cryptogamic crust	30	23	0.1	0.2	0.2	–	–	–	–

Common Name: Spiny Menodora Scrub
Group Assignment: G296; **Alliance Code:** A2515

Alliance Concept

The Spiny Menodora Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on alluvial deposits and terraces at various aspects. Soils are derived from a variety of substrates including alluvium, rhyolite, sandstone and limestone, and textures include clay loam, sand and silty clay. Elevations range from approximately 1050 to 1950 meters. *Menodora spinescens* is dominant or co-dominant in the shrub canopy. Other characteristic shrubs include *Lycium andersonii,* and those that are often present include *Atriplex confertifolia, Ephedra nevadensis, Grayia spinosa, Hymenoclea salsola* and *Krascheninnikovia lanata. Bromus rubens* and *Sphaeralcea ambigua* are often present.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Menodora spinescens* dominant or co-dominant. The overall shrub cover ranges from 7 to 45 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA. The alliance is scattered throughout the park at mid to high elevation. The alliance also occurs in DEVA, but we have no samples with location information from that park.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (21): 322Ac, 322Ad; Southeastern Great Basin (27): 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

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Menodora spinescens (alliance)	5	–	x	–	–
Menodora spinescens–(Ephedra nevadensis) [CEGL002767]	60	–	x	–	x
Menodora spinescens–Atriplex confertifolia [CEGL005769]	11	–	x	–	–

Association Notes: One sample was classified to the alliance level only in which *Thamnosma montana, Bromus rubens, Psorothamnus* sp. and *Ambrosia dumosa* all have more cover than or equivalent cover to *Menodora spinescens.*

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1414.6 m, Range 1067 – 1902 m
- Aspect: N (10), NE (11), E (8), NW (6), SE (9), Flat, Variable (1), SW (3), W (10), S (9)
- Slope: Mean 6.8 degrees, Range 0 – 23 degrees
- Macro Topography: Channel bed (1), Entire slope (1), High level/summit (7), High slope (5), Lowslope (6), Midslope (12), Toeslope (alluvial fan/bajada) (4)
- Tree Cover: Mean 0%, Range 0 – 0.5%
- Shrub Cover: Mean 17.7%, Range 7.4 – 44.8%
- Herb Cover: Mean 6.0%, Range 0 – 25.2%
- Large Rock: Mean 3.5%, Range 0 – 62.7%
- Small Rock: Mean 74.8%, Range 0 – 97%
- Fines Cover: Mean 12.2%, Range 0 – 76%
- Litter Cover: Mean 5.1%, Range 0 – 25%
- Geology: alluvium (24), conglomerate (2), granodiorite (2), limestone (1), quartz monzonite (1), rhyolite (8), sandstone with dolostone (dolomite) (9)
- Soil Texture: Clay loam (8), Coarse sand (1), Fine sand (3), Fine silty clay (1), Loam (4), Loamy sand (9), Sand (4), Sandy loam (4), Silty clay (1)

Environment: The alliance is found primarily on alluvial deposits and terraces at various aspects. Soils are derived from a variety of substrates including alluvium, rhyolite, and sandstone and textures include clay loam, sand, and silty clay. Elevations range from approximately 1,050 to 1,950 meters.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 7 to 45 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Menodora spinescens* is dominant or co-dominant in the shrub canopy. Other characteristic shrubs include *Lycium andersonii,* and those that are often present include *Atriplex confertifolia, Ephedra nevadensis, Grayia spinosa, Hymenoclea salsola* and *Krascheninnikovia lanata. Bromus rubens* and *Sphaeralcea ambigua* are often present.

Dynamics: *Menodora spinescens* stands are common on nutrient-poor volcanic and sedimentary substrates. They typically have high floristic diversity, and occur in a mosaic with other mid-elevation mixed desert scrub alliances of the of the Mojave Desert and southeastern Great Basin including *Ephedra nevadensis, Lycium* (*cooperi, andersonii*) and *Grayia spinosa* alliances.

Classification Comments

This alliance is similar to the *Ephedra nevadensis - Lycium andersonii - Grayia spinosa* Scrub Alliance, as the taxa in this alliance are often found in this *Menodora* alliance.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S3

References

Keeler-Wolf and Thomas 2000, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=76

LAKE (n=0)

DEVA (n=50): DEVA0140, DEVA0205, DEVA0389, DEVA0508, DEVA0577, DEVA0586, DEVA0611, DEVA0912, DEVA9196, DEVA9199, DEVA9250, DEVA9262, DEVA9335, DEVA9343, DEVA9345, DEVA9346, DEVA9372, DEVA9398, DEVA9507, DEVA9510, DEVA9521, DEVA9522, DEVA9549, DEVA9578, DEVA9585, DEVA9659, DEVA9824, DEVAD156, DEVAR033, DEVAR096, DEVAR119, DEVAR143, DEVAS068, DEVAS082, DEVAS098, DEVAS100, DEVAS111, DEVAS112, DEVAS122, DEVAS161, DEVAS233, MOJC0043, MOJC0173, MOJC0174, MOJC0335, MOJC0337, MOJC0835, MOJC0836, 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

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Menodora spinescens*	100	37	6.4	1	23	x	–	x	–
	Lycium andersonii	81.6	5.8	0.9	0.11	5	x	–	–	–
	Ephedra nevadensis	69.4	7.4	1.2	0.11	5	–	–	–	x
	Hymenoclea salsola	59.2	3.1	0.6	0.11	5	–	–	–	x
	Grayia spinosa	51	3.7	0.7	0.11	7	–	–	–	x
	Atriplex confertifolia	51	5.5	0.7	0.11	6	–	–	–	x
	Krascheninnikovia lanata	51	1.5	0.3	0.1	2	–	–	–	x
	Ericameria cooperi	46.9	3.8	0.8	0.11	8	–	–	–	–
	Larrea tridentata	36.7	4.2	0.6	0.11	4	–	–	–	–
	Eriogonum fasciculatum	32.7	2.7	0.5	0.2	5	–	–	–	–
	Psorothamnus arborescens	32.7	1.5	0.2	0.2	2	–	–	–	–
	Tetradymia axillaris	30.6	1.2	0.2	0.1	4	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Picrothamnus desertorum*	26.5	1.1	0.2	0.11	3	–	–	–	–
	Thamnosma montana	26.5	1	0.2	0.11	4	–	–	–	–
Herb	*Sphaeralcea ambigua*	67.3	7.8	0.2	0.11	2	–	–	–	x
	Bromus rubens	63.3	18	1.6	0.2	18	–	–	–	x
	Achnatherum speciosum	49	7.2	0.3	0.11	2	–	–	–	–
	Eriogonum inflatum	49	4.3	0.1	0.11	0.5	–	–	–	–
	Xylorhiza tortifolia	44.9	4.1	0.1	0.11	1	–	–	–	–
	Oxytheca perfoliata	38.8	3	0.1	0.11	1	–	–	–	–
	Amsinckia	36.7	3.8	0.2	0.11	3	–	–	–	–
	Gilia	34.7	3.5	0.2	0.33	1.5	–	–	–	–
	Eriogonum nidularium	34.7	1.5	0.1	0.11	0.5	–	–	–	–
	Chaenactis	30.6	3.4	0.4	0.22	14	–	–	–	–
	Phacelia vallis-mortae	30.6	1.5	0.1	0.2	1	–	–	–	–
	Cryptantha	26.5	3.3	0.3	0.33	6	–	–	–	–
	Achnatherum hymenoides	26.5	2.1	0.1	0.11	0.5	–	–	–	–
	Astragalus	26.5	2.1	0.1	0.11	0.5	–	–	–	–

Common Name: Utah Mortonia Scrub
Group Assignment: G296; **Alliance Code:** A4158

Alliance Concept

The Utah Mortonia Scrub Alliance forms an open shrub layer. The emergent tree layer is typically sparse, and the herbaceous layer is open. The alliance is found primarily on skeletal rocky slopes of various aspects. Soils are typically calcareous, and textures include clay loam, silty clay loam, and sandy loam. Elevations range from approximately 900 to 1700 meters. *Mortonia utahensis* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Echinocactus polycephalus, Echinocereus engelmannii, Eriogonum heermannii,* and *Gutierrezia sarothrae.* Dominant and characteristic herbs include *Bromus rubens* and *Sphaeralcea ambigua,* and *Aristida purpurea* is often present. Cryptogammic crust is often present in this alliance.

Diagnostic Criteria: This alliance is characterized by an open shrub layer of *Mortonia utahensis* as a dominant or co-dominant shrub. The overall shrub cover ranges from 4 to 29 percent.

Alliance Distribution

The alliance is found in LAKE NE of Iceberg Canyon, in MOJA in the Clark Mountains, and in DEVA in the Funeral Mountains.

States: CA, NV

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

Park Sampling Zones: DEVA: Funeral Mtns**; LAKE:** Gold Butte**; MOJA:** Clark Mountain

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Mortonia utahensis [CEGL005153]	13	x	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1237 m, Range 916 – 1692 m
- Aspect: N (1), NE (1), E (1), NW (2), SE (1), SW (3), W (2), S (2)
- Slope: Mean 30.6 degrees, Range 7 – 56 degrees
- Macro Topography: High level/summit (1), High slope (3), Midslope (5)
- Tree Cover: Mean 0.0%, Range 0 – 0.5%
- Shrub Cover: Mean 12.6%, Range 4.2 – 29%

- Herb Cover: Mean 5.6%, Range 2 – 12%
- Large Rock: Mean 62.3%, Range 7.5 – 93%
- Small Rock: Mean 31.1%, Range 4 – 75%
- Fines Cover: Mean 3.3%, Range 0 – 10%
- Litter Cover: Mean 2.1%, Range 0 – 5
- Geology: dolostone (dolomite) (1), gneiss (3), sandstone with dolostone (dolomite) (9)
- Soil Texture: Clay loam (3), Medium loam (1), Medium silt loam (1), Moderately fine silty clay loam (2), Sandy clay (1), Sandy loam (2)

Environment: The alliance is found primarily on skeletal rocky slopes of various aspects. Soils are typically calcareous, and textures include clay loam, silty clay loam, and sandy loam. The alliance occurs at mid to high elevations.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer, and the overall shrub cover ranges from 4 to 29 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Mortonia utahensis* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Echinocactus polycephalus, Echinocereus engelmannii, Eriogonum heermannii,* and *Gutierrezia sarothrae.* Dominant and characteristic herbs include *Bromus rubens* and *Sphaeralcea ambigua,* and *Aristida purpurea* is often present. Cryptogammic crust is often present in this alliance.

Dynamics: *Mortonia utahensis* stands occur on steep, rocky slopes with nutrient-poor sedimentary substrates including limestone and sandstone.

Classification Comments

Mortonia utahensis associations have been previously placed in the Mojave Mid-Elevation Mixed Desert Scrub Group (G296) and Western Madrean Chaparral Group (G281) of the USNVC hierarchy. Stands within the study area are ecologically related to those within G296 and within the Colorado Plateau Blackbrush - Mormon-tea Shrubland Group (G312), and the USNVC hierarchy has since been updated for this alliance to be placed only within G296. Other related associations include those on highly alkaline soils, such as limestone, including *Eriogonum heermannii, Buddleja utahensis, Coleogyne ramosissima,* and *Purshia stansburiana.* These plants appear to be calcicoles, which are plants that can tolerate soil with a high lime content (i.e., soils high in calcium carbonate that can make plant growth difficult). With future cross-ecoregional analysis, this alliance may be combined with other similar alliance(s) found on nutrient poor soils in the Southwestern US.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4
State (California): S2

References

Keeler-Wolf and Thomas 2000, NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=13
LAKE (n=5): LAKE9287, LAKE9288, LAKE9446, LAKE9530, LAKE9531
DEVA (n=5): DEVA0527, DEVAS170, MOJC0937, MOJC0938, MOJC0939
MOJA (n=3): MOJA0171, MOJA9170, MOJC0943
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Mortonia utahensis*	100	32	3.8	1	6.5	x	–	x	–
	Gutierrezia sarothrae	61.5	3.3	0.4	0.2	2	–	–	–	x
	Echinocereus engelmannii	61.5	1.8	0.2	0.2	0.5	–	–	–	x
	Echinocactus polycephalus	61.5	1.7	0.2	0.11	0.5	–	–	–	x
	Eriogonum heermannii	53.8	2.4	0.3	0.2	2	–	–	–	x
	Thamnosma montana	46.2	1	0.2	0.2	0.5	–	–	–	–
	Opuntia basilaris	46.2	1.3	0.1	0.2	0.5	–	–	–	–
	Ferocactus cylindraceus	46.2	1.2	0.1	0.2	0.5	–	–	–	–
	Agave utahensis	38.5	4	0.5	0.2	4	–	–	–	–
	Ephedra nevadensis	38.5	1.6	0.1	0.2	1	–	–	–	–
	Ephedra funerea	30.8	1.1	0.1	0.11	0.5	–	–	–	–
	Eriogonum fasciculatum	30.8	1.3	0.1	0.2	1	–	–	–	–
	Stephanomeria pauciflora	30.8	1.1	0.1	0.2	0.5	–	–	–	–
	Krameria erecta	30.8	1	0.1	0.2	0.5	–	–	–	–
	Larrea tridentata	30.8	1.2	0.1	0.2	0.5	–	–	–	–
Herb	*Bromus rubens*	92.3	27	1.3	0.2	5	x	–	–	–
	Sphaeralcea ambigua	76.9	3.8	0.2	0.11	0.5	x	–	–	–
	Aristida purpurea	53.8	9.4	0.6	0.11	4	–	–	–	x
	Eriogonum inflatum	46.2	3.3	0.2	0.2	1	–	–	–	–
	Achnatherum speciosum	38.5	2.4	0.2	0.2	1	–	–	–	–
	Cheilanthes parryi	38.5	2.3	0.1	0.2	0.5	–	–	–	–
	Pleuraphis rigida	30.8	2.8	0.3	0.2	3	–	–	–	–
	Thymophylla pentachaeta var. belenidium	30.8	1.6	0.1	0.2	0.5	–	–	–	–
	Xylorhiza tortifolia	30.8	1.3	0.1	0.11	0.5	–	–	–	–
Non-vasc	Cryptogamic crust	61.5	40	0.4	0.2	3	–	–	–	x
	Unknown Moss	38.5	17	0.1	0.2	0.5	–	–	–	–

Common Name: Stansbury Cliff Rose Scrub
Group Assignment: G296, G282, G312; **Alliance code:** A0833

Alliance Concept

The Stansbury Cliff Rose Scrub Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on rocky slopes at various aspects. Soils are derived typically from calcareous substrates (e.g., dolostone and limestone), and textures are variable, ranging from sand to loam to clay. Elevations range from approximately 1100 to 1850 meters. *Purshia stansburiana* is dominant or co-dominant in the shrub layer, and *Ephedra viridis* is characteristically present. Shrubs often present include *Eriogonum heermannii.* Dominant and characteristic herbs include *Bromus rubens,* and those often present are *Aristida purpurea* and *Sphaeralcea ambigua.* Moss, lichen, and cryptogamic crust are often present at low cover.

Diagnostic Criteria: This alliance is characterized by an open shrub layer of *Purshia stansburiana* as the dominant or co-dominant with other shrubs including *Agave utahensis, Artemisia tridentata, Buddleja utahensis, Coleogyne ramosissima,* or *Ericameria nauseosa*. Rarely *P. stansurbiana* is subdominant, though characteristic. The overall shrub cover ranges from 6 to 20 percent.

Alliance Distribution

The alliance is well-defined in sampling in northeastern MOJA in the Clark and Mescal Mountain Ranges, and scattered throughout northern DEVA. The alliance is most often found at high elevation.

States: CA

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

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Last Chance Range, Panamint Mtns**; MOJA:** Clark Mountain, Clark Mtn, Clark Mtn West, Ivanpah Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Coleogyne ramosissima–Purshia stansburiana [CEGL002720]	3	–	x	x	–
Purshia stansburiana [CEGL002957]	6	–	x	–	–
Purshia stansburiana–Agave utahensis [CEPP006748]	8	–	–	x	–
Purshia stansburiana–Artemisia tridentata [CEPP006749]	6	–	x	–	–

Association Notes: The *Coleogyne ramossisima–Purshia stansburiana* association has been placed in the *Coleogyne ramossisima* Alliance in the USNVC. However, it is more ecologically related to

other *Purshia stansburiana* associations that typically occur on calcareous substrates, so we have reclassified that association in this alliance.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1543 m, Range 1127 – 1829 m
- Aspect: N (2), NE (3), E (3), NW (5), SE (1), SW (5), S (4)
- Slope: Mean 25.9 degrees, Range 2 – 51 degrees
- Macro Topography: Channel bed (1), Channel wall (1), High level/summit (2), High slope (3), Lowslope (4), Midslope (5)
- Tree Cover: Mean 0.2%, Range 0 – 1%
- Shrub Cover: Mean 12.5%, Range 6.3 – 20.5%
- Herb Cover: Mean 4.6%, Range 0.2 – 15%
- Large Rock: Mean 54.1%, Range 0 – 98%
- Small Rock: Mean 39.2%, Range 1 – 97%
- Fines Cover: Mean 4.1%, Range 0.2 – 20%
- Litter Cover: Mean 2.0%, Range 0 – 9%
- Geology: conglomerate (1), dolostone (dolomite) (4), limestone (4), sandstone (14)
- Soil Texture: Clay (1), Clay loam (5), Loam (1), Loamy sand (1), Medium to very fine sandy loam (3), Moderately coarse sandy loam (1), Moderately fine sandy clay loam (2), Sand (1), Sandy loam (4), Silty clay (1)

Environment: The alliance is found primarily on rocky slopes at various aspects. Soils are derived from typically from calcareous substrates (e.g., dolostone and limestone), and textures are variable, ranging from sand to loam to clay. The alliance is typically found at high elevations, but a few samples were collected at mid-elevation range.

Vegetation Description

Vegetation Structure: The Alliance forms an open shrub layer and the overall shrub cover ranges from 6 to 21 percent cover. The tree layer, when present, is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Purshia stansburiana* is the dominant shrub of this alliance, and *Ephedra viridis* is characteristic of the alliance. Shrubs that are often present include *Eriogonum heermannii.* Dominant and characteristic herbs include *Bromus rubens,* and those often present are *Aristida purpurea* and *Sphaeralcea ambigua.* Moss, lichen, and cryptogamic crust are often present at low cover.

