

Vegetation Descriptions
GREAT BASIN ECOLOGICAL PROVINCE
CALVEG ZONE 9

March 23, 2009

This zone consists of the Northwestern Basin and Range Section (342B) or “Northwest”, the Mono Section (341D) or “Mono” and the Southeastern Basin and Range Section (341F) or “Southeast”. Areas have also been mapped within the Lahontan Basin Section (341E) or “Northern Mono” in Nevada.

CONIFER FOREST / WOODLAND

BP
BRISTLECONE PINE ALLIANCE

In the White Mountains (Mono), Bristlecone Pine (*Pinus longaeva*), the dominant of this Alliance, occurs more densely on dolomite soils, mainly above about 8000 ft (2440 m) on low gradient to moderately steep slopes. It also is scattered elsewhere on dry, rocky sites slopes in the Inyo Mountains (Southeast). It may be associated with Limber Pine (*P. flexilis*) and is an indicator of treeline and poor soil conditions. Occasional hardwood associates in this area include arboreal Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) and Quaking Aspen (*Populus tremuloides*) at elevations below about 10,400 ft (3172 m). Singleleaf Pinyon Pine (*P. monophylla*) stands often occur adjacent to these sites. [Photo](#)



EP
EASTSIDE PINE ALLIANCE



Jeffrey Pine (*Pinus jeffreyi*), or occasionally Ponderosa Pine (*P. ponderosa*), becomes a dominant conifer in association with Great Basin understory conifers, trees and shrubs in this Alliance. Commonly associated trees include Quaking Aspen (*Populus tremuloides*), Western Juniper (*Juniperus occidentalis* var. *occidentalis*) or Mountain Juniper (*J. o.* var. *australis*) and Singleleaf Pinyon Pine (*P. monophylla*). This type has been mapped abundantly in the Glass Mountain and less commonly in nine other Subsections of the Mono Section, and five in the Northwest Section. Soils are sometimes deep, with a relatively high site potential in some areas, but the Alliance is also common on volcanic and pyroclastic deposits chiefly in the range of 4400 – 9000 ft (1342 – 2745 m). Inclusions of Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) may be present on these rocky outcrops, often reaching the arboreal form. Bitterbrush (*Purshia tridentata*) forms an almost continuous shrub canopy under open pine stands in

some areas. Other shrub associates include Big Sagebrush (*Artemisia tridentata*) and Wax Currant (*Ribes cereum*). Rabbitbrush (*Chrysothamnus* spp.) tends to be an abundant understory shrub component on disturbed sites. As moisture increases at the higher elevations, and on cooler, northerly facing slopes, this type may grade into the Mixed Conifer-Fir, Lodgepole Pine (*P. contorta* ssp. *murrayana*) and Jeffrey Pine Alliances, where the associated shrub component is dominated by mesic montane chaparral species. [Photo](#)

JJ
YELLOW PINE – WESTERN JUNIPER ALLIANCE

Western Juniper (*Juniperus occidentalis* var. *occidentalis*, also called *J. occidentalis*), a small, shade-tolerant, long-lived conifer, is expanding its range in mesic areas of northeastern California and other arid states, especially in the absence of fire and under heavy livestock grazing conditions. This alliance is defined by combinations of Western Juniper with either (or

both) Ponderosa and/or Jeffrey Pines (*Pinus ponderosa*, *P. jeffreyi*), no single species becoming overly dominant. Ponderosa Pine is the more typical associate, but Jeffrey Pine may occur on cooler, higher or steeper sites. This dynamic pattern indicates the potential loss of more desirable understory shrubs such as Bitterbrush (*Purshia tridentata*) and Sagebrushes (*Artemisia* spp.) and forbs that might benefit wildlife such as the Greater Sage Grouse (*Centrocercus urophasianus*) within the Sagebrush Steppe ecosystem. Increasing density of young shrubs of Western Juniper in these areas develops a Juniper woodland that limits the growth of these and other associated shrubs, grasses and forbs. Quaking Aspen (*Populus tremuloides*) stands are also in decline and are being invaded by Western Juniper due to a combination of factors. This alliance has been identified very sparsely along the western edges of three northern subsections of the Northwest Section adjacent to the Warner Mountains in Modoc County. Elevations are generally in the range of about 4400 – 6400 ft (1342 – 1952 m). [Photo](#)