Dynamics: *Purshia stansburiana* is often found on rocky outcrops of limestone parent material, where the surrounding vegetation often includes *Coleogyne ramosissima, Menodora spinescens,* and *Yucca brevifolia* alliances.

Classification Comments

This alliance has been placed in the Western North America Montane Sclerophyll Scrub Group (G282) and Mojave Mid-Elevation Mixed Desert Scrub Group (G296) of the USNVC. However, other stands are ecologically related to those within the Colorado Plateau Blackbrush - Mormon-tea Shrubland Group (G312). Since current placement is still under review, we have placed associations of this alliance in the G296 group for this Mojave Desert Network classification. Also, other related alliances and associations include those with *Eriogonum heermannii, Buddleja utahensis,* and *Mortonia utahensis,* which also occur on highly alkaline, limestone-rich soils and have been placed in G296. These plants appear to be calcicoles, which are plants that can tolerate soil with a high lime content (i.e., soils high in calcium carbonate that can make plant growth difficult).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G3

State (California): S3

References

Keeler-Wolf and Thomas 2000, NatureServe 2012, Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=23

LAKE (n=0)

DEVA (n=13): DEVA9401, DEVA9550, DEVA9551, DEVA9599, DEVA9806, DEVA9825, DEVAS227, DEVAS230, MOJC0527, MOJC0528, MOJC1046, MOJC1047, MOJC1048

MOJA (n=10): MOJA0248, MOJA0324, MOJA9105, MOJA9140, MOJA9144, MOJA9217, MOJA9259, MOJA9349, MOJC0942, MOJC0949

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	26.1	24	0.1	0.2	0.2	–	–	–	–
Shrub	*Purshia stansburiana*	100	21	2.5	1	7	x	–	–	–
	Ephedra viridis	78.3	4.4	0.6	0.2	3	x	–	–	–
	Eriogonum heermannii	65.2	1.8	0.2	0.01	1	–	–	–	x
	Gutierrezia microcephala	47.8	5.2	0.6	0.5	3	–	–	–	–
	Agave utahensis	43.5	7.7	0.9	0.5	4	–	–	–	–
	Ericameria nauseosa	43.5	5	0.7	0.2	4	–	–	–	–
	Gutierrezia sarothrae	43.5	2.2	0.3	0.2	2	–	–	–	–
	Echinocereus engelmannii	39.1	1.2	0.2	0.2	1	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Coleogyne ramosissima*	34.8	5	0.5	0.2	3	–	–	–	–
	Prunus fasciculata	34.8	2.5	0.3	0.2	2.5	–	–	–	–
	Krascheninnikovia lanata	34.8	1.7	0.2	0.11	2	–	–	–	–
	Eriogonum fasciculatum	34.8	0.9	0.1	0.11	0.5	–	–	–	–
	Thamnosma montana	34.8	0.8	0.1	0.11	0.5	–	–	–	–
	Yucca baccata	30.4	3.3	0.4	1	3	–	–	–	–
	Brickellia microphylla	30.4	1.3	0.2	0.2	1.2	–	–	–	–
	Lepidium fremontii	30.4	1.4	0.2	0.2	1	–	–	–	–
	Artemisia tridentata	26.1	4	0.7	0.5	7	–	–	–	–
	Ephedra nevadensis	26.1	1.3	0.1	0.2	1	–	–	–	–
	Stephanomeria pauciflora	26.1	0.8	0.1	0.2	0.5	–	–	–	–
	Artemisia bigelovii	26.1	1	0.1	0.2	1	–	–	–	–
	Echinocereus mojavensis	26.1	0.7	0.1	0.2	0.5	–	–	–	–
Herb	*Bromus rubens*	82.6	27	2.1	0.11	10	x	–	–	–
	Aristida purpurea	60.9	5.7	0.3	0.2	2	–	–	–	x
	Sphaeralcea ambigua	52.2	2.2	0.2	0.2	0.5	–	–	–	x
	Achnatherum speciosum	47.8	6.9	0.4	0.2	3	–	–	–	–
	Thymophylla pentachaeta var. belenidium	34.8	3.5	0.3	0.2	3	–	–	–	–
	Linanthus pungens	30.4	1.4	0.1	0.11	0.5	–	–	–	–
	Elymus elymoides	26.1	1.3	0.1	0.2	0.5	–	–	–	–
	Eriogonum inflatum	26.1	0.9	0.1	0.2	0.5	–	–	–	–
	Erodium cicutarium	26.1	1	0.1	0.2	0.5	–	–	–	–
Non-vasc	Cryptogamic crust	56.5	34	0.5	0.2	4	–	–	–	x
	Unknown Lichen	52.2	27	0.6	0.4	6	–	–	–	x
	Unknown Moss	52.2	13	0.2	0.2	1	–	–	–	x

Common Name: Joshua Tree Wooded Shrubland
Group Assignment: G296; **Alliance Code:** A3148

Alliance Concept

The Joshua Tree Wooded Shrubland Alliance forms a sparse to open tree canopy with an open to intermittent shrub understory. It is found on channel beds and bottoms to summits at variable aspects. Soils are derived from a variety of substrates and textures are variable. Elevations range from approximately 800 to 2200 meters. The dominant tree is *Yucca brevifolia*. Commonly associated shrubs include *Ephedra nevadensis, Cylindropuntia acanthocarpa, Eriogonum fasciculatum, Menodora spinescens,* and *Lycium andersonii.* Commonly associated herbs include *Bromus rubens, Erodium cicutarium, Achnatherum speciosum,* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by a sparse to open tree canopy of *Yucca brevifolia,* which ranges from 1 to 19 percent cover. The overall tree cover ranges from 1 to 19 percent cover.

Alliance Distribution

The alliance is well-defined in sampling at all three Parks. It is scattered throughout MOJA, in the northwest half of DEVA and near Pearce Ferry Rd. in LAKE. It is found at mid to upper elevations.

States: AZ, CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (88): 322Aj, 322Ak, 322Al, 322Av; Southeastern Great Basin; (28): 341Fb, 341Fc, 341Fe

Park Sampling Zones: DEVA: CottonWood Mtns, Joshua Flat, Last Chance Range, Last Chance Vlly, Nelson Range**; LAKE:** Pearce Ferry**; MOJA:** Baker-Halloran, (Castle Mtns), Cima Dome NW, Cima Dome SE, Cinder Cones, Clark Mountain, Clark Mtn, Clark Mtn West, Hart Peak, Ivanpah Mtns, Ivanpah Vlly, Kelso Mtns, Lanfair Vlly, Marl Mtns, New York Mtns, Piute Range, Solomons Knob

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Yucca brevifolia (alliance)	3	–	–	x	–
Yucca brevifolia / (Artemisia tridentata–Atriplex confertifolia) [CEPP006854]	12	–	x	–	–
Yucca brevifolia / Coleogyne ramosissima [CEGL005294]	23	–	x	x	–
Yucca brevifolia / Larrea tridentata–Yucca schidigera / Pleuraphis rigida [CEGL005777]	18	x	–	x	x
Yucca brevifolia / Lycium andersonii–Ephedra nevadensis [CEGL005778]	32	x	x	x	x

Associations Table (continued). “x” indicates species present, “–” indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Yucca brevifolia / Cylindropuntia acanthocarpa [CEGL005779]	12	–	–	x	–
Yucca brevifolia / (Prunus fasciculata–Salazaria mexicana) [CEGL005776]	10	–	–	x	–
Yucca brevifolia / (Yucca baccata) / Pleuraphis jamesii–Bouteloua eriopoda [CEPP006862]	28	–	–	x	x

Association notes: One sample classified to alliance level has *Eriogonum heermanii* and *Ephedra viridis* present in the understory shrubl layer at higher cover than *Yucca brevifolia*, and two other samples have disturbance-related species in the understory including dominant shrubs *Hymenoclea salsola* and *Gutierrezia sarothrae* and the non-native grass *Bromus rubens.*

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1445.5 m, Range 813 – 2144 m
- Aspect: Flat, Variable (1), N (18), NE (14), E (17), NW (18), SE (23), SW (7), W (4), SW (12), S (17)
- Slope: Mean 6.9 degrees, Range 0 – 28 degrees
- Macro Topography: Channel bed (4), Entire slope (1), High level/summit (9), Highslope (11), Low level/bottom (7), Lowslope (16), Midslope (26), Step in slope (4), Toeslope (alluvial fan/bajada) (2)
- Tree Cover: Mean 2.6%, Range 1 – 19%
- Shrub Cover: Mean 16.7%, Range 5.2 – 40.6%
- Herb Cover: Mean 7.6%, Range 0.1 – 26%
- Large Rock: Mean 7.0%, Range 0 – 82%
- Small Rock: Mean 69.9%, Range 0 – 97%
- Fines Cover: Mean 16.5%, Range 0 – 84%
- Litter Cover: Mean 2.9%, Range 0 – 20%
- Geology: alluvium (35), basalt (3), conglomerate (1), dolostone (dolomite) (3), gneiss (5), granodiorite (26), gravel (1), landslide (3), limestone (4), rhyolite (16), sand (2), sandstone (9), shale (3), tephrite (basanite) (5)
- Soil Texture: Clay (2), Clay loam (9), Coarse sand (5), Fine sand (1), Fine sandy clay (1), Loam (7), Loamy sand (16), Medium sand (3), Medium silt loam (2), Medium to very fine sandy loam (11), Moderately coarse loamy sand (5), Moderately coarse sandy loam (1), Moderately fine clay loam (1), Moderately fine sandy clay loam (4), Sand (2), Sandy clay (2), Sandy loam (32), Silt loam (2), Silty clay (1)

Environment: The alliance is found at mid to upper elevations and at all aspects. It is found in channel beds and bottoms and up to summits. Soils are derived from a variety of substrates and textures are variable.

Vegetation Description

Vegetation Structure: The Alliance forms a sparse to open tree layer with a sparse to intermittent shrub layer and sparse or intermittent herbaceous understory.

Vegetation Floristics: The dominant tree is *Yucca brevifolia*. Commonly associated shrubs include *Ephedra nevadensis, Cylindropuntia acanthocarpa, Eriogonum fasciculatum, Menodora spinescens,* and *Lycium andersonii.* Commonly associated herbs include *Bromus rubens, Erodium cicutarium, Achnatherum speciosum,* and *Sphaeralcea ambigua.*

Dynamics: *Yucca brevifolia* is an emergent small tree canopy over a shrub and/or grass layer. *Yucca brevifolia* is a relatively long-lived and fast-growing plant. Vegetative reproduction by adventitious roots and stems following disturbance is the most important mode of regeneration on many sites. There is a high degree of stand-to-stand variation in structure and species composition. Stands are threatened by grazing and vandalism.

Classification Comments

None.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S3

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Keeler-Wolf et al. 2005, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description
MOJN: N=132 [+14]
LAKE (n=4): LAKE0270, LAKE0423, LAKE0427, LAKE0429
DEVA (n=28): DEVA0144, DEVA0149, DEVA0236, DEVA9121, DEVA9135, DEVA9145, DEVA9227, DEVA9241, DEVA9263, DEVA9265, DEVA9323, DEVA9324, DEVA9326, DEVA9453, DEVA9568, DEVA9572, DEVA9907, DEVAD175, DEVAS054, DEVAS058, DEVAS070, DEVAS090, DEVAS091, DEVAS124, MOJC0065, MOJC0598, MOJC1069, MOJC1070
MOJA (n=82): MOJA0107, MOJA0131, MOJA0216, MOJA0228, MOJA0233, MOJA0237, MOJA0298, MOJA0318, MOJA0339, MOJA9106, MOJA9109, MOJA9110, MOJA9112, MOJA9128, MOJA9129, MOJA9134, MOJA9146, MOJA9173, MOJA9174, MOJA9176, MOJA9208, MOJA9214, MOJA9219, MOJA9238, MOJA9240, MOJA9242, MOJA9243, MOJA9244, MOJA9246, MOJA9258, MOJA9266, MOJA9279, MOJA9295, MOJA9321, MOJA9325, MOJA9327, MOJA9328, MOJA9331, MOJA9341, MOJA9356, MOJA9358, MOJA9364, MOJA9395, MOJA9396, MOJA9399, MOJA9578, MOJA9579, MOJA9610, MOJA9642, MOJA9643, MOJAJC01, MOJAJC02, MOJC0006, MOJC0074, MOJC0075, MOJC0079, MOJC0080, MOJC0081, MOJC0194, MOJC0941, MOJC0974, MOJC0975,

MOJC0976, MOJC0995, MOJC0998, MOJC1000, MOJC1001, MOJC1002, MOJC1079, MOJC1080, MOJC1082, MOJC1083, MOJC1084, MOJC1085, MOJC1094, MOJC1097, MOJC1145, MOJC1146, MOJC1176, MOJC1179, MOJC1180, MOJC1181
MOJN-Johnson (n=18): MOJJE241, MOJJE244, MOJJE248, MOJJE385, MOJJE456, MOJJE548, MOJJE566, MOJJE630, MOJJE632, MOJJE633, MOJJE668, MOJJE670, MOJJE681, MOJJE686, MOJJE756, MOJJE759, MOJJE881, MOJJE883
[CAMO (n=4): CAMO8104, CAMO9103, CAMO9124, CAMO9130]; [MOJA-McAuliffe (n=10); MOJAA001, MOJAA016, MOJAA020, MOJAA022, MOJAA023, MOJAA029, MOJAA041, MOJAA048, MOJAA049, MOJAA062]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	100	93	2.4	1	19	x	x	–	–
Shrub	*Ephedra nevadensis*	88.7	7.9	1.2	0.11	5.7	x	–	–	–
	Cylindropuntia acanthocarpa	60	5.4	0.9	0.2	8.5	–	–	–	x
	Lycium andersonii	54.8	3	0.4	0.2	3.5	–	–	–	x
	Menodora spinescens	51.3	5.7	0.9	0.11	10	–	–	–	x
	Eriogonum fasciculatum	47.8	2.9	0.5	0.2	4	–	–	–	–
	Krascheninnikovia lanata	41.7	2.8	0.4	0.1	4	–	–	–	–
	Echinocereus engelmannii	41.7	1	0.2	0.1	3	–	–	–	–
	Hymenoclea salsola	40	3.5	0.6	0.11	17.5	–	–	–	–
	Yucca schidigera	40	3.7	0.6	0.01	6	–	–	–	–
	Yucca baccata	35.7	4.1	0.7	0.2	4.5	–	–	–	–
	Thamnosma montana	35.7	1	0.2	0.2	1.7	–	–	–	–
	Gutierrezia sarothrae	34.8	2.9	0.4	0.1	6	–	–	–	–
	Ericameria cooperi	31.3	2.3	0.4	0.2	5	–	–	–	–
	Krameria erecta	31.3	1	0.2	0.2	3	–	–	–	–
	Salazaria mexicana	30.4	2.9	0.5	0.2	10.5	–	–	–	–
	Opuntia polyacantha var. erinacea	30.4	1	0.1	0.11	2	–	–	–	–
	Larrea tridentata	27.8	3.9	0.6	0.1	7.5	–	–	–	–
	Coleogyne ramosissima	27	10	2.3	0.11	25	–	–	–	–
	Cylindropuntia echinocarpa	26.1	0.5	0.1	0.11	0.5	–	–	–	–
	Salvia dorrii	25.2	2	0.3	0.01	8	–	–	–	–
Herb	*Bromus rubens*	85.2	13	1.2	0.11	10	x	–	–	–
	Sphaeralcea ambigua	64.3	3.1	0.2	0.1	1	–	–	–	x
	Erodium cicutarium	59.1	7.9	0.8	0.2	13	–	–	–	x
	Achnatherum speciosum	53	5.4	0.3	0.2	3	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eriogonum inflatum*	45.2	2.2	0.2	0.1	1.5	–	–	–	–
	Muhlenbergia porteri	44.3	3.3	0.3	0.2	8	–	–	–	–
	Pleuraphis jamesii	39.1	7.8	1	0.2	20.5	–	–	–	–
	Dasyochloa pulchella	37.4	2.7	0.2	0.1	4	–	–	–	–
	Achnatherum hymenoides	34.8	1.3	0.1	0.01	0.5	–	–	–	–
	Amsinckia	31.3	1.1	0.1	0.11	1	–	–	–	–
	Bouteloua eriopoda	26.1	4.2	0.6	0.2	12	–	–	–	–
	Cryptantha	26.1	2.7	0.2	0.6	1.5	–	–	–	–
Non-vascular	Cryptogamic crust	33	27	0.3	0.2	6	–	–	–	–

Common Name: Mojave Yucca Scrub
Group Assignment: G296; **Alliance Code:** A3147

Alliance Concept

The Mojave Yucca Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found on a variety of upland landforms including hills and upper bajadas at various aspects. Soils are derived from a variety of substrates including alluvium, gneiss, and granodiorite and textures were highly variable. Elevations range from approximately 550 to 1850 meters. *Yucca schidigera* is typically co-dominant in the shrub layer, and other characteristic species include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Ephedra nevadensis* and *Eriogonum fasciculatum.* Shrubs that are often present include *Acacia greggii (=Senegalia greggii), Ferocactus cylindraceus, Krameria erecta, Larrea tridentata, Thamnosma montana* and *Viguiera parishii.* Dominant and characteristic herbs include *Bromus rubens* and *Erodium cicutarium,* and those often present are *Eriogonum inflatum* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer of *Yucca schidigera* co-dominant with other shrubs including *Coleogyne ramosissima, Cylindropuntia acanthocarpa, Echinocereus engelmannii, Ephedra nevadensis,* and *Eriogonum fasciculatum*. *Yucca schidigera* is at least 2% or more in absolute cover in stands, and the overall shrub cover ranges from 8 to 44 percent.

Alliance Distribution

The alliance is well-defined in sampling, though scattered, within LAKE and MOJA along mid to upper elevations.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (94): 322Ai, 322Aj, 322Ak, 322Al, 322Am, 322Av

Park Sampling Zones: LAKE: Katherine, Pearce Ferry, Temple Bar**; MOJA:** Baker-Halloran, (Castle Mtns), Cima Dome NW, Cima Dome SE, Cinder Cones, Clark Mountain, Clark Mtn, Clark Mtn West, Clipper Vlly, Fenner Vlly, Fenner Vlly West, Granite Mtns, HackberryVontrigger, Hart Peak, Ivanpah Mtns, Ivanpah Vlly, Kelso Mtns, Kelso-Cima, Lanfair Vlly, Marl Mtns, Mid Hills, Mineral Hill, New York Mtns, Piute Range, Providence Mtns, Valley Wells, Van Winkle Mtn, Vulcan Mine, Woods Mtns

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Yucca schidigera–Coleogyne ramosissima [CEGL005780]	17	–	–	x	–
Yucca schidigera–Opuntia acanthocarpa [CEGL005783]	17	–	–	x	–
Yucca schidigera–Eriogonum fasciculatum [CEGL005781]	33	x	–	x	–
Yucca schidigera–Larrea tridentata–Ambrosia dumosa [CEGL005295]	18	x	–	x	–
Yucca schidigera–Larrea tridentata–Ephedra nevadensis [CEGL005782]	12	–	–	x	x

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1185 m, Range 592 – 1809 m
- Aspect: N (10), NE (9), E (18), NW (8), SE (8), SW (26), W (1), S (14)
- Slope: Mean 10.6 degrees, Range 1 – 35 degrees
- Macro Topography: High level/summit (5), High slope (14), Low level/bottom (4), Lowslope (23), Midslope (21), Toeslope (alluvial fan/bajada) (3)
- Tree Cover: Mean 0.1%, Range 0 – 2%
- Shrub Cover: Mean 19.9%, Range 7.6 – 43.5%
- Herb Cover: Mean 6.8%, Range 0 – 22%
- Large Rock: Mean 13.3%, Range 0 – 93%
- Small Rock: Mean 70.1%, Range 0 – 97.5%
- Fines Cover: Mean 11.0%, Range 0 – 62.5%
- Litter Cover: Mean 2.5%, Range 0 – 11%
- Geology: alkali-granite (alaskite) (5), alluvium (23), gneiss (14), granodiorite (19), gravel (1), limestone (4), rhyolite (13), sand (1), sandstone (9), schist (1), tephrite (basanite) (4)
- Soil Texture: Clay (4), Clay loam (13), Fine sand (1), Fine silty clay (1), Loam (6), Loamy sand (10), Medium loam (1), Medium sand (3), Medium silt loam (2), Medium to very fine sandy loam (7), Moderately coarse loamy sand (1), Moderately fine clay loam (1), Moderately fine sandy clay loam (2), Moderately fine silty clay loam (2), Sand (2), Sandy clay (1), Sandy loam (26), Silt loam (1), Silty clay (3)

Environment: The alliance is found on a variety of upland landforms including hills and upper bajadas at various aspects. Soils are derived from a variety of substrates including alluvium, gneiss, and granodiorite and textures were highly variable.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 8 to 44 percent cover. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: *Yucca schidigera* is typically co-dominant in the shrub layer, and other characteristic species include *Cylindropuntia acanthocarpa, Echinocereus engelmannii, Ephedra nevadensis* and *Eriogonum fasciculatum.* Shrubs that are often present include *Acacia greggii (=Senegalia greggii), Ferocactus cylindraceus, Krameria erecta, Larrea tridentata, Thamnosma montana* and *Viguiera parishii.* Dominant and characteristic herbs include *Bromus rubens* and *Erodium cicutarium,* and those often present are *Eriogonum inflatum* and *Sphaeralcea ambigua.*

Dynamics: *Yucca schidigera* stands are floristically diverse and occur in a matrix with other mid-elevation mixed desert scrub types in the Mojave Desert including alliances with *Coleogyne ramosissima, Cylindropuntia acanthocarpa, Ephedra nevadensis, Eriogonum fasciculatum,* and *Viguiera parishii*.

Classification Comments

Associations of Yucca schidigera–Coleogyne ramosissima and Yucca schidigera–Eriogonum fasciculatum were difficult to separate in the classification from associations in the Coleogyne ramosissima and Eriogonum fasciculatum–Viguiera parishii alliances, respectively. Current rules (cf. Thomas et al. 2004) allow co-dominance or dominance of other shrubs as long as Yucca schidigera is at least 2% cover to classifed in this Yucca alliance.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4
State (California): S4

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, cf. Keeler-Wolf et al. 1998, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=100
LAKE (n=7): LAKE0175, LAKE0618, LAKE0621, LAKE0623, LAKE9166, LAKE9614, LAKE9615
DEVA (n=0)
MOJA (n=92): MOJA0103, MOJA0154, MOJA0251, MOJA0340, MOJA9125, MOJA9153, MOJA9179, MOJA9252, MOJA9253, MOJA9254, MOJA9255, MOJA9284, MOJA9296, MOJA9301, MOJA9310, MOJA9313, MOJA9315, MOJA9330, MOJA9333, MOJA9336, MOJA9337, MOJA9338, MOJA9362, MOJA9373, MOJA9376, MOJA9397, MOJA9415, MOJA9419, MOJA9420, MOJA9422, MOJA9429, MOJA9437, MOJA9457, MOJA9461, MOJA9500, MOJA9520, MOJA9523, MOJA9531, MOJA9532, MOJA9533, MOJA9534,

MOJA9536, MOJA9537, MOJA9538, MOJA9565, MOJA9568, MOJA9569, MOJA9576, MOJA9582, MOJA9585, MOJA9586, MOJA9592, MOJA9608, MOJA9622, MOJA9623, MOJA9625, MOJA9632, MOJA9634, MOJA9641, MOJA9668, MOJA9903, MOJA9904, MOJA9905, MOJC0011, MOJC0077, MOJC0085, MOJC0094, MOJC0097, MOJC0098, MOJC0189, MOJC0191, MOJC0195, MOJC0211, MOJC0297, MOJC0352, MOJC0353, MOJC0354, MOJC0981, MOJC0982, MOJC0997, MOJC1074, MOJC1076, MOJC1081, MOJC1154, MOJC1211, MOJC1212, MOJC1231
MOJN-Johnson (n=1): MOJJE700
[CAMO (n=5): CAMO9104, CAMO9105, CAMO9107, CAMO9131, CAMO9133]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Yucca schidigera*	100	18	3.3	1	7	x	–	–	–
	Cylindropuntia acanthocarpa	83.2	7.4	1.4	0.2	12.5	x	–	–	–
	Eriogonum fasciculatum	77.9	8.6	1.6	0.2	10	x	–	–	–
	Echinocereus engelmannii	77.9	1.5	0.3	0.2	2	x	–	–	–
	Ephedra nevadensis	76.8	5	0.9	0.2	4.5	x	–	–	–
	Larrea tridentata	74.7	7.8	1.3	0.2	8	–	–	–	x
	Krameria erecta	68.4	1.6	0.3	0.2	1.5	–	–	–	x
	Ferocactus cylindraceus	65.3	3.2	0.6	0.2	5	–	–	–	x
	Acacia greggii	57.9	2.4	0.5	0.2	4	–	–	–	x
	Viguiera parishii	54.7	2.8	0.6	0.2	6	–	–	–	x
	Thamnosma montana	51.6	1.4	0.3	0.2	2	–	–	–	x
	Ambrosia dumosa	44.2	6.1	1	0.2	9	–	–	–	–
	Salazaria mexicana	41.1	2	0.5	0.1	16.5	–	–	–	–
	Ericameria cooperi	40	2.5	0.5	0.2	8	–	–	–	–
	Opuntia basilaris	37.9	0.7	0.1	0.2	1.5	–	–	–	–
	Stephanomeria pauciflora	36.8	0.6	0.1	0.2	1	–	–	–	–
	Coleogyne ramosissima	35.8	6.1	1.2	0.2	11	–	–	–	–
	Lycium andersonii	32.6	1.6	0.3	0.2	6.5	–	–	–	–
	Gutierrezia sarothrae	32.6	1.4	0.3	0.2	8	–	–	–	–
	Encelia virginensis	29.5	0.9	0.2	0.2	2	–	–	–	–
	Hymenoclea salsola	26.3	1.5	0.3	0.2	7	–	–	–	–
	Psilostrophe cooperi	25.3	0.7	0.1	0.2	5	–	–	–	–
Herb	*Bromus rubens*	94.7	23	2.2	0.2	18	x	–	–	–
	Erodium cicutarium	83.2	14	1.2	0.2	12	x	–	–	–
	Sphaeralcea ambigua	57.9	2.8	0.2	0.2	0.5	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eriogonum inflatum*	54.7	2.9	0.2	0.2	3	–	–	–	x
	Amsinckia	47.4	2.9	0.2	0.2	2	–	–	–	–
	Pleuraphis rigida	46.3	8.9	0.9	0.2	12	–	–	–	–
	Achnatherum speciosum	45.3	3.4	0.2	0.2	6	–	–	–	–
	Xylorhiza tortifolia	41.1	2.1	0.1	0.2	1	–	–	–	–
	Schismus	36.8	3.8	0.3	0.2	6	–	–	–	–
	Dasyochloa pulchella	32.6	1.8	0.1	0.2	1	–	–	–	–
	Porophyllum gracile	28.4	1.4	0.1	0.1	0.5	–	–	–	–
	Mirabilis laevis	27.4	1	0.1	0.2	0.5	–	–	–	–
Non-vasc	Unknown Lichen	43.2	34	0.2	0.4	2	–	–	–	–
	Cryptogamic crust	34.7	26	0.4	0.2	8	–	–	–	–

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

Chrysothamnus viscidiflorus Shrubland and Shrub Herbaceous Alliance

Common Name: Sticky-Flowered Rabbitbrush Shrubland
Group Assignment: G310; **Alliance Code:** A3195

Alliance Concept

The Sticky-Flowered Rabbitbrush Shrubland Alliance forms an open shrub layer in the three samples from Death Valley National Park. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance was found on hillslope with northerly to southerly aspect and in a drainage channel in post-fire, overgrazed, and/or intermittent wash conditions. Soils are derived from sandstone or shale, and textures include clay loam. Elevations range from approximately 1700 to 2780 meters. The dominant and characteristic shrubs is *Chrysothamnus viscidiflorus,* and those that are often present at lower cover include *Artemisia tridentata, Atriplex confertifolia, Ephedra nevadensis, Ericameria nauseosa, Picrothamnus desertorum, Opuntia polyacantha* var. *erinacea,* and *Tetradymia axillaris. Achnatherum hymenoides* and *Elymus elymoides* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Chrysothamnus viscidiflorus* dominant or co-dominant. The overall shrub cover ranges from 12 to 30 percent.

Alliance Distribution

The alliance was sampled at high elevations in DEVA. The alliance was not found in the other parks.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (3): 341Fc, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Panamint Mtns, Joshua Flat

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Chrysothamnus viscidiflorus Shrub Herbaceous [CEGL002530]	3	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 2216 m, Range 1708 – 2777 m
- Aspect: NE (1), NW (1), S (1)
- Slope: Mean 19.7 degrees, Range 9 – 40 degrees
- Macro Topography: High slope (2)
- Tree Cover: Mean 1.5%, Range 0 – 4%
- Shrub Cover: Mean 21.9%, Range 11.7 – 30%
- Herb Cover: Mean 4.3%, Range 0 – 12%
- Large Rock: Mean 12.4%, Range 3 – 30.2%
- Small Rock: Mean 79.5%, Range 57.5 – 96%
- Fines Cover: Mean 5.0%, Range 0 – 10%
- Litter Cover: Mean 2.4%, Range 0.2 – 6%
- Geology: sandstone (2), shale (1)
- Soil Texture: Clay loam (2)

Environment: The alliance occurs on various land forms at high elevation including hills, ridgetops, and intermittent drainages. Soils are derived from sandstone or shale and textures include clay loam.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 12 to 30 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: Dominant and characteristic shrubs include *Chrysothamnus viscidiflorus,* and those that are often present include *Artemisia tridentata, Atriplex confertifolia, , Ephedra nevadensis, Ericameria nauseosa, Picrothamnus desertorum, Opuntia polyacantha* var. *erinacea,* and *Tetradymia axillaris. Achnatherum hymenoides* and *Elymus elymoides* are often present in the herbaceous layer.

Dynamics: *Chrysothamnus viscidiflorus* stands appear transitional to those with *Artemisia tridentata* dominant including in post-fire and other disturbed settings in the study area.

Classification Comments

With only three stands sampled in the region, the stands may be better mapped/defined in other related alliances including *Artemisia tridentata* and *Ericameria nauseosa*.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G5
State (California): S5

References

NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=3
LAKE (n=0)
DEVA (n=3): DEVA9269 DEVA9654, MOJC0358
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Pinus monophylla*	33	33	1.3	4	4	–	–	–	–
	Yucca brevifolia	33	33	0.2	0.5	0.5	–	–	–	–
Shrub	*Chrysothamnus viscidiflorus*	100	45	9.3	7	14	x	–	x	–
	Artemisia tridentata	67	6.4	0.8	0.5	2	–	–	–	x
	Atriplex confertifolia	67	5.3	0.5	0.5	1	–	–	–	x
	Ephedra nevadensis	67	3.6	0.6	0.2	1	–	–	–	x
	Picrothamnus desertorum	67	1.3	0.2	0.2	0.5	–	–	–	x
	Tetradymia axillaris	67	1.3	0.2	0.2	0.5	–	–	–	x
	Opuntia polyacantha var. erinacea	33	0.8	0.1	0.2	0.2	–	–	–	–
	Artemisia tridentata var. vaseyana	33	8.9	2.7	8	8	–	–	–	–
	Ericameria nauseosa	33	7.1	2.5	5	5	–	–	–	–
	Salvia pachyphylla	33	5.6	1.3	2.5	2.5	–	–	–	–
	Keckiella antirrhinoides	33	3.6	1.3	2.5	2.5	–	–	–	–
	Lupinus excubitus	33	2.2	0.7	2	2	–	–	–	–
	Hecastocleis shockleyi	33	1.4	0.3	1	1	–	–	–	–
	Artemisia nova	33	0.7	0.2	0.5	0.5	–	–	–	–
	Ericameria teretifolia	33	0.7	0.2	0.5	0.5	–	–	–	–
	Eriogonum fasciculatum	33	0.7	0.2	0.5	0.5	–	–	–	–
	Gutierrezia microcephala	33	0.7	0.2	0.5	0.5	–	–	–	–
	Hymenoclea salsola	33	0.7	0.2	0.5	0.5	–	–	–	–
	Lycium andersonii	33	0.7	0.2	0.5	0.5	–	–	–	–
	Menodora spinescens	33	1.4	0.2	0.5	0.5	–	–	–	–
	Opuntia basilaris	33	0.7	0.2	0.5	0.5	–	–	–	–
	Psorothamnus	33	0.7	0.2	0.5	0.5	–	–	–	–
	Psorothamnus arborescens	33	0.7	0.2	0.5	0.5	–	–	–	–
	Stephanomeria pauciflora	33	0.7	0.2	0.5	0.5	–	–	–	–
	Chamabatiaria millefolium	33	0.2	0.1	0.2	0.2	–	–	–	–
	Ephedra viridis	33	0.2	0.1	0.2	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub (cont.)	*Keckiella rothrockii*	33	0.2	0.1	0.2	0.2	–	–	–	–
	Krascheninnikovia lanata	33	0.6	0.1	0.2	0.2	–	–	–	–
	Ribes cereum	33	0.2	0.1	0.2	0.2	–	–	–	–
	Sclerocactus polyancistrus	33	0.6	0.1	0.2	0.2	–	–	–	–
Herb	*Achnatherum hymenoides*	67	2.4	0.4	0.2	0.5	–	–	–	x
	Elymus elymoides	67	2.4	0.4	0.2	0.5	–	–	–	x
	Bassia americana	33	12.8	0.3	1	1	–	–	–	–
	Camissonia	33	4.8	0.3	1	1	–	–	–	–
	Eriogonum	33	4.8	0.3	1	1	–	–	–	–
	Mirabilis	33	4.8	0.3	1	1	–	–	–	–
	Pleuraphis jamesii	33	4.8	0.3	1	1	–	–	–	–
	Achnatherum speciosum	33	2.4	0.2	0.5	0.5	–	–	–	–
	Arenaria macradenia	33	2.4	0.2	0.5	0.5	–	–	–	–
	Bromus rubens	33	2.4	0.2	0.5	0.5	–	–	–	–
	Eriogonum inflatum	33	2.4	0.2	0.5	0.5	–	–	–	–
	Poa secunda	33	2.4	0.2	0.5	0.5	–	–	–	–
	Stanleya elata	33	2.4	0.2	0.5	0.5	–	–	–	–
	Chaenactis douglasii	33	6.7	0.1	0.2	0.2	–	–	–	–
	Eriogonum eremicola	33	6.7	0.1	0.2	0.2	–	–	–	–
	Linanthus pungens	33	6.7	0.1	0.2	0.2	–	–	–	–
	Oenothera caespitosa	33	6.7	0.1	0.2	0.2	–	–	–	–
	Scrophularia	33	6.7	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	33	2.6	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Lichen	33	31.7	1.3	4	4	–	–	–	–
	Unknown Moss	33	1.6	0.1	0.2	0.2	–	–	–	–

Common Name: Rubber Rabbitbrush Scrub
Group Assignment: G310, G559; **Alliance Code:** A3196

Alliance Concept

The Rubber Rabbitbrush Scrub Alliance forms an open to continuous shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to intermittent. The alliance is found primarily along higher elevation washes and springs at various aspects; though, it also can found in other disturbed settings, e.g., after clearing or fire. Soils are typically alluvium derived from a variety of substrates including granodiorite, sandstone, and shale. Soils range from sand to loam. Elevations range from approximately 950 to 1950 meters. *Ericameria nauseosa* is dominant and characteristic in the shrub layer, or *Lepidospartum latisquamum* is dominant or co-dominant in the shrub layer. *Artemisia tridentata ssp. vaseyana, Atriplex confertifolia, Ephedra viridis, Eriogonum fasciculatum, Eriogonum heermannii, Gutierrezia microcephala, Hymenoclea salsola*, *Penstemon fructiformis,* and *Prunus fasciculata* are sometimes present at lower cover. *Achnatherum hymenoides, Amsinckia* sp., *Bromus rubens, Cryptantha* spp., *Elymus elymoides, Gilia* spp., and *Sphaeralcea ambigua* are sometimes to often found in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to continuous shrub layer with *Ericameria nauseosa* dominant. Rarely, *Lepidospartum squamatum* is dominant or co-dominant with other shrubs such as *Ericameria nauseosa*. The overall shrub cover ranges 7 to 99 percent.