JP JEFFREY PINE ALLIANCE

Jeffrey Pine (*Pinus jeffreyi*) assumes dominance without a Great Basin understory occasionally in the Pine Nut Mountains, Fort Sage Mountains – Lemmon Valley and Glass Mountain Subsections (Mono) on flat to moderately steep slopes. Elevations are commonly in the range of about 5200 – 8600 ft (1586 – 2623 m). Incense Cedar (*Calocedrus decurrens*) is associated with this type as well as shrubs of the Upper Montane Mixed Chaparral Alliance, such as Greenleaf Manzanita (*Arctostaphylos patula*) and Mountain Whitethorn (*Ceanothus cordulatus*). The Mixed Conifer - Fir Alliance commonly occurs adjacent to these sites. [Photo](#)



JU UTAH JUNIPER ALLIANCE



Areas dominated by Utah Juniper (*Juniperus osteosperma*) have occasionally been mapped on the eastside of the southern Sierras near the Nevada border. The Alliance has been mapped within seven subsections of the Mono and Southeast Sections, being locally prominent in the Mono Valley Subsection. It generally is found on dry, shallow and rocky soils at elevations mainly between about 6000 – 8800 ft (1830 – 2684 m). Utah Juniper is infrequently associated with the arboreal form of Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*). [Photo](#)

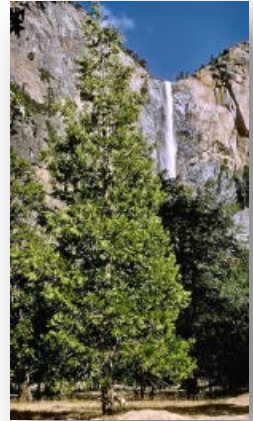
LP LODGEPOLE PINE ALLIANCE

The Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) Alliance has been mapped extensively in the Glass Mountain Subsection and more sparsely in the Sweetwater Mountains - Pine Grove Hills and White Mountains Subsections (Mono) and Sheldon Range Subsection (Northwest). Sites tend to be on flat to low gradient slopes having volcanic and pyroclastic deposits at elevations mainly between 6800 - 10,600 ft (2074 - 3233 m). Quaking Aspen (*Populus tremuloides*) occasionally forms a hardwood understory at elevations below about 9400 ft (2867 m). The Eastside Pine Alliance is often found adjacent to this Alliance. [Photo](#)



MD INCENSE CEDAR ALLIANCE

Incense Cedar (*Calocedrus decurrens*), a wide ranging species that competes well on a variety of open sites, has been mapped very sparsely as a dominant conifer along the western edge of the Fort Sage Mountains – Lemmon Valley Subsection (Mono Section). It occurs there at elevations from around 5800 – 6000 ft (1770 – 1830 m) in association with the Eastside Pine Alliance and Great Basin species such as Bitterbrush (*Purshia tridentata*) and Big Sagebrush (*Artemisia tridentata*). The persistence of this conifer appears to be a remnant of selective logging of Ponderosa and Jeffrey Pines (*Pinus ponderosa*, *P. jeffreyi*) during settlement (or later) logging practices, as the Cedar is commonly a minor component of sites dominated by either pine in this area. [Photo](#)



MF MIXED CONIFER - FIR ALLIANCE



At least three conifers are included in the Mixed Conifer - Fir Alliance, typically White Fir (*Abies concolor*), Red Fir (*A. magnifica*), Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) and Jeffrey Pine (*P. jeffreyi*). These species, addition to Singleleaf Pinyon Pine (*P. monophylla*) and Quaking Aspen (*Populus tremuloides*), also are commonly found as dominants in their own alliances adjacent to this type. Great Basin species such as Bitterbrush (*Purshia tridentata*), Sagebrushes (*Artemisia* spp.) and Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) often occur as understory shrubs in this type. It has been mapped in scattered areas of eight subsections of the Mono and Northwest Sections, becoming locally common in the Glass Mountain Subsection, chiefly found within the elevation range of about 4600 – 9400 ft (1402 – 2867 m) on north to east facing slopes. [Photo](#)

MH MOUNTAIN HEMLOCK ALLIANCE

Mountain Hemlock (*Tsuga mertensiana*) the dominant of this Alliance, is representative of subalpine areas and has been mapped only in a small area of the Glass Mountain Subsection of the Mono Section. It is generally found on north facing slopes where snow accumulation holds well into the summer months, surviving well in recreational ski areas. Elevations of these stands are between 8600 and 10,000 ft (2623 - 3050 m) and may be associated with scattered species such as Lodgepole Pine (*Pinus contorta* ssp. *murrayana*), White Fir (*Abies concolor*) and Red Fir (*A. magnifica*). [Photo](#)