Alliance Distribution

The alliance is well-defined in sampling in northern DEVA, and represented in MOJA by a few plots in the western part of the park. The alliance was not found in LAKE. The alliance occurred at mid to high elevations.

States: CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7), Southeastern Great Basin (10): 322Ab, 322Ac, 322Al, 341Fa, 341Fc, 341Fe

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Last Chance Range, Last Chance Vlly, Nelson Range, Nevada Triangle**; MOJA:** Mid Hills, New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ericameria nauseosa [CEGL002713]	1	–	–	x	–
Ericameria nauseosa Desert Wash [CEGL002261]	13	–	x	x	–
Lepidospartum latisquamum [CEPP006725]	3	–	x	–	–

Association Notes: The *Lepidospartum latisquamum* association is a provisional, new and relatively rare type that has been placed within the *Ericameria nauseosa* alliance since it occurs in similar higher elevation wash habitats, and *E. nauseosa* is often present in stands.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1655.5 m, Range 963 – 1929 m
- Aspect: N (1), NE (1), E (1), NW (2), SE (3), SW (4), S (5)
- Slope: Mean 6.1 degrees, Range 1 – 20 degrees
- Macro Topography: Channel bed (4), Low level/bottom (1), Lowslope (1), Midslope (7)
- Tree Cover: Mean 0.3%, Range 0 – 1.2%
- Shrub Cover: Mean 24.7%, Range 6.9 – 98.9%
- Herb Cover: Mean 5.2%, Range 0 – 34%
- Large Rock: Mean 12.6%, Range 0 – 60%
- Small Rock: Mean 51.2%, Range 2.7 – 94%
- Fines Cover: Mean 18.2%, Range 1.6 – 72%
- Litter Cover: Mean 16.2%, Range 0 – 81%
- Geology: alluvium (3), andesite (1), granodiorite (6), rhyolite (1), sandstone (3), shale (3)
- Soil Texture: Clay loam (2), Coarse sand (2), Loam (1), Loamy sand (2), Medium sand (1), Sand (5), Sandy clay (1), Sandy loam (2), Silty clay (1)

Environment: The Rubber Brush Scrub Alliance is found primarily along higher elevation washes and springs at various aspects; though, it is also can found in other disturbed settings, e.g., after clearing or fire. Soils are typically alluvium derived from a variety of substrates including granodiorite, sandstone, and shale. Soils range from sand to loam. Elevations range from mid to high.

Vegetation Description

Vegetation Structure: The alliance forms an open to continuous shrub layer and the overall shrub cover ranges from 7 to 99 percent. The tree layer is typically sparse, and the herb layer is sparse to intermittent. Non-vascular plants are typically sparse.

Vegetation Floristics: *Ericameria nauseosa* is dominant and characteristic in the shrub layer, or *Lepidospartum latisquamum* is dominant or co-dominant in the shrub layer. *Artemisia tridentata ssp. vaseyana, Atriplex confertifolia, Ephedra viridis, Eriogonum fasciculatum, Eriogonum heermannii, Gutierrezia microcephala, Hymenoclea salsola*, *Penstemon fructiformis,* and *Prunus fasciculata* are sometimes present at lower cover. *Achnatherum hymenoides, Amsinckia* sp., *Bromus rubens,Cryptantha* spp., *Elymus elymoides, Gilia* spp., and *Sphaeralcea ambigua* are sometimes to often found in the herbaceous layer.

Dynamics: *Ericameria nauseosa* is adapted to disturbance, whether naturally from intermittent flooding or disturbed by overgrazing, clearing, road cuts, or old mine tailings. It is also found at higher elevations after fire and is shorter-lived than other shrub species, such as *Artemisia tridentata,* which can overtake the rabbitbrush in a decade or more after fire.

Classification Comments

Ericameria nauseosa associations have been placed in the Intermountain Semi-Desert Steppe & Shrubland (G310) and Cool Semi-Desert Shrub & Herb Wash-Arroyo (G559) groups of the USNVC hierarchy. For the Mojave Network classification, we have combined these associations into one alliance in the G310 group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G5

State (California): S5

References

Evens et al. 2012, NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=17

LAKE (n=0)

DEVA (n=13): DEVA0146, DEVA0658, DEVA9217, DEVA9328, DEVA9445, DEVA9450, DEVA9553, DEVA9571, DEVA9574, DEVA9637, DEVA9665, MOJC0062, MOJC0631

MOJA (n=4): MOJA0352, MOJA9230, MOJC0014, MOJC0018

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ericameria nauseosa*	94.1	55	18	1	95	x	x	–	–
	Atriplex confertifolia	41.2	2.5	0.3	0.2	4	–	–	–	–
	Ephedra viridis	35.3	2.9	0.6	0.5	6	–	–	–	–
	Penstemon fruticiformis	35.3	3.1	0.3	0.2	3	–	–	–	–
	Prunus fasciculata	35.3	1.6	0.3	0.2	2	–	–	–	–
	Eriogonum heermannii	35.3	1.2	0.2	0.2	1	–	–	–	–
	Eriogonum fasciculatum	35.3	0.7	0.1	0.2	0.5	–	–	–	–
	Artemisia tridentata ssp. vaseyana	29.4	2.9	0.5	0.2	3	–	–	–	–
	Gutierrezia microcephala	29.4	2.4	0.3	0.2	3.5	–	–	–	–
	Hymenoclea salsola	29.4	0.8	0.1	0.2	1	–	–	–	–
Herb	*Bromus rubens*	58.8	10	1.5	0.2	10	–	–	–	x
	Elymus elymoides	41.2	2.3	0.2	0.2	1	–	–	–	–
	Sphaeralcea ambigua	41.2	1.2	0.1	0.2	0.5	–	–	–	–
	Achnatherum hymenoides	41.2	2.2	0.1	0.2	0.5	–	–	–	–
	Bromus tectorum	35.3	5.4	1.4	0.2	20	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Gilia*	35.3	2.4	0.2	0.6	0.6	–	–	–	–
	Amsinckia	35.3	1.3	0.1	0.2	0.2	–	–	–	–
	Cryptantha	29.4	6.1	0.3	0.6	1.5	–	–	–	–
	Cryptantha circumscissa	29.4	0.8	0.1	0.2	0.2	–	–	–	–

Common Name: Needleleaf Rabbitbrush Scrub
Group Assignment: G310; **Alliance Code:** A2540

Alliance Concept

The Needleleaf Rabbitbrush Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found on a variety of landforms and aspects. Soils are derived from alluvium, granodiorite, or rhyolite and textures were generally sandy. Elevations range from approximately 750 to 1850 meters. The dominant and characteristic shrub is *Ericameria teretifolia,* and those that are often present at lower cover include *Ephedra funerea* and *Eriogonum fasciculatum.* Dominant and characteristic herbs include *Bromus rubens,* and those often present are *Achnatherum speciosum, Cryptantha* spp.*, Phacelia* spp.*,* and *Sphaeralcea ambigua.*

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ericameria teretifolia* dominant. The overall shrub cover ranges from 5 to 55 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA and is represented by two samples in MOJA. It occurs from mid to high elevation. The alliance was not found in LAKE.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (6): 322Ab, 322Ad, 322Af, 322Al Southeastern Great Basin; (2): 341Ff

Park Sampling Zones: DEVA: Black Mtns, Death Valley, Green Water Rng/Vlly, Owlshead Mtns, Panamint Mtns**; MOJA:** Mid Hills, New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Ericameria teretifolia [CEGL002963]	8	–	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1396 m, Range 774 – 1829 m
- Aspect: NE (1), E (3), NW (1), SW (3), S (1)
- Slope: Mean 11.9 degrees, Range 2 – 29 degrees
- Macro Topography: Channel bed (1), Entire slope (3), High level/summit (1), High slope (1), Midslope (1)

- Tree Cover: Mean 0.1%, Range 0 – 1%
- Shrub Cover: Mean 27.3%, Range 5 – 55.2%
- Herb Cover: Mean 15.2%, Range 3 – 32%
- Large Rock: Mean 29.6%, Range 0 – 82.5%
- Small Rock: Mean 47.1%, Range 30 – 75%
- Fines Cover: Mean 18.1%, Range 0 – 62.5%
- Litter Cover: Mean 5.3%, Range 0 – 15%
- Geology: alluvium (4), granodiorite (1), rhyolite (5)
- Soil Texture: Coarse loamy sand (1), Medium to very fine sandy loam (1), Moderately coarse sandy loam (1), Sand (3)

Environment: The Needleleaf Rabbitbrush Scrub Alliance occurs on a variety of landforms and aspects. Soils are derived from alluvium, granodiorite, or rhyolite and textures were generally sandy. The alliance occurred at mid to high elevation.

Vegetation Description

Vegetation Structure: The alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 5 to 55 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse to open.

Vegetation Floristics: The dominant and characteristic shrubs is *Ericameria teretifolia,* and those that are often present at lower cover include *Ephedra funerea* and *Eriogonum fasciculatum.* Dominant and characteristic herbs include *Bromus rubens,* and those often present are *Achnatherum speciosum, Cryptantha* spp.*, Phacelia* spp.*,* and *Sphaeralcea ambigua.*

Dynamics: *Ericameria teretifolia* stands occur in upland areas that have recently had disturbance such as clearing, burning, and heavily grazed sites. They appear to be mid-seral and transition to longer-lived shrubland types such as *Coleogyne ramosissima* stands after a few decades post-disturbance.

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4
State (California): S4

References

Evens et al. 2012, Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=8
LAKE (n=0)

DEVA (n=6): DEVA9318, DEVAD012, DEVAD154, DEVAS107, DEVAS120, MOJC1003
MOJA (n=2): MOJC0249, MOJC1096
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ericameria teretifolia*	100	35	9.2	1	20	x	–	x	–
	Eriogonum fasciculatum	60	6.9	1.6	1	6	–	–	–	x
	Ephedra funerea	50	3	1.1	0.1	5	–	–	–	x
	Hymenoclea salsola	40	2	0.6	0.11	3	–	–	–	–
	Krascheninnikovia lanata	40	1.9	0.2	0.1	1	–	–	–	–
	Stephanomeria pauciflora	40	1.1	0.1	0.11	0.5	–	–	–	–
	Lycium	30	6.4	3	5	15	–	–	–	–
	Coleogyne ramosissima	30	3.1	1.5	0.11	10	–	–	–	–
	Atriplex canescens	30	3.2	1.3	1	10	–	–	–	–
	Ambrosia dumosa	30	7.4	1	1	5	–	–	–	–
	Lycium andersonii	30	2.6	0.3	0.5	2	–	–	–	–
	Salazaria mexicana	30	1.1	0.3	0.5	1	–	–	–	–
	Ephedra viridis	30	1.2	0.2	0.11	1	–	–	–	–
Herb	*Bromus rubens*	90	36	8.7	0.2	30	x	–	x	–
	Achnatherum speciosum	60	2.3	0.4	0.11	2	–	–	–	x
	Phacelia	50	8.5	1.8	0.22	10	–	–	–	x
	Sphaeralcea ambigua	50	2.9	0.7	0.11	5	–	–	–	x
	Cryptantha	50	0.8	0.2	0.3	0.33	–	–	–	x
	Xylorhiza tortifolia	30	3.7	0.1	0.1	1	–	–	–	–

Common Name: Snakeweed Scrub
Group Assignment: G310; **Alliance Code:** A3203

Alliance Concept

The Snakeweed Scrub Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse, and the herbaceous layer is sparse to open. The alliance is found primarily on a variety of landforms and aspects. Soils are derived from a variety of substrates and textures include clay loam, loam, and loamy sand. Elevations range from approximately 850 to 2050 meters. The dominant and characteristic shrub is *Gutierrezia sarothrae* or G. *microcephala,* and those that are often present at low cover include *Larrea tridentata* and *Opuntia polyacantha var. erinacea.* Dominant herbs include *Bromus rubens,* and characteristic herbs include *Bromus rubens,* and *Sphaeralcea ambigua,* and those often present are *Achnatherum speciosum, Bromus tectorum, Elymus elymoides, Erodium cicutarium* and *Pleuraphis rigida.*

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Gutierrezia sarothrae* or *G. microcephala* dominant. The overall shrub cover ranges from 6 to 10 percent.

Alliance Distribution

The alliance is well-defined in sampling at eastern MOJA and is represented in DEVA by one sample in Warm Springs Canyon in the Panamint Mountains. It was not field documented but was mapped in LAKE along the border with Grand Canyon - Parashant National Monument. It is found at mid to high elevations. An additional sample was collected in CAMO after the classification analysis and data summaries were complete and has been assigned to the *Gutierrezia (microcephala, sarothrae)* Association.

States: (AZ); CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Af, 322Aj, 322Ak, 322Al, (322Av)

Park Sampling Zones: DEVA: Panamint Mtns; (**LAKE:** Parashant); **MOJA:** (Castle Mtns,) Clark Mtn, Hackberry, Vontrigger, Mid Hills, New York Mtns

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Gutierrezia sarothrae / Pleuraphis rigida – Sphaeralcea ambigua [CEGL001543]	7	(x)	x	x	–
Gutierrezia (microcephala, sarothrae) [CEPP009523]	(1)	–	–	(x)	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1428m, Range 869 – 2022 m
- Aspect: N (3), NE (1), E (1), NW (1)
- Slope: Mean 18.5 degrees, Range 3 – 49 degrees
- Macro Topography: High level/summit (1), Lowslope (4), Midslope (2)
- Tree Cover: Mean 0.1%, Range 0 – 0.6%
- Shrub Cover: Mean 7.2%, Range 6.1 – 9.8%
- Herb Cover: Mean 17.4%, Range 0 – 35%
- Large Rock: Mean 24.4%, Range 0 – 96%
- Small Rock: Mean 56.1%, Range 2 – 92%
- Fines Cover: Mean 15.7%, Range 0 – 49%
- Litter Cover: Mean 3.7%, Range 2 – 7%
- Geology: alluvium (1), granodiorite (2), rhyolite (3), sandstone (1)
- Soil Texture: Clay loam (2), Loam (1), Loamy sand (1), Sandy loam (2)

Environment: The Snakeweed Scrub Alliance is found on a variety of landforms and aspects at mid to high elevations. Soils are derived from a variety of substrates and textures include clay loam, loam, and loamy sand.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 6 to 10 percent. The tree layer is typically sparse, and the herb layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: The dominant and characteristic shrubs is *Gutierrezia sarothrae* or G. *microcephala,* and those that are often present at low cover include *Larrea tridentata* and *Opuntia polyacantha var. erinacea.* Dominant herbs include *Bromus rubens,* and characteristic herbs include *Bromus rubens,* and *Sphaeralcea ambigua,* and those often present are *Achnatherum speciosum, Bromus tectorum, Elymus elymoides, Erodium cicutarium* and *Pleuraphis rigida.*

Dynamics: *Gutierrezia sarothrae* was the dominant sampled in the parks, though *G. microcephala* may be also found dominant in the region for this alliance. Stands have been sampled in recently burned areas and along steep cliffs with colluvial disturbance; they also have been observed in rocky minor drainages that are intermittently flooded in mountains.

Classification Comments

Stands in this alliance have *Gutierrezia* species apparently dominant in disturbed areas; though, a variety of other alliances can have *Gutierrezia* species co-dominant. This alliance is currently placed in G310 Intermountain Semi-Desert Steppe & Shrubland Group and related alliances are in G296 Mojave Mid-Elevation Mixed Desert Scrub Group in the USNVC hierarchy.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3

State (California): S3

References

NatureServe 2012, cf. Sawyer et al. 2009

Surveys (with Sample Sizes) Used in Description

MOJN: N=7 [+1]

LAKE (n=0); DEVA (n=1): DEVA9280; MOJA (n=6): MOJA0111, MOJA0322, MOJA9268, MOJA9269, MOJA9614, MOJA9615; MOJN-Johnson (n=0)

[CAMO (n=1): CAMO9200]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	28.6	18	0.1	0.2	0.21	–	–	–	–
	Juniperus osteosperma	28.6	5.4	0	0.01	0.2	–	–	–	–
Shrub	*Gutierrezia sarothrae*	100	45	3.1	2	5	x	–	x	–
	Larrea tridentata	57.1	5.4	0.5	0.01	3	–	–	–	x
	Opuntia polyacantha var. erinacea	57.1	1.6	0.1	0.2	0.2	–	–	–	x
	Cylindropuntia acanthocarpa	42.9	3.3	0.2	0.01	1.5	–	–	–	–
	Yucca schidigera	42.9	1.9	0.1	0.2	0.5	–	–	–	–
	Eriogonum wrightii	42.9	1.5	0.1	0.1	0.5	–	–	–	–
	Ephedra nevadensis	42.9	1.3	0.1	0.2	0.2	–	–	–	–
	Stephanomeria pauciflora	42.9	1.1	0.1	0.2	0.2	–	–	–	–
	Prunus fasciculata	42.9	0.9	0.1	0.01	0.2	–	–	–	–
	Ephedra viridis	28.6	1.4	0.1	0.2	0.5	–	–	–	–
	Eriogonum heermannii	28.6	0.8	0.1	0.2	0.2	–	–	–	–
	Krameria erecta	28.6	0.8	0.1	0.2	0.2	–	–	–	–
	Lycium andersonii	28.6	0.8	0.1	0.2	0.2	–	–	–	–
	Menodora scabra	28.6	0.8	0.1	0.2	0.2	–	–	–	–
	Salazaria mexicana	28.6	0.8	0.1	0.2	0.2	–	–	–	–
	Yucca baccata	28.6	0.9	0.1	0.2	0.2	–	–	–	–
	Ericameria cooperi	28.6	0.4	0	0.01	0.2	–	–	–	–
Herb	*Bromus rubens*	100	33	10	0.2	25	x	–	x	–
	Sphaeralcea ambigua	100	22	2.9	0.2	5	x	–	–	–
	Erodium cicutarium	71.4	2.9	0.8	0.2	5	–	–	–	x
	Pleuraphis rigida	71.4	3.4	0.7	0.2	3	–	–	–	x

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Bromus tectorum*	57.1	2.9	0.7	0.2	2	–	–	–	x
	Achnatherum speciosum	57.1	3	0.2	0.2	0.5	–	–	–	x
	Elymus elymoides	57.1	1.5	0.2	0.2	0.5	–	–	–	x
	Amsinckia	42.9	2	0.2	0.2	1	–	–	–	–
	Aristida purpurea	42.9	1.4	0.1	0.2	0.5	–	–	–	–
	Eriogonum inflatum	42.9	2.4	0.1	0.2	0.2	–	–	–	–
	Gilia	28.6	6.4	0.2	0.6	0.6	–	–	–	–
	Arabis	28.6	0.5	0.1	0.2	0.2	–	–	–	–
	Chaetopappa ericoides	28.6	0.7	0.1	0.2	0.2	–	–	–	–
	Hymenoxys cooperi	28.6	0.7	0.1	0.2	0.2	–	–	–	–
	Mirabilis multiflora	28.6	0.7	0.1	0.2	0.2	–	–	–	–
Non-vascular	Unknown Lichen	42.9	29	0.2	0.4	0.4	–	–	–	–
	Cryptogamic crust	28.6	19	0.1	0.2	0.2	–	–	–	–
	Unknown Moss	28.6	9.5	0.1	0.2	0.2	–	–	–	–

Common Name: Winterfat Scrubland
Group Assignment: G310; **Alliance Code:** A3202

Alliance Concept

The Winterfat Steppe & Dwarf-shrubland Alliance forms an open shrub layer. The emergent tree layer, when present, is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found on a variety of landforms and aspects, though usually alkaline flats around playas and along drainage terraces, plains, and old lakebeds above current drainages. Soils are derived from a variety of substrates including alluvium, rhyolite, and sandstone, and textures include clay loam, silt, and sandy loam. Elevations range from approximately 950 to 2050 meters. The dominant and characteristic shrub is *Krascheninnikovia lanata,* and those that are often present include *Atriplex confertifolia* and *Lycium andersonii.* Herbaceous plants often present are *Achnatherum hymenoides, Bromus rubens,* and *Sphaeralcea ambigua.* Cryptogamic crust is commonly associated with this vegetation alliance.

Diagnostic Criteria: This alliance is characterized by an open shrub layer with *Krascheninnikovia lanata* dominant. The overall shrub cover ranges from 6 to 25 percent.

Alliance Distribution

The alliance is well-defined in sampling in the northern portion of DEVA and in the Providence Mountain Range in MOJA. There was one sample from LAKE in the Willow Beach area. The elevations range from mid to high.

States: AZ, CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (3) 322Al, 322Av; Southeastern Great Basin (16): 341Fa, 341Fb, 341Fc, 341Fe, 341Ff

Park Sampling Zones: DEVA: CottonWood Mtns, Joshua Flat, Last Chance Range, Nelson Range, Panamint Mtns**; LAKE:** Willow Beach**; MOJA:** Lanfair Vlly, Mid Hills

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Krascheninnikovia lanata [CEGL001320]	18	x	x	x	x
Krascheninnikovia lanata (alliance)	2	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1503.2 m, Range 955 – 2017 m

- Aspect: Flat, Variable (2), N (4), NE (2), E (6), NW (1), SE (1), W (1), SW (1)
- Slope: Mean 7.5 degrees, Range 0 – 29 degrees
- Macro Topography: High level/summit (1), High slope (3), Low level/bottom (4), Lowslope (2), Midslope (4)
- Tree Cover: Mean 0.2%, Range 0 – 2.2%
- Shrub Cover: Mean 13.1%, Range 5.8 – 25.2%
- Herb Cover: Mean 7.7%, Range 1 – 39%
- Large Rock: Mean 2.5%, Range 0 – 12%
- Small Rock: Mean 60.7%, Range 0 – 95%
- Fines Cover: Mean 34.0%, Range 2 – 98%
- Litter Cover: Mean 1.8%, Range 0 – 5%
- Geology: alluvium (5), dolostone (dolomite) (3), granodiorite (1), limestone (1), rhyolite (3), sandstone (5), shale (1)
- Soil Texture: Clay loam (4), Loam (1), Loamy sand (3), Medium silt (1), Sandy clay (1), Sandy loam (5)

Environment: The alliance is found on a variety of landforms and aspects, though usually alkaline flats around playas and along drainage terraces, plains, and old lakebeds above current drainages. Sometimes stands are on north-facing slopes where soils have high clay content. Soils are derived from a variety of substrates including alluvium, rhyolite, and sandstone, and textures include clay loam, silt, and sandy loam. The alliance was found at mid to high elevations.

Vegetation Description

Vegetation Structure: The alliance forms an open shrub layer and the overall shrub cover ranges from 6 to 25 percent. The tree layer is typically sparse to open, and the herb layer is sparse to intermittent. Non-vascular plants are typically not present or sparse.

Vegetation Floristics: The dominant and characteristic shrub is *Krascheninnikovia lanata,* and those that are often present include *Atriplex confertifolia* and *Lycium andersonii.* Herbaceous plants often present are *Achnatherum hymenoides, Bromus rubens,* and *Sphaeralcea ambigua.* Cryptogamic crust is commonly associated with this vegetation alliance.

Dynamics: *Krascheninnikovia lanata* stands occur in a fine-scale matrix with other mid to high elevation shrubland alliances including *Artemisia tridentata, Atriplex canescens, Atriplex confertifolia, Coleogyne ramosissima, Grayia spinosa* and *Yucca brevifolia.*

Classification Comments

None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S2

References

Keeler-Wolf and Thomas 2000, NatureServe 2012, Root 1978, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=20 [+8]
LAKE (n=1): LAKE9310
DEVA (n=16): DEVA0134, DEVA0141, DEVA0233, DEVA9103, DEVA9106, DEVA9123, DEVA9142, DEVA9201, DEVA9246, DEVA9251, DEVA9255, DEVA9357, DEVAR031, DEVAR086, MOJC0042, MOJC0494
MOJA (n=2): MOJA9360, MOJA9810
MOJN-Johnson (n=1): MOJJE773
[MOJA-McAuliffe (n=8): MOJAA014, MOJAA024, MOJAA025, MOJAA026, MOJAA031, MOJAA032, MOJAA039, MOJAA077]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	26.3	26	0.2	0.2	2	–	–	–	–
Shrub	*Krascheninnikovia lanata*	100	56	7.6	2	25	x	x	–	–
	Lycium andersonii	52.6	6.4	0.7	0.2	4.5	–	–	–	x
	Atriplex confertifolia	52.6	4.4	0.5	0.2	2	–	–	–	x
	Ephedra nevadensis	42.1	0.9	0.1	0.2	0.5	–	–	–	–
	Picrothamnus desertorum	42.1	1	0.1	0.2	0.5	–	–	–	–
	Atriplex canescens	31.6	3.1	0.3	0.2	3	–	–	–	–
	Psorothamnus arborescens	31.6	1.4	0.1	0.2	1	–	–	–	–
	Menodora spinescens	26.3	2.7	0.2	0.2	3	–	–	–	–
	Acamptopappus shockleyi	26.3	2.4	0.2	0.2	3	–	–	–	–
Herb	*Achnatherum hymenoides*	63.2	8.3	0.3	0.2	3	–	–	–	x
	Sphaeralcea ambigua	63.2	2.9	0.2	0.2	1	–	–	–	x
	Bromus rubens	52.6	5.1	0.5	0.2	3	–	–	–	x
	Eriogonum inflatum	47.4	6.4	0.1	0.2	0.5	–	–	–	–
	Oxytheca perfoliata	42.1	4.3	0.3	0.2	2	–	–	–	–
	Amsinckia	42.1	4.6	0.2	0.2	2	–	–	–	–
	Xylorhiza tortifolia	36.8	2.2	0.1	0.2	1	–	–	–	–
	Gilia	31.6	3.3	0.2	0.6	0.6	–	–	–	–
	Pleuraphis jamesii	26.3	5.2	0.7	0.2	6	–	–	–	–
	Chaenactis	26.3	3.7	0.2	0.4	2	–	–	–	–
	Salsola	26.3	2	0.1	0.2	0.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Eriogonum nidularium*	26.3	0.8	0.1	0.2	0.2	–	–	–	–
	Phacelia fremontii	26.3	1.1	0.1	0.2	0.2	–	–	–	–
Non-vasc	Cryptogamic crust	57.9	54	0.1	0.2	0.2	–	–	–	x

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

Common Name: Indian Ricegrass - Bluebunch Wheatgrass - Sandhill Muhly Grassland
Group Assignment: G311, G775; **Alliance Code:** A1262, A4011

Alliance Concept

The Indian Ricegrass - Bluebunch Wheatgrass - Sandhill Muhly Grassland Alliance forms a sparse to intermittent herbaceous layer including perennial graminoids. The shrub layer is sparse and the tree layer, if present, is sparse. The alliance is found primarily along sand dunes and sand sheets, often with north and northwest aspects, though sometimes on sandy alluvium. Soils are derived from alluvium and textures fine to medium sand. Elevations range from approximately 900 to (3400) meters. *Achnatherum hymenoides* is characteristically present and may be co-dominant to dominant in the herbaceous layer with other herbs such as *Sphaeralcea ambigua* at low cover. Those often present are *Oenothera deltoides* and *Salsola* spp. In the shrub layer, *Psorothamnus* spp. is sometimes present. Rarely, *Sporobolus contractus* is co-dominant with other grasses including *Muhlenbergia porteri.*

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent herbaceous layer with *Achnatherum hymenoides* characteristically present, co-dominant or dominant. The overall herbaceous cover ranges from 1.5 to 34 percent cover.

Alliance Distribution

The alliance was sampled at DEVA near the Eureka Dunes at mid elevations, and stands have also been observed in MOJA such as at Devil's Playground and Kelso Dunes. Stands are also likely to occur at LAKE in sandy areas.

States: CA

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

Park Sampling Zones: DEVA: Eureka Valley, (Inyo and Coso Mtns); **MOJA:** (Devil's Playground)

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Achnatherum hymenoides–Oenothera deltoides [CEGL002343]	3	–	x	–	–

Association Notes: The association with *Achnatherum hymenoides* was previously denoted as *Achnatherum hymenoides – Sphaeralcea ambigua* Association (Keeler-Wolf and Thomas 2000), which we have renamed. Also, another association with limited occurrence, including the eastside of the New York Mountains, was identified recently on sandy, alluvial terraces above ephemeral streams; it is noted as *Muhlenbergia porteri – Sporobolus contractus* Association (McAuliffe 2016). We tentatively place this association in this mixed graminoid alliance with *Achnatherum hymenoides.* However, the *Hymenoclea salsola - Bebbia juncea* Mojave-Sonoran Desert Wash Shrubland Alliance may be a better ecological placement for this association, yet further data compilation and comparison is needed to make this determination.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 921 m, Range 914 – 930 m
- Aspect: N (2), NW (1)
- Slope: Mean 1 degrees, Range 1 – 1 degrees
- Macro Topography:
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0.5%, Range 0 – 1.5%
- Herb Cover: Mean 12.8%, Range 1.5 – 34%
- Large Rock: Mean 0%, Range 0 – 0.2%
- Small Rock: Mean 28.5%, Range 10 – 37.7%
- Fines Cover: Mean 62.5%, Range 62.5 – 62.5%
- Litter Cover: Mean 3.5%, Range 0.2 – 10%
- Geology: alluvium (3)
- Soil Texture: Fine sand (1), Medium sand (2)

Environment: The alliance occurs at mid elevations in sandy areas including sand dunes and sheets. Aspects include north and northwest. Soils are fine to medium sand derived from alluvium.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to intermittent herbaceous layer, and the overall herbaceous cover ranges from 1.5 to 34 percent cover. The shrub layer is typically sparse. The tree layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: *Achnatherum hymenoides* is characteristically present and may be co-dominant to dominant in the herbaceous layer with other herbs such as *Sphaeralcea ambigua.* Those often present are *Oenothera deltoides* and *Salsola* spp. In the shrub layer, *Psorothamnus* spp. is sometimes present. Rarely, *Sporobolus contractus* is co-dominant with other grasses including *Muhlenbergia porteri.*

Dynamics: *Achnatherum hymenoides* stands occur throughout the Great Basin, but are rare in the Mojave Desert. Stands occur along sandy areas, including sand dunes and flats, and can tolerate low

nutrient and water levels. Along Death Valley Highway near the junction of Darwin Road, *Acnatherum hymenoides* can locally dominate on degraded areas of *Atriplex confertifolia.*

Classification Comments

Acnatherum hymenoides associations are currently placed in the Intermountain Semi-Desert Grassland Group (G311) and the Intermountain Sparsely Vegetated Dune Scrub & Grassland (G775). For this Mojave Desert Network classification, we have described one alliance in the G311 group.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G4

State (California): S1

References

Buck-Diaz et al. 2012, cf. Keeler-Wolf and Thomas 2000, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=3

LAKE (n=0)

DEVA (n=3): MOJC0626, MOJC0627, MOJC1238

MOJA (n=0)

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Unknown	Unknown	33	33	0.2	0.5	0.5	–	–	–	–
Shrub	*Psorothamnus*	33	33	0.5	1.5	1.5	–	–	–	–
Herb	*Achnatherum hymenoides*	100	27	4	0.5	11	x	–	–	–
	Sphaeralcea ambigua	100	19	1	0.5	2	x	–	–	–
	Salsola	67	32	7.5	0.5	22	–	–	–	x
	Oenothera deltoides	67	6	0.3	0.5	0.5	–	–	–	x
	Abronia	33	5.6	0.2	0.5	0.5	–	–	–	–
	Baileya pleniradiata	33	5.6	0.2	0.5	0.5	–	–	–	–
	Oenothera	33	5.6	0.2	0.5	0.5	–	–	–	–

Common Name: Desert Needlegrass Grassland
Group Assignment: G311, G296; **Alliance Code:** A1290

Alliance Concept

The Desert Needlegrass Grassland Alliance forms an open herbaceous layer. The shrub layer is open and the tree layer, if present, is sparse. The alliance is found on alluvial fans and channel beds at south aspects. In the one stand sampled, the soils are derived from sandstone, textures are loamy sand, and the elevation is 1527 meters. *Achnatherum speciosum* is dominant or co-dominant in stands, and other herbs present can include *Mentzelia* spp., *Cryptantha* spp., and *Eriogonum* spp. Associated emergent shrubs at open cover can include *Ericameria laricifolia, Atriplex confertifolia, Brickellia arguta, Brickellia microphylla, Echinocactus polycephalus, Echinocereus engelmannii, Ephedra viridis, Ericameria cuneata, Eriogonum fasciculatum, Gutierrezia sarothrae,* and *Stephanomeria pauciflora.*

Diagnostic Criteria: This alliance is characterized by an open herbaceous layer with *Achnatherum speciosum* dominant or co-dominant. The overall herbaceous cover is 10 percent cover.

Alliance Distribution

The alliance was sampled once in the study area. It occurs in DEVA in the Last Chance Range at high elevation. It has also been observed in the Panamint Mountains, and is likely to occur in MOJA in post-burn sites.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Fc

Park Sampling Zones: DEVA: Last Chance Range, (Panamint Mtns); [**MOJA:** New York Mtns]

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Achnatherum speciosum Shrub Herbaceous [CEGL003113]	1	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 1527 m
- Aspect: S (1)
- Slope: 10 degrees
- Macro Topography: Channel bed (1)

- Tree Cover: 0%
- Shrub Cover: 4.2%
- Herb Cover: 10%
- Large Rock: 23%
- Small Rock: 75%
- Fines Cover: 1%
- Litter Cover: 1%
- Geology: sandstone (1)
- Soil Texture: Loamy sand (1)

Environment: The alliance occurs at mid- to high elevations. The one stand sampled had a south aspect in a drainage channel of the Last Chance Range. Soils are loamy sand derived from sandstone. The alliance has also been observed in the Panamint Mountains.

Vegetation Description

Vegetation Structure: The alliance forms an open herbaceous layer, and the overall herbaceous cover is 10 percent cover. The shrub layer is sparse to open. The tree layer and non-vascular plants, when present, are sparse.