MP MIXED CONIFER – PINE ALLIANCE



This alliance of three or more conifers is abundant and well described in the North Interior and Northern Sierran Calveg zones. In this zone, this type has been mapped sparsely along the western edges of the Surprise Valley and Honey Lake Basin Subsections (Northwest) at elevations between about 4600 – 5300 ft (1400 – 1616 m) close to the Sierra Nevada Section. Although conifers in this mixture such as Ponderosa Pine (*Pinus ponderosa*) and White Fir (*Abies concolor*) indicate relatively mesic conditions, these isolated stands are surrounded by “eastside” alliances such as Western Juniper (*Juniperus occidentalis* var. *occidentalis*) and Eastside Pine. Jeffrey Pine (*P. jeffreyi*) and Lodgepole Pine (*P. contorta* ssp. *murrayana*) are generally absent from the Mixed Conifer - Pine type. [Photo](#)

PJ

SINGLELEAF PINYON PINE ALLIANCE

Singleleaf Pinyon Pine (*Pinus monophylla*) dominates open woodlands on the dry, eastside slopes of the Southern Sierras and is the most extensively mapped conifer type in this more arid zone, occurring in most subsections of the Mono Section and prominently in the Inyo Mountains Subsection (Southeast). Elevations of these sites range as low as 5000 ft and up to about 9200 ft (1524 - 2806 m) or higher in the White Mountains. Associated with this small conifer in upland sites are Utah Juniper (*Juniperus osteosperma*) and Great Basin shrubs such as Big Sagebrush (*Artemisia tridentata*), Black Sagebrush (*A. nova*), Bitterbrush (*Purshia tridentata*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), Mormon Tea (*Ephedra* spp.), and Rabbitbrush (*Chrysothamnus* spp.). Mixed conifer / hardwood stands in this Alliance also include riparian or moist site species such as Water Birch (*Betula occidentalis*), Willows of several species (*Salix* spp.), Quaking Aspen (*Populus tremuloides*), and Black Cottonwood (*Populus balsamifera* ssp. *trichocarpa*).

PL

LIMBER PINE ALLIANCE

Limber Pine (*Pinus flexilis*), a long-lived, slow-growing interior conifer, is widely distributed in Canada and the western states and is adaptable to a variety of climates and environments, especially harsh rocky sites. As identified as a dominant conifer in this Alliance, it persists on dry, low gradient to moderately steep, high elevation slopes mostly within the elevation range of about 7800 - 11,000 ft (2379 - 3355 m). Sites tend to occur on nutrient poor, coarse textured granitic substrates where the pine has competitive advantage or sometimes on dolomite and limestone sites in the White Mountains. The Alliance has been mapped in scattered areas of the Inyo Mountain Subsection (Southeast) and in the White Mountains, Sweetwater Mountains – Pine Grove Hills, Bodie Hills – Excelsior Mountains and Glass Mountain Subsections (Mono). Hardwood and shrub associates include Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), Quaking Aspen (*Populus tremuloides*), Singleleaf Pinyon Pine (*P. monophylla*), Bristlecone Pine (*P. longaeva*), and Low Sagebrush (*Artemisia arbuscula*).

PP

PONDEROSA PINE ALLIANCE

Ponderosa Pine (*Pinus ponderosa*) as a dominant tree occurs only rarely in this area, but has been mapped along the western edge of the Honey Lake Basin and Surprise Valley Subsections (Northwest) at elevations between about 4300 – 5000 ft (1310 – 1524 m). It is associated with the Mixed Conifer – Pine, Eastside Pine and Yellow Pine – Western Juniper Alliances in these areas and usually is an important (but not dominant) element in them.

PW

PONDEROSA PINE – WHITE FIR ALLIANCE

Ponderosa Pine (*Pinus ponderosa*) and White Fir (*Abies concolor*) co-mingle in this alliance on one site along the western edge of the Surprise Valley Subsection (Northwest). This is a cold-air drainage environment at the base of a canyon within the elevational range of about 4600 – 5000 ft (1402 – 1524 m), providing sufficient moisture for growth and development under these otherwise arid conditions. The surrounding taxa include Western Juniper (*Juniperus occidentalis*) and Big Basin Sagebrush (*Artemisia tridentata* ssp. *tridentata*).