Vegetation Floristics: *Achnatherum speciosum* is dominant or co-dominant in the herbaceous layer, and other herbs present can include *Mentzelia* spp., *Cryptantha* spp., and *Eriogonum* spp. Associated emergent shrubs at open cover include *Ericameria laricifolia, Atriplex confertifolia, Brickellia arguta, Brickellia microphylla, Echinocactus polycephalus, Echinocereus engelmannii, Ephedra viridis, Ericameria cuneata, Eriogonum fasciculatum, Gutierrezia sarothrae,* and *Stephanomeria pauciflora.*

Dynamics: *Achnatherum speciosum* alliance is uncommon. Surrounding shrub vegetation is often well stocked with *A. speciosum* suggesting that with appropriate fire intensity and frequency, stands of *A. speciosum* could increase. Adjacent stands often include *Artemesia tridentata, Eriogonum fasciculatum,* and *Coleogyne ramosissima.*

Classification Comments

Acnatherum speciosum associations are currently placed in the Intermountain Semi-Desert Grassland Group (G311) and the Mojave Mid-Elevation Mixed Desert Scrub Group (G296). For this Mojave Desert Network classification, we have described this in one alliance in the G311 group.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: G4
State (California): S2

References

NatureServe 2012, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=1

LAKE (n=0); DEVA (n=1): DEVA0301; MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Ericameria laricifolia*	100	43	1.5	1.5	1.5	x	–	x	–
	Atriplex confertifolia	100	5.7	0.2	0.2	0.2	x	–	–	–
	Brickellia arguta	100	5.7	0.2	0.2	0.2	x	–	–	–
	Brickellia microphylla	100	5.7	0.2	0.2	0.2	x	–	–	–
	Echinocactus polycephalus	100	5.7	0.2	0.2	0.2	x	–	–	–
	Echinocereus engelmannii	100	5.7	0.2	0.2	0.2	x	–	–	–
	Ephedra viridis	100	5.7	0.2	0.2	0.2	x	–	–	–
	Ericameria cuneata	100	5.7	0.2	0.2	0.2	x	–	–	–
	Eriogonum fasciculatum	100	5.7	0.2	0.2	0.2	x	–	–	–
	Gutierrezia sarothrae	100	5.7	0.2	0.2	0.2	x	–	–	–
	Stephanomeria pauciflora	100	5.7	0.2	0.2	0.2	x	–	–	–
Herb	*Achnatherum speciosum*	100	48	8	8	8	x	–	x	–
	Mentzelia	100	12	2	2	2	x	–	–	–
	Cryptantha	100	7.1	1.2	1.2	1.2	x	–	–	–
	Eriogonum	100	2.4	0.4	0.4	0.4	x	–	–	–
	Achnatherum hymenoides	100	1.2	0.2	0.2	0.2	x	–	–	–
	Antheropeas	100	1.2	0.2	0.2	0.2	x	–	–	–
	Bromus rubens	100	1.2	0.2	0.2	0.2	x	–	–	–
	Camissonia refracta	100	1.2	0.2	0.2	0.2	x	–	–	–
	Chaenactis stevioides	100	1.2	0.2	0.2	0.2	x	–	–	–
	Chorizanthe brevicornu	100	1.2	0.2	0.2	0.2	x	–	–	–
	Chorizanthe rigida	100	1.2	0.2	0.2	0.2	x	–	–	–
	Cryptantha circumscissa	100	1.2	0.2	0.2	0.2	x	–	–	–
	Cryptantha nevadensis	100	1.2	0.2	0.2	0.2	x	–	–	–
	Cryptantha pterocarya	100	1.2	0.2	0.2	0.2	x	–	–	–
	Cryptantha utahensis	100	1.2	0.2	0.2	0.2	x	–	–	–
	Dasyochloa pulchella	100	1.2	0.2	0.2	0.2	x	–	–	–
	Eriogonum inflatum	100	1.2	0.2	0.2	0.2	x	–	–	–
	Eriogonum nidularium	100	1.2	0.2	0.2	0.2	x	–	–	–
	Erodium cicutarium	100	1.2	0.2	0.2	0.2	x	–	–	–
	Gilia latiflora	100	1.2	0.2	0.2	0.2	x	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Langloisia setosissima*	100	1.2	0.2	0.2	0.2	x	–	–	–
	Malacothrix glabrata	100	1.2	0.2	0.2	0.2	x	–	–	–
	Oxytheca perfoliata	100	1.2	0.2	0.2	0.2	x	–	–	–
	Phacelia crenulata	100	1.2	0.2	0.2	0.2	x	–	–	–
	Phacelia fremontii	100	1.2	0.2	0.2	0.2	x	–	–	–
	Pleuraphis rigida	100	1.2	0.2	0.2	0.2	x	–	–	–
	Sphaeralcea ambigua	100	1.2	0.2	0.2	0.2	x	–	–	–
	Stylocline	100	1.2	0.2	0.2	0.2	x	–	–	–
	Vulpia	100	1.2	0.2	0.2	0.2	x	–	–	–
	Xylorhiza tortifolia	100	1.2	0.2	0.2	0.2	x	–	–	–
Non-vascular	Cryptogamic crust	100	100	0.2	0.2	0.2	x	x	–	–

Common Name: James' Galleta Grassland
Group Assignment: G311; **Alliance Code:** A1287

Alliance Concept

The James' Galleta Grassland Alliance forms an open herbaceous layer. The shrub layer is open and the tree layer is sparse. The alliance is found primarily on midslopes to summits on all aspects. Soils are derived from a variety of substrates and textures range from fine silty clay to fine sand. Elevation ranges from approximately 650 to 1650 (2800) meters. *Pleuraphis jamesii* is dominant or co-dominant, and characteristic herbs include *Erodium cicutarium.* Those often present are *Bouteloa* spp., *Bromus rubens, Eriogonum inflatum,* and *Sphaeralcea ambigua.* Commonly associated emergent shrubs at sparse to open cover include *Lycium andersonii* and *Opuntia polyacantha* var. *erinacea. Yucca brevifolia* is sometimes found in the tree layer.

Diagnostic Criteria: This alliance is characterized by an open herbaceous layer with *Pleuraphis jamesii* or *Bouteloa* spp. dominant or co-dominant. The overall herbaceous cover ranges from 4 to 32 percent cover.

Alliance Distribution

The alliance was sampled at MOJA at mid to upper elevations. It was found scattered around the Providence, New York and Piute Mountains.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (7): 322Ai, 322Al

Park Sampling Zones: MOJA: (Castle Mtns), HackberryVontrigger, Kelso Dunes, Lanfair Vlly, New York Mtns, Piute Range

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Pleuraphis jamesii [CEGL001777]	8 (4)	–	–	x	x
Bouteloua eriopoda – Pleuraphis jamesii [CEGL001751]	5 (14)	–	–	x	x
Scleropogon brevifolius – Pleuraphis jamesii – Bouteloua eriopoda [CEGL006755]	(2)	–	–	(x)	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1375.5 m, Range 654 – 1620 m
- Aspect: N (1), E (3), SE (3), W (1), SW (2), S (2)

- Slope: Mean 7.4 degrees, Range 1 – 27 degrees
- Macro Topography: High level/summit (1), Midslope (2)
- Tree Cover: Mean 0.2%, Range 0 – 1%
- Shrub Cover: Mean 4.4%, Range 0.5 – 9.4%
- Herb Cover: Mean 15.4%, Range 4 – 32%
- Large Rock: Mean 0.8%, Range 0 – 2.7%
- Small Rock: Mean 51.4%, Range 0 – 90%
- Fines Cover: Mean 41.6%, Range 10 – 87.5%
- Litter Cover: Mean 1.7%, Range 0.2 – 2.5%
- Geology: alluvium (1), dune sand (1), granodiorite (1), rhyolite (4)
- Soil Texture: Fine sand (1), Fine silty clay (1), Loam (2), Loamy sand (1), Sandy loam (1), Silty clay (1)

Environment: The alliance occurs at mid to upper elevations on midslopes to summits at all aspects. Soil textures range from silty clay to sand.

Vegetation Description

Vegetation Structure: The alliance forms an open herbaceous layer, and the overall herbaceous cover ranges from 4 to 32 percent cover. The tree layer is typically sparse, and the shrub layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: *Pleuraphis jamesii* is dominant or co-dominant in the herbaceous layer, and characteristic herbs include *Erodium cicutarium.* Those often present are *Bouteloa* spp., *Bromus rubens, Eriogonum inflatum,* and *Sphaeralcea ambigua.* Those herbs that may be co-dominant include *Bouteloua eriopoda, Bouteloua gracilis, Bromus rubens, Erodium cicutarium,* and *Muhlenbergia porteri.* The shrub layer is emergent and typically or often includes *Lycium andersonii, Ephedra nevadensis, Gutierrezia sarothrae,* and *Opuntia polyacantha* var. *erinacea*. *Yucca brevifolia* is sometimes found in the tree layer.

Dynamics: The alliance is uncommon in the Mojave Desert, but extends into the Great Basin. The alliance forms small patches in associated shrubland stands of *Artemesia tridentata, Coleogyne ramosissima, Ericameria nauseosa, Krascheninnikovia lanata, Ephedra nevadensis, Mendora spinescens, Yucca schidigera,* and *Yucca brevifolia.* Some stands may be established and maintained by disturbances, such as livestock grazing and fire in desert landscapes.

Classification Comments

Additional representation of this grassland vegetation is summarized by McAuliffe (2016).

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: G3
State (California): S2

References

McAuliffe 2016, Keeler-Wolf and Thomas 2000, NatureServe 2012, Thomas et al. 2004, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=13 [+6]
LAKE (n=0)
DEVA (n=0)
MOJA (n=7): MOJA0275, MOJA9280, MOJA9613, MOJC0020, MOJC1098, MOJC1101, MOJC1205
MOJN-Johnson (n=6): MOJJE242, MOJJE569, MOJJE570, MOJJE571, MOJJE572, MOJJE763
[CAMO (n=6): CAMO0115, CAMO0116, CAMO0117, CAMO8103, CAMO9125, CAMO9135]
[MOJA-McAuliffe (n=17): MOJAA012, MOJAA013, MOJAA019, MOJAA021, MOJAA042, MOJAA050, MOJAA051, MOJAA052, MOJAA055, MOJAA056, MOJAA059, MOJAA060, MOJAA061, MOJAA063, MOJAA064, MOJAA065, MOJAA069]

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Unknown	Unknown	29	29	0.1	0.5	0.5	–	–	–	–
Tree	*Yucca brevifolia*	29	29	0.2	0.5	1	–	–	–	–
Shrub	*Opuntia polyacantha var. erinacea*	71	5.2	0.2	0.2	0.5	–	–	–	x
	Lycium andersonii	57	5.1	0.2	0.2	0.5	–	–	–	x
	Gutierrezia sarothrae	43	17	1.3	1	5	–	–	–	–
	Ephedra nevadensis	43	5.7	0.4	0.2	1.5	–	–	–	–
	Yucca schidigera	43	5.6	0.3	0.5	1	–	–	–	–
	Cylindropuntia acanthocarpa	43	4.2	0.2	0.2	1	–	–	–	–
	Krameria erecta	43	4.8	0.2	0.5	0.5	–	–	–	–
	Larrea tridentata	43	3.5	0.2	0.5	0.5	–	–	–	–
	Stephanomeria pauciflora	43	4.4	0.2	0.2	0.5	–	–	–	–
	Eriogonum fasciculatum	43	1.4	0.1	0.2	0.5	–	–	–	–
	Ericameria cooperi	29	4.2	0.3	0.2	2	–	–	–	–
	Psilostrophe cooperi	29	1	0.1	0.2	0.5	–	–	–	–
	Echinocereus engelmannii	29	0.7	0.1	0.2	0.2	–	–	–	–
	Salazaria mexicana	29	0.7	0.1	0.2	0.2	–	–	–	–
	Salvia dorrii	29	0.8	0.1	0.2	0.2	–	–	–	–
	Yucca baccata	29	0.8	0.1	0.2	0.2	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Pleuraphis jamesii*	100	45	8.3	3	13	x	–	x	–
	Erodium cicutarium	86	19	3.1	0.5	8	x	–	–	–
	Bromus rubens	71	12	2.3	0.5	10	–	–	–	x
	Sphaeralcea ambigua	71	1.7	0.3	0.2	0.5	–	–	–	x
	Eriogonum inflatum	57	2.1	0.4	0.5	1	–	–	–	x
	Aristida purpurea	43	0.9	0.2	0.2	1	–	–	–	–
	Amsinckia	43	0.4	0.1	0.2	0.2	–	–	–	–
	Bouteloua eriopoda	29	3.7	1	2	5	–	–	–	–
	Cryptantha	29	0.6	0.2	0.6	0.6	–	–	–	–
	Calochortus kennedyi	29	1.1	0.1	0.5	0.5	–	–	–	–
	Xylorhiza tortifolia	29	0.5	0.1	0.2	0.5	–	–	–	–
	Calochortus	29	0.2	0.1	0.2	0.2	–	–	–	–
	Eriastrum	29	0.2	0.1	0.2	0.2	–	–	–	–
	Muhlenbergia porteri	29	0.2	0.1	0.2	0.2	–	–	–	–

Common Name: Globemallow Dry Meadow
Group Assignment: G311; **Alliance Code:** A4216

Alliance Concept

The Globemallow Dry Meadow Alliance forms a sparse to intermittent herbaceous layer. The shrub layer is open and the tree layer is sparse. The alliance is found from valley bottoms and channel beds to summits at all aspects, especially in post-burn areas and along rocky lava flows. Soils are derived from a variety of substrates and textures are variable. Elevations range from approximately 750 to 1950 meters. The characteristic herb is *Sphaeralcea ambigua* in the stands sampled however, sometimes *Descurainia pinnata* can be dominant. Those often present are non-natives *Bromus rubens* and *Erodium cicutarium.* Other herbs sometimes present include *Achnatherum speciosum, Amsinckia tessellata, Bromus tectorum, Cryptantha* spp., *Eriogonum inflatum, Eriogonum nidularium,* and *Salvia columbariae.* Shrubs that are sometimes present at low cover include *Thamnosma montana, Lycium andersonii, Stephanomeria pauciflora, Coleogyne ramosissima, Eriogonum fasciculatum, Gutierrezia sarothrae,* and *Larrea tridentata.*

Diagnostic Criteria: This alliance is characterized by a sparse to intermittent herbaceous layer with *Sphaeralcea ambigua* characteristically present and variable in cover. The overall herbaceous cover ranges from 0.2 to 46 percent cover.

Alliance Distribution

The alliance is well-defined with sampling from two Parks. It is scattered at mid to upper elevations throughout MOJA and in DEVA in the Black and Panamint Mountains.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (12): 322Ad, 322Aj, 322Al; Southeastern Great Basin (1): 341Ff

Park Sampling Zones: DEVA: Black Mtns, Panamint Mtns**; MOJA:** Baker-Halloran, Cinder Cones, Mid Hills, New York Mtns, Piute Range, Woods Mtns

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Descurainia pinnata	(2)	–	(x)	–	–
Sphaeralcea (ambigua, coccinea, parvifolia) (alliance)	1	–	–	x	–
Sphaeralcea ambigua [CEPP009532]	13	–	x	x	x

Association Notes: The *Descurainia pinnata* Association is provisional, often found in valley bottoms that fluctuate in annual rainfall as well as in composition and abundance of plants. One

sample, identified at alliance level, is found on a steep, rocky lava field, and another sample is in a valley bottom with high cover of *Lupinus* and *Mentzelia* spp. with characteristic presence of the *Sphaeralcea ambigua.*

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1376.4 m, Range 792 – 1913 m
- Aspect: Flat, Variable (1), N (1), NE (3), E (1), SE (1), SW (2), W (1), S (5)
- Slope: Mean 9.2 degrees, Range 0 – 25 degrees
- Macro Topography: Channel bed (1), High level/summit (1), High slope (1), Low level/bottom (1), Lowslope (4), Midslope (4)
- Tree Cover: Mean 0%, Range 0 – 0.5%
- Shrub Cover: Mean 0.9%, Range 0.2 – 2%
- Herb Cover: Mean 8.9%, Range 0.2 – 46%
- Large Rock: Mean 20.5%, Range 0 – 70%
- Small Rock: Mean 48.6%, Range 0 – 97.5%
- Fines Cover: Mean 25.5%, Range 1 – 95%
- Litter Cover: Mean 2.7%, Range 0 – 7%
- Geology: alluvium (1), granodiorite (4), rhyolite (5), sandstone (3), tephrite (basanite) (1)
- Soil Texture: Clay loam (1), Loam (2), Sand (1), Sandy loam (4), Silt (1)

Environment: The alliance occurs at mid to upper elevations on various landforms including valley bottoms and channel beds to summits at all aspects, especially in post-burn areas and rocky lava flows. Soil texture is variable and derived from a variety of substrates.

Vegetation Description

Vegetation Structure: The alliance forms a sparse to intermittent herbaceous layer, and the overall herbaceous cover ranges from 0.2 to 46 percent cover. The tree layer is typically sparse, and the shrub layer is sparse to open. Non-vascular plants are typically sparse.

Vegetation Floristics: The characteristic herb is *Sphaeralcea ambigua,* which is variable in cover along with other herbs; however, sometimes *Descurainia pinnata* can be dominant. Those often present are non-natives *Bromus rubens* and *Erodium cicutarium.* Other herbs sometimes present include *Achnatherum speciosum, Amsinckia tessellata, Bromus tectorum, Cryptantha* spp., *Eriogonum inflatum, Eriogonum nidularium,* and *Salvia columbariae.* Shrubs that are sometimes present at low cover include *Thamnosma montana, Lycium andersonii, Stephanomeria pauciflora, Coleogyne ramosissima, Eriogonum fasciculatum, Gutierrezia sarothrae,* and *Larrea tridentata.*

Dynamics: *Sphaeralcea ambigua* and various other native desert herbs including *Salvia columbariae* readily germinate after disturbance, including fire, and interannual cover varies depending on moisture availability. Burned areas in the vegetation surveys sometimes had less cover of *Sphaeralcea ambigua* (sometimes less than 5%), while some unburned valley bottoms had a dense cover (up to 20%) of *Sphaeralcea ambigua*. However, burned sites often host an abundance of these forbs and other herbaceous species, such as *Achatherum speciosum, Bromus rubens, Eriogonum* spp.,

and *Erodium cicutarium* as well as short-lived shrubs such as *Gutierrezia microcephala* and *G. sarothrae* (Abella 2010, Shryock et al. 2014). Early seral herbaceous stands can naturally transition to shrub and then tree stands within 10-50+ years after disturbance, though invasion by non-natives, including *Bromus rubens,* can act as principal fuels and increase fire threat.

Classification Comments
None.

Classification Confidence of Alliance: Moderate

Conservation Status Rank
Global: GNR
State (California): S4

References
Abella 2010

Surveys (with Sample Sizes) Used in Description
MOJN: N=15
LAKE (n=0)
DEVA (n=7): DEVAS135, DEVAS136, DEVAS138, DEVAS139, DEVAS147, DEVA9163, [SLTN0773]
MOJA (n=8): MOJA9108, MOJA9160, MOJA9175, MOJA9294, MOJA9512, MOJA9604, MOJC1099, MOJC1100
MOJN-Johnson (n=1): MOJJE278

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Shrub	*Thamnosma montana*	43	5.4	0.2	0.1	1	–	–	–	–
	Lycium andersonii	43	4.9	0.1	0.1	0.5	–	–	–	–
	Stephanomeria pauciflora	43	6.7	0.1	0.2	0.5	–	–	–	–
	Coleogyne ramosissima	36	4.8	0.1	0.1	0.5	–	–	–	–
	Eriogonum fasciculatum	36	3.4	0.1	0.1	0.2	–	–	–	–
	Gutierrezia sarothrae	29	4.1	0.1	0.1	1	–	–	–	–
	Larrea tridentata	29	3.3	0.1	0.1	0.5	–	–	–	–
Herb	*Sphaeralcea ambigua*	100	11	1	0.1	4.5	x	–	–	–
	Bromus rubens	71	9.4	0.8	0.1	4	–	–	–	x
	Erodium cicutarium	50	18	1.8	0.2	10	–	–	–	x
	Cryptantha	36	4.5	0.2	0.3	0.6	–	–	–	–
	Eriogonum inflatum	36	1.7	0.1	0.1	0.5	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb (cont.)	*Salvia columbariae*	36	1.6	0	0.1	0.2	–	–	–	–
	Eriogonum nidularium	36	1.7	0	0.1	0.1	–	–	–	–
	Achnatherum speciosum	29	0.8	0.1	0.1	0.5	–	–	–	–
	Bromus tectorum	29	1.2	0.1	0.1	0.5	–	–	–	–
	Amsinckia	29	1.1	0.1	0.1	0.2	–	–	–	–
	Antheropeas	29	1.3	0	0.1	0.1	–	–	–	–

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

Ephedra viridis Colorado Plateau Shrubland Alliance

Common Name: Mormon Tea Scrub
Group Assignment: G312; **Alliance Code:** A3201

Alliance Concept

The Mormon Tea Scrub Alliance forms an open to intermittent shrub layer. The emergent tree layer is typically sparse to open, and the herbaceous layer is sparse to open. The alliance is found on upland sites at various aspects typically in higher elevations along mountain slopes. Elevations range from approximately 600 to 2150 meters. Soils are rocky and well-drained, derived from a variety of substrates including granodiorite, rhyolite and shale, and textures include clay loam, loamy sand,and silt loam. *Ephedra viridis* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Purshia tridentata* var. *glandulosa. Achnatherum speciosum* and *Bromus tectorum* are often present in the herbaceous layer.

Diagnostic Criteria: This alliance is characterized by an open to intermittent shrub layer with *Ephedra viridis* dominant or co-dominant. The overall shrub cover ranges from 3 to 35 percent.

Alliance Distribution

The alliance is well-defined in sampling at DEVA, with points scattered throughout the park. There are two samples from LAKE in the Boulder Canyon area, and there is one plot from MOJA near Kessler Peak. It was found at mid to high elevation.

States: AZ, CA, NV

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (5): 322Ac, 322Ad, 322Aj, 322Av, 322Ay; Southeastern Great Basin (13): 341Fc, 341Fd, 341Ff, 341Fg

Park Sampling Zones: DEVA: CottonWood Mtns, Grapevine Mtns, Green Water Rng/Vlly, Joshua Flat, Nelson Range, Nevada Triangle, Owlshead Mtns**; LAKE:** Callville, Willow Beach**; MOJA:** Ivanpah Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Ephedra viridis [CEPP006703]	7	x	x	x	–
Ephedra viridis–Purshia glandulosa [CEPP006702]	11	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 1643.7 m, Range 613 – 2139 m
- Aspect: N (4), NE (5), NW (2), SE (1), SW (1), S (3)
- Slope: Mean 22.9 degrees, Range 2 – 38 degrees
- Macro Topography: Channel bed (1), High level/summit (1), High slope (4), Lowslope (3), Midslope (7)
- Tree Cover: Mean 0.3%, Range 0 – 2%
- Shrub Cover: Mean 17.8%, Range 3.0 – 35.1%
- Herb Cover: Mean 4.8%, Range 0 – 22%
- Large Rock: Mean 34.5%, Range 0.2 – 94%
- Small Rock: Mean 47.3%, Range 0 – 89%
- Fines Cover: Mean 9.3%, Range 0 – 41%
- Litter Cover: Mean 8.3%, Range 0 – 48%
- Geology: alluvium (1), claystone (1), granodiorite (7), limestone (1), rhyolite (5), shale (1)
- Soil Texture: Clay loam (4), Loamy sand (2), Sand (1), Sandy loam (2), Silt loam (1)

Environment: The alliance is found on upland sites at vaious aspects primarily in higher elevations of the Mojave Desert along mountain slopes. Soils are typically rocky and well-drained, derived from a variety of substrates including granodiorite, rhyolite and shale, and textures include clay loam, loamy sand,and silt loam.

Vegetation Description

Vegetation Structure: The Alliance forms an open to intermittent shrub layer and the overall shrub cover ranges from 3 to 35 percent. The tree layer is typically sparse to open, and the herb layer is sparse to open. Non-vascular plants are sparse to intermittent

Vegetation Floristics: *Ephedra viridis* is dominant or co-dominant in the shrub layer, and those shrubs often present include *Purshia tridentata* var. *glandulosa. Achnatherum speciosum* and *Bromus tectorum* are often present in the herbaceous layer.

Dynamics: *Ephedra viridis* stands occur primarily on well-drained, rocky and shallow soils including steep slopes, as compared to related *Artemisia tridentata* stands that tolerate moister and deeper soils and residual alluvium.

Classification Comments

Associations with *Ephedra viridis* dominant or codominant are currently placed in two Groups in the USNVC hierachy: Colorado Plateau Blackbrush - Mormon-tea Shrubland Group (G312) and Intermountain Basins Cliff, Scree & Badland Sparse Vegetation Group (G570). Similarities between these two groups and related alliances/associations will undergo further review. For the Mojave Network classification, we have placed associations into one alliance in the G312 group. However, the stands sampled are also related to Mojave Mid-Elevation Mixed Desert Scrub (G296).

Additionally, associations of one or more *Ephedra* spp. co-dominant with *Artemisia tridentata* have been currently placed in a mixed *Artemisia tridentata* alliance per the USNVC hierarchy. However, co-dominant stands were placed in the *Ephedra viridis* Alliance per Sawyer et al. (2009) and Thomas et al. (2004). We have placed these co-dominant stands in *Artemisia tridentata* ssp. *vaseyana* alliance, instead, as that *Artemisia* taxon was co-dominant with *Ephedra viridis* in the study area.

Classification Confidence of Alliance: High

Conservation Status Rank

Global: G4

State (California): S4

References

Buck-Diaz et al. 2012, Keeler-Wolf and Thomas 2000, NatureServe 2012, Peterson 1984, Sawyer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=18

LAKE (n=2): LAKE9199, LAKE9450

DEVA (n=15): DEVA0664, DEVA9295, DEVA9379, DEVA9479, DEVA9580, DEVA9594, DEVA9650, DEVA9656, DEVAS059, DEVAS121, DEVAS197, DEVAS199, DEVAS200, MOJC0463, MOJC0464

MOJA (n=1): MOJA0109

MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Yucca brevifolia*	31	28	0.1	0.11	0.2	–	–	–	–
Shrub	*Ephedra viridis*	100	33	5.8	1	20	x	–	x	–
	Purshia tridentata var. glandulosa	56	18.5	3.5	3	11	–	–	–	x
	Eriogonum fasciculatum	50	3.0	0.7	0.2	4	–	–	–	–
	Ericameria nauseosa	50	0.9	0.1	0.11	0.5	–	–	–	–
	Prunus fasciculata	38	3.0	0.4	0.2	2	–	–	–	–
	Grayia spinosa	38	0.9	0.1	0.11	1	–	–	–	–
	Ericameria linearifolia	31	5.2	1.4	0.11	20	–	–	–	–
	Gutierrezia sarothrae	31	2.3	0.3	0.2	4	–	–	–	–
	Artemisia tridentata ssp. vaseyana	25	2.8	0.7	0.5	6	–	–	–	–
	Eriogonum microthecum	25	1.4	0.3	0.2	1	–	–	–	–
	Thamnosma montana	25	1.8	0.1	0.2	1	–	–	–	–

Alliance Stand Table (continued). Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Achnatherum speciosum*	69	12	0.3	0.11	1	–	–	–	x
	Bromus tectorum	63	14	1.2	0.11	8	–	–	–	x
	Bromus rubens	44	12	1.2	0.2	15	–	–	–	–
	Mentzelia	44	4.7	0.4	0.22	4	–	–	–	–
	Amsinckia	38	2.1	0.1	0.11	0.2	–	–	–	–
	Elymus elymoides	38	7.2	0.1	0.11	0.2	–	–	–	–
	Phacelia vallis-mortae	31	1.3	0.1	0.2	0.2	–	–	–	–
	Sphaeralcea ambigua	31	1.9	0.1	0.11	0.2	–	–	–	–
	Phacelia	25	1.3	0.05	0.2	0.2	–	–	–	–
Non-vasc	Unknown Lichen	50	42	7.9	0.2	100	–	–	–	–
	Unknown Moss	38	9.4	0.2	0.1	2	–	–	–	–
	Cryptogamic crust	31	11	0.1	0.2	0.2	–	–	–	–

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

M499. Western North American Cool Semi-Desert Ruderal Scrub & Grassland Macrogroup

G600. Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group

Bromus tectorum - Taeniatherum caput-medusae Ruderal Annual Grassland Alliance

Common Name: Cheatgrass - Medusa-head Ruderal Annual Grassland
Group Assignment: G600; **Alliance Code:** A1814

Alliance Concept

The Cheatgrass - Medusa-head Ruderal Annual Grassland Alliance forms an intermittent herbaceous layer. *Bromus tectorum* is dominant in the herbaceous layer along with other non-natives in the one stand sampled. *Poa* spp. is also present in the herbaceous layer, and emergent shrubs may be present. The alliance can occur in abandoned fields, eroded areas, overgrazed rangelands, road verges, waste places, foothills and lower montane slopes. It can occur at elevations ranging from 0 – 2200 m.

Diagnostic Criteria: This alliance is characterized by an intermittent herbaceous layer with *Bromus tectorum* dominant. The overall herbaceous cover is 63 percent cover in the one stand sampled.

Alliance Distribution

The alliance was sampled once in the study area. It occurs in DEVA in the Grapevine Mountains.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Southeastern Great Basin (1): 341Fd

Park Sampling Zones: DEVA: Grapevine Mtns

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name [NVC Code]	Sample Size	LAKE	DEVA	MOJA	Johnson
Bromus tectorum Ruderal [CEGL003019]	1	–	x	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: 2040 m
- Aspect: (unknown)
- Slope: (unknown)

- Macro Topography: (unknown)
- Tree Cover: 0%
- Shrub Cover: 0%
- Herb Cover: 63%
- Large Rock: Mean %, Range – % (unknown)
- Small Rock: Mean %, Range – % (unknown)
- Fines Cover: Mean 0%, Range 0 – 0% (unknown)
- Litter Cover: Mean 0%, Range 0 – 0% (unknown)
- Geology: (unknown)
- Soil Texture: (unknown)

Environment: Bromus tectorum is a non-native annual grass that is often found in areas of disturbance such as cultivation, overgrazing and frequent fires.

Vegetation Description

Vegetation Structure: The alliance forms an intermittent herbaceous layer, and the overall herbaceous cover ranges is 63 percent cover. The tree and shrub layers and non-vascular plants, if present, are sparse.

Vegetation Floristics: The dominant herb is *Bromus tectorum,* and *Poa* sp. is present.

Dynamics: *Bromus tectorum* abundance and production vary among years depending on annual precipitation and temperature patterns. *Bromus tectorum* has seriously affected natural vegetation in Nevada and northeastern California. It invades other mid-elevation sites, especially post-burn areas adjacent to woodlands. Rarely have regional vegetation patterns been as drastically changed as they have with *B. tectorum* in the intermountain West. Stands can occur after fire in areas previously dominated by *Artemisia* spp. and *Pinus* spp.

Classification Comments

Further review of USNVC groups is necessary to determine the best placement of herbaceous types since three groups of ruderal (semi-natural) herbaceous stands exist with related concepts: California Ruderal Grassland & Forb Meadow Group (G497), North American Warm Desert Ruderal Scrub & Grassland Group (G677), and Great Basin-Intermountain Ruderal Dry Shrubland & Grassland Group (G600).

Classification Confidence of Alliance: High

Conservation Status Rank

Global: GN
State (California): GNR

References

Evens and San 2005, Stuart et al. 1996, Sawer et al. 2009, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=1
LAKE (n=0)
DEVA (n=1): DEVA8004
MOJA (n=0)
MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Herb	*Bromus tectorum*	100	78	49	49	49	x	x	–	–
	Poa	100	22	14	14	14	x	–	–	–

7. Agricultural & Developed Vegetation

7.C.2. Other Developed Vegetation Formation

7.C.1.2. Horticultural Garden Division and 7.C.2.1. Other Developed Vegetation Division

CGR038. Tree Garden Macrogroup; CGR040. Tree Developed Vegetation Macrogroup and CGR039. Shrub & Herb Developed Vegetation Macrogroup

CSG043. Temperate Tree Garden Group; CSG047. Temperate Tree Developed Vegetation Group and CSG045. Temperate Shrub & Herb Developed Vegetation Group

North American Desert Tree Garden Cultural Type (*Tamarix* spp. Planted)

Common Name: Athel Tamarisk Planted Stands
Group Assignment: CSG043, CSG047 and CSG045, **Alliance Code:** None

Alliance Concept

The North American Desert Tree Garden Cultural Type (Athel Tamarisk Planted) forms an intermittent to continuous tree canopy with a sparse to open shrub understory. The alliance is found planted at alkali springs in DEVA along lowslopes, and it also is observed as planted stands in LAKE and MOJA in ornamental settings. Soils are derived from alluvium and texture is sand. Elevations range from approximately 200 to 750 meters. The dominant tree is *Tamarix aphylla.* The commonly associated shrubs include *Larrea tridentata* and *Nerium oleander*.

Diagnostic Criteria: This alliance is characterized by an intermittent to continuous tree canopy dominated by *Tamarix aphylla*. The overall tree cover ranges from 63 to 81 percent cover.

Alliance Distribution

The alliance was sampled at DEVA at low to mid elevations at Panamint, Warm, Shoot me up, and Ratatat Springs, and it was mapped as individuals and stands at the Travertine Springs complex (Thomas 2006). It also was observed as planted stands at Kelso in MOJA and at LAKE.

States: CA, (AZ, NV)

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]

Associations Table. “x” indicates species present, “–” indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Tamarix aphylla Planted [CST006759]	4	–	x	[x]	–

Association notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 573.3 m, Range 240 – 735 m
- Aspect: NE (1)
- Slope: 2 degrees
- Macro Topography: Lowslope (1)
- Tree Cover: Mean 76.3%, Range 63 – 81%
- Shrub Cover: Mean 12.1%, Range 0.2 – 27%
- Herb Cover: 0%
- Large Rock: 0%
- Small Rock: 4%
- Fines Cover: 0%
- Litter Cover: Mean 24%, Range 0 – 96%
- Geology: alluvium (1)
- Soil Texture: Sand (1)

Environment: This developed vegetation is found planted in or near alkali springs in DEVA, primarily on low slopes at low to mid elevations. It also has been observed as planted stands at Kelso in MOJA and at in ornamental settings in LAKE. It occurs on sand derived from alluvium.

Vegetation Description

Vegetation Structure: The vegetation type forms an intermittent to continuous tree layer with a sparse to open shrub layer. The herbaceous layer, if present, is sparse.

Vegetation Floristics: The dominant tree is *Tamarix aphylla* in the overstory. Dominant and characteristic shrubs include *Larrea tridentata* and *Nerium oleander.*

Dynamics: *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).

Classification Comments

Planted stands of *Tamarix aphylla* may be best placed in the Temperate Tree Garden Group (CSG043) within the Horticultural Garden Vegetation Division, or the Temperate Tree Developed Vegetation Group (CSG047) or Temperate Shrub & Herb Developed Vegetation Group (CSG045) within the Other Developed Vegetation Division of the USNVC hierarchy since this tamarix (athel) occurs often in planted/developed areas. The ornamental stands mapped at LAKE are placed within a Mixed Ornamental & Semi-Natural Woodland mapping unit. However, stands sampled in this

project are also related to the Interior West Ruderal Riparian Forest & Scrub Group (G510) since a few trees have naturalized in the spring sites.

Classification Confidence of Alliance: Low

Conservation Status Rank
Global: GNR
State (California): GNR

References
Sawyer et al. 2009, Thomas 2006, Tesky 1992

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)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). "x" indicates the term applies to the species, "–" indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Tree	*Tamarix aphylla*	100	100	76	63	81	x	x	–	–
Shrub	*Nerium oleander*	75	71	9.3	1	27	x	x	–	–
	Larrea tridentata	25	4.2	0.1	0.2	0.2	–	–	–	–

12. Natural Surface Bare Area Class

12.B.x. Consolidated Natural Bare Areas Landform

12.B.x.x. Consolidated Natural Bare Areas Landform

U001. Consolidated Natural Bare Areas Landform

Cliff, Scree & Pavement Mapping Unit

Common Name: Cliff, Scree & Pavement Mapping Unit
Group Assignment: U001

Alliance Concept

The Cliff, Scree & Pavement mapping unit has no cover or very sparse cover. The shrub and tree layers typically have no cover. The mapping unit has been sampled on rocky, desert pavements to cliffs with flat and east aspects. Soils are derived from alluvium and conglomerate, and texture includes medium silt. Elevations range from approximately 90 to 150 meters.

Diagnostic Criteria: This type is characterized by an herbaceous layer with little or no cover, instead the harsh desert pavement substrate defines the type. The overall herbaceous cover in stands sampled is 0 percent cover.

Alliance Distribution

The mapping unit was sampled in DEVA at low elevations, though it occurs across the region.

States: CA

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

Park Sampling Zones: DEVA: Black Mtns, Death Valley

Associations Table. "x" indicates species present, "–" indicates species not found, "(x)" indicates observations of the association that are not represented in the data summaries presented here.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Cliff, Scree & Pavement Sparse (Desert Pavement)	2	–	x	(x)	–
Cliff, Scree & Pavement Sparse (Mudhills)	0	–	–	–	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 118 m, Range 93 – 143 m
- Aspect: E (1), Flat, Variable (1)
- Slope: Mean 2 degrees, Range 2 – 2 degrees
- Macro Topography:

- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0%, Range 0 – 0%
- Herb Cover: Mean 0%, Range 0 – 0%
- Large Rock: Mean 0.2%, Range 0.2 – 0.2%
- Small Rock: Mean 97.5%, Range 97.5 – 97.5%
- Fines Cover: Mean 0%, Range 0 – 0%
- Litter Cover: Mean 0%, Range 0 – 0%
- Geology: alluvium (1), conglomerate (1)
- Soil Texture: Medium silt (1)

Environment: The alliance was sampled at low elevation on rocky, desert pavements with east or flat aspects. Soils are derived from alluvium or conglomerate; texture includes medium silt.

Vegetation Description

Vegetation Structure: The type has little or no herbaceous cover, and the overall herbaceous cover in stands sampled is 0 percent cover. The non-vascular plants and the tree and shrub layers, if present, are sparse.

Vegetation Floristics: No plants were observed in stands sampled, instead the rocky desert pavement define the type.

Dynamics: Desert pavements, steep bajadas, and mudhills can vary in the presence and abundance of plants, depending on the amount of disturbance and amount of annual rainfall and temperature patterns. Since the sampling in the park areas occurred from fall to summer, it is possible that these areas without herbaceous cover were not sampled during optimum climate conditions to detect plants.