RF

RED FIR ALLIANCE

The Red Fir Alliance has been mapped very sparsely along the western edges of the Glass Mountain and Sweetwater Mountains – Pine Grove Hills Subsections (Mono Section). Red Fir (*Abies magnifica*), the dominant species, mainly occurs in this Alliance at an elevation range from about 8200 - 9200 ft (2500 - 2806 m) on prominences usually above the Lodgepole Pine Alliance and Mixed Conifer - Fir Alliance sites and interspersed with conifers in the Subalpine Conifers Alliance such as Lodgepole Pine (*Pinus contorta* ssp. *murrayana*) and Mountain Hemlock (*Tsuga mertensiana*).

SA

SUBALPINE CONIFERS ALLIANCE

In this zone, a high elevation mixed conifer type has been mapped very sparsely in volcanic areas of the Pine Nut Mountains, Sweetwater Mountains – Pine Grove Hills and Glass Mountain Subsections of the Mono Section. Elevations of the Subalpine Conifers Alliance in this zone are chiefly within the range 7600 – 10,800 ft (2318 – 3294 m). The conifer mixture consists of Mountain Hemlock (*Tsuga mertensiana*), Lodgepole Pine (*Pinus contorta* ssp. *murrayana*), Limber Pine (*P. flexilis*), Whitebark Pine (*P. albicaulis*) and Red Fir (*Abies magnifica*). Aspen (*Populus tremuloides*) is an associated hardwood of this Alliance on sites where soils are richer. More open or exposed areas may be dominated by herbaceous components such as those in the Alpine Grasses and Forbs Alliance.

WB

WHITEBARK PINE ALLIANCE

This Alliance, dominated by Whitebark Pine (*Pinus albicaulis*), occurs on open, windswept ridges at treeline. In these areas, a krummholzed form is common. It also grows in areas of glacial scouring where soil development is poor, where it is often found adjacent to barren areas or sites mapped as the Alpine Grasses and Forbs Alliance. It has been mapped sparsely in the Glass Mountain and Sweetwater Mountains – Pine Grove Hills (Mono) and Sheldon Range Subsections (Northwest) within the elevation range of about 8800 - 11,200 ft (2684 - 3416 m). Lodgepole Pine (*P. contorta* ssp. *murrayana*) may be associated with it on occasion.

WF

WHITE FIR ALLIANCE

White Fir (*Abies concolor*) occurs in pure stands in this Alliance, which is found at elevations typically higher than the Mixed Conifer-Fir Alliance. It has been mapped sparsely and widely scattered in three subsections of the Mono Sections and within two of the Northwest Section. In the Glass Mountain Subsection (Mono Section), for example, it has been mapped at elevations within the general range of 6400 – 9600 ft (1952 – 2928 m). Quaking Aspen (*Populus tremuloides*) and tree-sized Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) are the only consistent hardwood associates occurring on or adjacent to White Fir stands in this zone.

WJ

WESTERN (MOUNTAIN) JUNIPER ALLIANCE

Mountain Juniper (*Juniperus occidentalis* var. *australis*, also renamed as *J. grandis*) has been mapped sparsely in this zone as a dominant conifer at elevations up to 9000 ft (2750 m) near the western edge of the Sweetwater Mountains – Pine Grove Hills and Fort Sage Mountains - Lemmon Valley Subsections (Mono). It occurs on granitic, exposed sites of the higher slopes and ridges. Towards the north, another variety, called Western Juniper (*J. o.* var. *occidentalis*, also renamed as *J. occidentalis*) occurs on dry, level to gently rolling slopes at lower elevations, mainly between about 4500 – 7000 ft (1372 – 2134 m). This variety has been expanding its range into semi-arid areas and has been mapped in five subsections of the Northwest Section. On those sites, its associates include Big Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), Saltbush (*Atriplex* spp.) and Yellow Pines (*P. ponderosa*, *P. jeffreyi*).

WW

WESTERN WHITE PINE ALLIANCE

Western White Pine (*Pinus monticola*) occurs in small groves on high elevation, dry, windblown slopes. The Western White Pine Alliance has been mapped very sparsely in the Great Basin area within the Sweetwater Mountains - Pine Grove Hills Subsections (Mono Section) at elevations between about 8800 - 9700 ft (2684 - 2958 m). In this area, it is found adjacent to and in the vicinity of Great Basin shrubs such as Mountain Sagebrush (*Artemisia tridentata* ssp. *vaseyana*), Snowbrush (*Symphoricarpos* spp.) and Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) and trees such as Lodgepole Pine (*P. contorta* ssp. *murrayana*), Whitebark Pine (*P. albicaulis*), Red Fir (*Abies magnifica*) and Quaking Aspen (*Populus tremuloides*).

HARDWOOD FOREST / WOODLAND

FM

CURLLEAF MOUNTAIN MAHOGANY ALLIANCE

Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) is recognized as both a small tree and a shrub lifeform in the Calveg system of classification. This arboreal Alliance occurs mainly on granitic, sedimentary or metamorphosed substrates on flat to steep slopes at elevations ranging from about 5400 ft (1646 m) to above 9000 ft (2745 m). These exceed 10,000 ft (3050 m) in the White Mountains (Mono). It is mapped in widely scattered patches in the Mono and Southeast Sections in association with rocky outcrops. Sagebrushes (*Artemisia* spp.) and Limber Pine (*Pinus flexilis*) are often associated with this Alliance and Bristlecone Pine (*P. longaeva*) and Utah juniper (*Juniperus osteosperma*) to a lesser extent.

FO

WATER BIRCH ALLIANCE

Water Birch (*Betula occidentalis*), the dominant of this Alliance, is considered to be a small tree in this area that forms dense thickets. It has been mapped very sparsely in riparian areas in the Benton - Upper Owens Valleys and White Mountains Subsections (Mono Section) at elevations from about 4600 to 8800 ft (1402 – 2684 m). Tree and shrub associates include species of Willow (*Salix* spp.), Quaking Aspen (*Populus tremuloides*), Interior Rose (*Rosa woodsii*) and species of Currant

(Ribes spp.). Conifers in close proximity include Jeffrey Pine (Pinus jeffreyi) and Singleleaf Pinyon Pine (P. monophylla) in this region.

NR RIPARIAN MIXED HARDWOOD ALLIANCE

Riparian or seep areas that contain a mixture of non-dominant hardwoods identify the Riparian Mixed Hardwood Alliance. It has been mapped very sparsely within eleven subsections in the Mono and Northwest Sections at elevations from about 4400 ft (1342 m) to 8600 ft (2623 m). The mixture may include Quaking Aspen (Populus tremuloides), Water Birch (Betula occidentalis), shrub or arboreal Willows (Salix spp.), Fremont Cottonwood (Populus fremontii) and Black Cottonwood (P. balsamifera spp. trichocarpa) in addition to other shrubs.

QF FREMONT COTTONWOOD ALLIANCE

The riparian Fremont Cottonwood (Populus fremontii) Alliance has been mapped sparsely in alluvial drainages in four subsections of the Mono Section and in the Silver Peak Mountains – Fish Lake Valley Subsection of the Northwest Section. Elevations are generally within the range 3800 – 6600 ft (1160 – 2012 m) on these sites. Other lower elevation riparian hardwoods such as Water Birch (Betula occidentalis) and Willows (Salix spp.) may be present in minor amounts.

QK BLACK OAK ALLIANCE

Black Oak (Quercus kelloggii) occasionally occurs in pure or in mixed conifer – hardwood stands in the Great Basin area, having been mapped sparsely near the western edge of the Fort Sage Mountains – Lemmon Valley Subsection (Mono Section). Elevations of this mapped Alliance are between about 4000 – 5200 ft (1220 – 1586 m). Black Oak is found within and as understory to several conifer alliances in this zone, as well as adjacent to shrubs such as Big Sagebrush (Artemisia tridentata) and Greenleaf Manzanita (Arctostaphylos patula).

QO WILLOW ALLIANCE

This riparian hardwood alliance is dominated by mixed or single species of tree Willows (Salix spp.). It has been mapped in scattered locations in nine subsections of this zone in the Mono, Southeast and Northwest Sections. As many species of Willow may occur, this Alliance has been mapped over a range of elevations from about 3200 to 9200 ft (976 - 2806 m). The following arboreal species are likely to occur on these sites in this area: Red Willow (S. laevigata), Arroyo Willow (S. lasiolepis) and Shining Willow (S. lucida). Associates of this stringer-like Alliance include Water Birch (Betula occidentalis), Interior Rose (Rosa woodsii), Cottonwoods (Populus spp.), Quaking Aspen (Populus tremuloides) and other water tolerant species.