Classification Comments

None.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR
State (California): GNR

References

NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0)
DEVA (n=2): MOJC0676, MOJC0903
MOJA (n=0); MOJN-Johnson (n=0)

Alliance Stand Table: None (Unvegetated)

12. Natural Surface Bare Area Class

12.B.x. Unconsolidated Natural Bare Areas Landform

12.B.x.x. Unconsolidated Natural Bare Areas Landform

U002. Unconsolidated Natural Bare Areas Landform

Playa Mapping Unit

Common Name: Playa Mapping Unit
Group Assignment: None; Alliance Code: None

Alliance Concept

The Desert Playa Mapping Unit forms a non-vegetated to very sparse herbaceous layer. The shrub and tree layers if present are very sparse. The mapping unit is found on basin floors and dry lake beds (playas) that are primarily flat in aspect and alkaline or saline. Soils are derived from alluvium, and textures are variable though usually clayey. Elevations range from approximately -90 to 1300 meters.

Diagnostic Criteria: This alliance is characterized by a non-vegetated to very sparse herbaceous layer without characteristic presence of a certain plant species, instead the substrate and landform defines the type. The overall herbaceous cover ranges from 0 to 6 percent cover.

Alliance Distribution

The alliance occurs in all three parks and is defined with samples from two of the Parks. Stands sampled are scattered throughout DEVA at low to upper elevations and in MOJA at Soda Lake.

States: CA

Ecoregion Section Names (Sample Size) and Subsection Codes: Mojave Desert (14): 322Ab, 322Af, 322Ai, Southeastern Great Basin (3): 341Fc

Park Sampling Zones: DEVA: Black Mtns, CottonWood Mtns, Death Valley, Joshua Flat, Owlshead Mtns, Saline Valley**; MOJA:** Soda Lake

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Playa	17	–	x	x	–

Association Notes: None.

Environmental Description

Plot/Sample Data Environmental Summary:

- Elevation: Mean 172.6 m, Range -90 – 1274 m
- Aspect: Flat, Variable (10), N (1), Flat, Variable (1), E (1), Flat, Variable (1), Flat, Variable (2)

- Slope: Mean 0.2 degrees, Range 0 – 1 degrees
- Macro Topography: Basin floor/wetland (1), Low level/bottom (9)
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0.2%, Range 0 – 1.8%
- Herb Cover: Mean 0.5%, Range 0 – 1%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 0.2%, Range 0 – 2%
- Fines Cover: Mean 79.6%, Range 0 – 100%
- Litter Cover: Mean 0%, Range 0 – 0.4%
- Geology: alluvium (16), water (1)
- Soil Texture: Clay (6), Fine silty clay (3), Sand (1), Sandy clay (1), Sandy loam (1), Silty clay (2)

Environment: The alliance is found at low to upper elevations on basin floors with dry lake beds (playas) that are relatively flat in aspect and alkaline or saline. Soils are derived from alluvium, and textures are variable but primarily clayey.

Vegetation Description

Vegetation Structure: The alliance forms a non-vegetated to very sparse herbaceous layer, and the overall herbaceous cover ranges from 0 to 6 percent cover. The shrub and tree layers, if present are very sparse (0 – 1% total vegetation cover).

Vegetation Floristics: Unknown

Dynamics: Playa edges can vary in the presence and abundance of herbaceous plants depending on rainfall and temperature patterns. At the time of sampling these stands, indeterminate annual plants and alkaline shrubs had relatively sparse if any cover.

Classification Comments

Desert Playa stands are ecologically related to the unclassified herbaceous seep and playa vegetation stands, which had higher cover of unidentified herbaceous plants.

Classification Confidence of Alliance: Moderate

Conservation Status Rank

Global: GNR
State (California): GNR

References

NatureServe 2012, VegCAMP and AIS 2013

Surveys (with Sample Sizes) Used in Description

MOJN: N=18
LAKE (n=0); DEVA (n=16): DEVA0380, DEVA0601, DEVA9260, DEVA9292, DEVA9315, DEVA9382, DEVA9518, DEVA9616, DEVA9619, DEVA9809, DEVAD101, MOJC0723,

MOJC0766, MOJC0849, MOJC0850, MOJC0851; MOJA (n=2): MOJC0852, MOJC0853; MOJN-Johnson (n=0)

Alliance Stand Table. Con = constancy, RelCov = relative cover, Avg = average cover, Min = minimum cover, Max = maximum cover, C = characteristic, D = dominant, cD = co-dominant, and Often = usually present (see Glossary for complete list of definitions). “x” indicates the term applies to the species, “–” indicates it does not apply.

Layer	Species Name	Con	RelCov	Avg	Min	Max	C	D	cD	Often
Unknown	Unknown	29	29	0	0.1	0.1	–	–	–	–

Semi-Desert Dunes & Sand Flats Mapping Unit

Common Name: Semi-Desert Dunes & Sand Flats Mapping Unit
Group Assignment: U001

Alliance Concept
Other stands of Semi-Desert Dunes & Sand Flats have no vegetation cover on open sand. Soils are derived from aeolian (wind-blown) sand, and textures include fine and medium sand. Elevations range from approximately 300 to 950 meters.

Diagnostic Criteria: This type is characterized by no (0%) vegetation cover, and instead the shifting, sandy substrate defines the type.

Alliance Distribution
The alliance was sampled at DEVA in Eureka Valley and MOJA in Devil's Playground at mid and low elevations, respectively.

States: CA

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

Park Sampling Zones: DEVA: Eureka Valley**; MOJA:** Devil's Playground

Associations Table. "x" indicates species present, "–" indicates species not found.

Association Scientific Name	Sample Size	LAKE	DEVA	MOJA	Johnson
Semi-Desert Dunes & Sand Flats Mapping Unit	2	–	x	x	–

Association Notes: None.

Environmental Description
Plot/Sample Data Environmental Summary:

- Elevation: Mean 615.5 m, Range 304 – 927 m
- Aspect: NW (1), SW (1)
- Slope: Mean 4.5 degrees, Range 1 – 8 degrees
- Macro Topography:
- Tree Cover: Mean 0%, Range 0 – 0%
- Shrub Cover: Mean 0%, Range 0 – 0%
- Herb Cover: Mean 0%, Range 0 – 0%
- Large Rock: Mean 0%, Range 0 – 0%
- Small Rock: Mean 0%, Range 0 – 0%
- Fines Cover: Mean 87.5%, Range 87.5 – 87.5%
- Litter Cover: Mean 0.1%, Range 0 – 0.2%

- Geology: dune sand (2)
- Soil Texture: Fine sand (1), Medium sand (1)

Environment: Stands are found on dune fields at low to mid elevations. Soils are derived from dune sand, and textures include fine and medium sand.

Vegetation Description

Vegetation Structure: The alliance overall has no (0 percent) cover of plants.

Vegetation Floristics: No plants are present in the areas sampled.

Dynamics: Sand dunes and sheets often vary in the presence and abundance of plant species, depending on moisture availability and the amount of shifting sand. Since plant species composition and abundance are driven mostly by annual rainfall, temperature variation, seasonality, and frequency of disturbance or substrate movement, it is difficult to determine if these sites will remain unvegetated.

Classification Comments

None.

Classification Confidence of Alliance: Low

Conservation Status Rank

Global: GNR
State (California): GNR

References

NatureServe 2012

Surveys (with Sample Sizes) Used in Description

MOJN: N=2
LAKE (n=0)
DEVA (n=1): MOJC0443
MOJA (n=1): MOJC0861
MOJN-Johnson (n=0)

Alliance Stand Table: None (Unvegetated).

Glossary of Terms Used in the Keys and Descriptions

The following terms with their respective definitions have been established in developing the vegetation classification, keys, and descriptions.

- **Constancy, Cover-Abundance, and Related Terms** – Used in the key, descriptions and the vegetation constancy tables (codes from tables in parentheses):
- **Constancy** (Con) – Number of occurrences divided by the number of samples X 100%
- **Diagnostic** – A species or group of species whose relative constancy or abundance differentiates one vegetation type from another; the term can include character, constant, differential, and indicator species (Jennings et al. 2006).
- **Dominant** (D) – Must be in at least 75% of the samples, with at least 50% relative cover in all samples.
- **Co-dominant** (cD) – Must be in at least 75% of the samples, with at least 30% relative cover in all samples.
- **Characteristic** (C) – Present in at least 75% of the samples for that vegetation type, with no restriction on cover.
- **Abundant** – Present in 50 to 75% of the samples, with at least 50% relative cover.
- **Usually/Often** (Often) – Present in 50 to 75% of the samples, with no restriction on cover.
- **Sometimes** – Present in 25 to 50% of the samples, with no restriction on cover.
- **Average** (Avg) **and Relative Cover** (RelCov) – Average cover for a taxon in a vegetation type is calculated as the sum of its 'absolute' cover values divided by the total sample size; relative cover is calculated as the comparative sum of cover values for one taxon compared to the sum of cover values of other taxa, in which proportional numbers are derived (see **Cover** section for more details).
- **Minimum** (Min) and **Maximum** (Max) – The minimum and maximum cover values that a taxon had from the surveys of a vegetation type. Values could be an absolute cover value (e.g., 1%) and/or a mid-point value of a cover class (e.g., 2.5% for a cover class of 1–5 %) depending on data available
- **Cover** – The primary metric used to quantify the abundance of a particular species or a particular vegetation layer within a plot. It was measured by estimating the aerial extent of the living plants, or the "bird's-eye view" looking from above for each category. Various subcategories of cover for species and vegetation are defined as follows:
- **Absolute cover** – Refers to the actual percentage of the ground (surface of the plot or stand) that is covered by a species or group of species. For example, *Pinus monophylla* covers between 5% and 10% of the stand. Absolute cover of all species or groups if added in a stand or plot may total greater or less than 100% because it is not a proportional number.
- **Relative cover** – Refers to the amount of the surface of the plot or stand sampled that is covered by one species (or physiognomic group) as compared to (relative to) the amount of surface of the plot or stand covered by all species (in that group). Thus, 50% relative cover means that half of the total cover of all species or physiognomic groups is composed of the single species or group

in question. Relative cover values are proportional numbers and, if added, total 100% for each stand (sample).

- **Dense/Continuous cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is greater than 66 percent absolute cover.
- **Intermittent cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where there is 33-66 percent absolute cover.
- **Open cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the cover is less than 33 percent absolute cover.
- **Sparse cover** – Used to describe individual layers of vegetation (tree, shrub, herb, or subdivisions of them) where the *average* cover value is <2% absolute cover (though the range in cover could be <1-9% cover).
- **Emergent** – A plant (or vegetation layer) is considered emergent if it includes plants that rises above a predominant vegetation layer, but that are sparse in cover. It is considered as a member of the next tallest layer, but typically has an absolute cover < 10%.
- **Lifeform terms:**
- **Tree** – Is a one-stemmed woody plant that normally grows to be greater than 5 meters tall. In some cases trees may be multiple-stemmed (ramifying) after fire or other disturbance, but size of mature plants is typically greater than 5 m and undisturbed individuals of these species are usually single stemmed.
- **Shrub** – Is normally a multi-stemmed woody plant that generally has several erect, spreading, or prostrate stems and that is usually between 0.2 meters and 5 meters tall, giving it a bushy appearance. Definitions are blurred at the low and the high ends of the height scales. At the tall end, shrubs may approach trees based on disturbance frequencies (e.g., old-growth re-sprouting chaparral species such as *Quercus turbinella,* etc., may frequently attain "tree size"). At the low end, woody perennial herbs or sub-shrubs of various species are often difficult to categorize into a single life-form; usually sub-shrubs (per USDA-NRCS 2011) were categorized in the "shrub" category.
- **Herb** – Is any vascular plant species that has no main woody stem-development, and includes grasses, forbs, and perennial species that die-back seasonally.
- **Cryptogam -** Is a nonvascular plant or plant-like organism without specialized water or fluid conducting vascular tissue (i.e., xylem and phloem). Includes mosses, lichens, liverworts, hornworts, and algae.
- **Stand** – Is the basic physical unit of vegetation in a landscape. It has no set size. Some vegetation stands are very small such as wetland seeps, and some may be several square kilometers in size such as desert or forest types. A stand is defined by two main unifying characteristics:
- It has *compositional* integrity. Throughout the site, the combination of species is similar. The stand is differentiated from adjacent stands by a discernable boundary that may be abrupt or gradual.
- It has *structural* integrity. It has a similar history or environmental setting, affording relatively similar horizontal and vertical spacing of plant species. For example, a hillside forest formerly dominated by the same species, but that has burned on the upper part of the slope and not the lower is divided into two stands. Likewise, a sparse woodland occupying a slope with shallow

rocky soils is considered a different stand from an adjacent slope of a denser woodland/forest with deep moister soil and the same species.

- **Vegetation:**
- **Woodland and forest vegetation**: In the National Vegetation Classification, a woodland is defined as a tree-dominated stand of vegetation with between 25 and 60 percent cover of trees and a forest is defined as a tree-dominated stand of vegetation with 60 percent or greater cover of trees.
- **Shrubland vegetation**: Shrubs (including dwarf-shrubs) are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and one or both of the following criteria are met: (1) Shrubs influence the distribution or population dynamics of other plant species; (2) Shrubs play an important role in ecological processes within the stand.
- **Herbaceous vegetation**: Herbs are evenly distributed throughout the stand, providing a consistent (even if sparse) structural component, and play an important role in ecological processes within the stand, and the stand cannot be characterized as a tree or shrub stand.
- **Nonvascular vegetation**: Nonvascular organisms provide a consistent (even if sparse) structural component and play an important role in ecological processes within the stand.
- **Semi-natural/ruderal vegetation**: Stands characterized by naturalized non-native species. Examples include *Tamarix* spp., and *Brassica* spp. Note: the terminology for semi-natural versus ruderal plant communities is still under discussion with ESA Vegetation Panel and Hierarchy Review Working Group, and in the last 5 years the classification names have gone back and forth between these two terms.
- **National Vegetation Classification Hierarchy Levels:**
- **Group** – A vegetation classification unit of intermediate rank (6th level) defined by combinations of relatively narrow sets of diagnostic plant species (including dominants and co-dominants), broadly similar composition, and diagnostic growth forms that reflect biogeographic differences in mesoclimate, geology, substrates, hydrology, and disturbance regimes (FGDC 2008).
- **Alliance** – A classification unit of vegetation of low rank (7th level), containing one or more associations and defined by one or more diagnostic species, often of high cover, in the uppermost layer or the layer with the highest canopy cover. Alliances reflect physiognomy as well as regional to subregional climates, substrates, hydrology, and disturbance regimes (Jennings et al. 2006, FGDC 2008).
- **Association** – A vegetation classification unit of low rank (8th level) defined by a diagnostic species, a characteristic range of species composition, physiognomy, and distinctive habitat conditions (Jennings et al. 2006). Associations reflect local topo-edaphic climates, substrates, hydrology, and disturbance regimes.
- **Other Classification Terms:**
- **Provisional Type –** A vegetation type that is not yet formally described, but expected to be an addition to the existing list of USNVC types for a project area. The type may be represented by plot samples (e.g, <10 samples), while it may or may not be particularly common or because it is localized in extent; however, it could be documented in additional location(s) outside of the study area.

- **Park Special Type (or Special Stands)** – A vegetation type that is not yet formally described except from a locally defined project area. The type is represented by very few plots (often <5 samples), because it is an oddity or rarity, and its relationships with other vegetation types are poorly known. It typically has not been document in literature beforehand, and it is unknown if the type may occur elsewhere.
- **Conservation Rank** – Listed by the state Nature Conservancy Heritage Programs, including the California Department of Fish and Wildlife's Vegetation Classification and Mapping Program, these are the "Global" and "State" ranks, as seen below:
- **G1 and S1** – Critically Imperiled—At very high risk of extinction due to extreme rarity. Often 5 or fewer viable occurrences and/or up to 518 hectares.
- **G2 and S2** – Imperiled—At high risk of extinction due to very restricted range, very few occurrences, steep declines, or other factors. Often 6–20 viable occurrences, and/or 518–2,590 hectares
- **G3 and S3** – Vulnerable—At moderate risk of extinction due to a restricted range, relatively few populations, recent and widespread declines, or other factors. Often 21–100 viable occurrences and/or 2,590–12,950 hectares.
- **G4 and S4** – Apparently Secure—Uncommon but not rare; some cause for long-term concern due to declines or other factors. Often greater than 100 viable occurrences and/or more than 12,950 hectares.
- **G5 and S5** – Secure—Common; widespread and abundant.
- **Landform and Other Descriptive Terms:**
- **Bajada** – An alluvial plain formed at the base of a mountain by the coalescing of several alluvial fans.
- **Elevation –** Denoted in meters for the project, and as general categories:

Category	Range
High	>1,219 m (>4,000+ ft)
Mid -	609–1,219 m (2,000–4,000 ft)
Low	<609 m (< 2,000 ft)

- **Park Sampling Zones –** Areas designated by NPS park staff during the MOJN I&M sampling effort for stratifying the sampling locations.
- **Steepness –** Inclination of a slope, including the following categories:

Designation	Degrees	Percent
Flat	0	0%
Gentle	0–5	1–9%
Moderate	6–14	10–25%
Somewhat steep	15–26	26–49%
Steep	27–45	50–100%
Very steep	46–69	101–275%
Abrupt	70–100	276–300%
Overhanging	>100	>300%

- **Surveys (with Sample Sizes)**: In the descriptions, survey numbers and sample sizes are provided for each classified vegetation type. The survey numbers are from the compiled set of databases, which typically begin with an alpha code and then a number modifier: For example, "MOJA0101" is the first classification plot sample and "MOJA9101" is the first observation

sample of the plots collected for this network project in 2010–2011, and "MOJC" denotes the plots collected for the central Mojave Desert by the Mojave Desert Ecosystem Program Initiative in 1997–1998.

- **Abbreviations and Other Characters:**
- **Cf. –** Compare with
- **Parentheses ( )** – When parentheses are used around a species name within a vegetation type name, it indicates that the species is often present as an indicator of that association or alliance, but it does not meet a threshold of 75% or more constancy. The parentheses may be used around the full scientific name or only around the species epithet. An example is the *Pinus longaeva / (Ericameria discoidea - Ribes* spp.) association. If parentheses are only around the species epithet, it means that the genus is consistently present but another species could also be present from that genus. An example is the *Sphaeralcea (ambigua, coccinea, parvifolia)* Dry Meadow Alliance, where the genus may be represented by one or more species found within the parentheses.

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