QQ QUAKING ASPEN ALLIANCE

Quaking Aspen (Populus tremuloides) occurs as an indicator of moist conditions in high elevation meadows and other moist areas. It is generally dominant on more productive sites, often forming dense, long-lived clonal patches on the landscape in the Sweetwater Mountains - Pine Grove Hills and Glass Mountain Subsections, more sparsely in eight other subsections of the Mono Section and in three subsections of the Northwest Section. In this area, it has been mapped chiefly at elevations above 6000 ft (1830 m) on a variety of geologic substrates. Quaking Aspen has been identified as the principal hardwood understory species in Bristlecone Pine (Pinus longaeva), Eastside Pine (P. jeffreyi), Lodgepole Pine (P. contorta spp. murrayana), and Limber Pine (P. flexilis) sites. Along with arboreal Curleaf Mountain Mahogany (Cercocarpus ledifolius), it forms the hardwood associates of Singleleaf Pinyon Pine (P. monophylla) stands. Shrub associates on moist sites include Interior Rose (Rosa woodsii), Currants (Ribes spp.) and Silver Sagebrush (Artemisia cana) and on drier sites Big Sagebrush (A. tridentata), and Bitterbrush (Purshia tridentata). Other associated taxa are herbaceous species in dry and seasonally moist grasslands and meadows and riparian hardwoods such as Willows (Salix spp.) and Water Birch (Betula occidentalis).

QX BLACK COTTONWOOD ALLIANCE

Black Cottonwood (Populus balsamifera ssp. trichocarpa) as a dominant hardwood in its own Alliance, has been mapped sparsely in ten subsections in this zone. Its mapped range is from 4800 - 8600 ft (1464 - 2623 m). Singleleaf Pinyon Pine (Pinus monophylla) sometimes occurs on adjacent upland sites. Other associates include shrub and tree Willows (Salix spp.)

SHRUBS AND CHAPARRAL

AX

ALPINE MIXED SCRUB ALLIANCE

Alpine Mixed Scrub communities are often low graminoid and forb species within a mixture of dwarf shrubs which often include some cushion plants. This type has been mapped abundantly in the White Mountains Subsection and more sparsely in two other subsections of the Mono Section at elevations generally above 9200 ft (2806 m). The region near and above timberline in the White Mountains has a more intensive solar radiation flux than usual for this general latitude in California and is geologically diverse. In this area, the Mixed Alpine Scrub Alliance is identified in scattered locations of bedrock outcrops which provide more mesic sites for shrubs. The mixture may include Fern Bush (*Chamaebatiaria millefolium*), Mountain Snowberry (*Symphoricarpos rotundifolius*) and Spineless Horsebrush (*Tetradymia canescens*). Herbaceous species that are common in this high elevation site are Dwarf Lupine (*Lupinus lepidus*), Mountain Dandelion (*Agoseris glauca*), Jacob's Ladder (*Polemonium* spp.), Oval-leaved Buckwheat (*Eriogonum ovalifolium*), Colville's Phlox (*Phlox covillei*) and graminoids such as Tufted Hairgrass (*Deschampsia caespitosa*), Junegrass (*Koeleria cristata*), and Sedges (*Carex* spp.). Drier dolomite sites may have less shrub components and are mapped as the Alpine Grasses and Forbs Alliance where identified but these communities are difficult to separate in mapping procedures.

BB

BITTERBRUSH ALLIANCE

The Bitterbrush Alliance in this zone may have any combination of the more common species Antelope Bitterbrush (*Purshia tridentata* var. *tridentata*), Desert Bitterbrush (*P. t.* var. *glandulosa*) and Cliffrose (*P. mexicana* var. *stansburyana*), as they may overlap in this zone. These high-value forage taxa have been mapped in the elevation range of about 4600 – 9800 ft (1464 – 2989 m) prominently in the Mono Valley and Crowley Flowlands Subsections and more sparsely in eight others in the Mono Section, generally on low-gradient slopes. Associates include Big Sagebrush (*Artemisia tridentata*), Singleleaf Pinyon Pine (*Pinus monophylla*), Jeffrey Pine (*P. jeffreyi*) and other Great Basin shrubs.

BC

SALTBUUSH ALLIANCE

This Alliance, in which any combination of Saltbush species (*Atriplex* spp.) forms the dominant shrub genus, has been mapped in widely scattered areas from Modoc to Inyo Counties. It is especially prominent in the Surprise Valley, Sheldon Range and Honey Lake Basin Subsections of the Northwest Section and also occurs in eight other subsections in this zone. Both Shadscale or Spiny Saltbush (*A. confertifolia*) and Fourwing Saltbush (*A. canescens*) occur from northern Owens Valley to Kern County. Shadscale generally is located on dry alkaline plains and hills on the east slopes of the Sierra Nevada in Mono, Kern, and Inyo Counties. Fourwing Saltbush may be abundant on saline desert flats and washes of the same counties, where it is mapped as its own Alliance. Other *Atriplex* species may be included in this Alliance such as Allscale (*A. polycarpa*) in addition to minor amounts of Sagebrush (*Artemisia* spp.), Creosote Bush (*Larrea tridentata*) and grasses. Sites are generally in flat, saline, alluvial deposits with elevations mainly between 3800 – 6600 ft (1160 – 2012 m). These include toeslopes of alluvial fans as well as in Owens Valley (Mono Section) where Rabbitbrush (*Chrysothamnus* spp.) species are not dominant.

BG

GREASEWOOD ALLIANCE

Greasewood (*Sarcobatus vermiculatus*), a shrub of diverse habitats and capable of developing an extensive taproot in dry areas, becomes a dominant shrub in scattered patches as mapped in the Bodie Hills - Excelsior Mountains Subsection (Mono) and Inyo Mountains Subsection (Southeast). These flat, dry alkaline slopes are in the elevation range 3600 - 7000 ft (1098 - 2135 m). Saltbush (*Atriplex* spp.), Big Sagebrush (*Artemisia tridentata*) and Horsebrush (*Tetradymia* spp.) may occur in this Alliance.

BI

LITTLELEAF MOUNTAIN MAHOGANY ALLIANCE

Scattered sites containing dominant Littleleaf Mountain Mahogany (*Cercocarpus intricatus*), a long-lived, drought-tolerant, evergreen shrub, have been identified very sparsely in dry, rocky sections of the White Mountains Subsection (Mono Section) and Inyo Mountains (Southeast Section). Much less common than Curleaf Mountain Mahogany (*C. ledifolius*), which is found on adjacent sites, this smaller shrub is often found on calcareous strata such as limestone, dolomite and other harsh sites. Elevations are mainly between about 5800 – 8800 ft (1768 – 2684 m) on low gradient to moderately steep slopes.

BL

LOW SAGEBRUSH ALLIANCE

Low Sagebrush (*Artemisia arbuscula*), a short evergreen shrub, is dominant in this alliance. Patches of it have been mapped in scattered and widespread areas of this zone from Modoc to Inyo Counties, including six subsections of the Mono Section, one in the Southeast Section and three in the Northwest Section. Elevations are in the range of about 5000 – 12,500 ft (1524 – 3813 m). These sites often occur in rocky or sterile areas such as basins with clay or saline to alkaline soils that are intermittently flooded and terraces with hardpans or heavy clay substrata that restrict root growth of competing species. Typical sites are higher or have more available moisture than those occupied by Black Sagebrush (*A. nova*) but often with more bedrock than those dominated by Big Sagebrush (*A. tridentata*). Conifers such as Singleleaf Pinyon Pine (*Pinus monophylla*) and Bristlecone Pine (*P. longaeva*) are often associated with this alliance as well as a variety of desert and semiarid shrubs such as Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) and Bitterbrush (*Purshia tridentata*).

BM

CURLLEAF MOUNTAIN MAHOGANY ALLIANCE

The shrub form of Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) has been mapped in scattered patches of ten subsections of the Mono Section, in one subsection in the Southeast Section and two in the Northwest Section. This Alliance occurs on gently to steeply sloping mountain uplands and ridgetops, usually in association with rocky outcrops. These stands were mostly mapped at elevations above about 5400 ft (1646 m). On more xeric sites, Curlleaf Mountain Mahogany occurs as the dominant species in association with Idaho Fescue (*Festuca idahoensis*), Squirreltail (*Elymus elymoides*), and a few other grasses and forbs. Trees such as Singleleaf Pinyon Pine (*Pinus monophylla*), Limber Pine (*P. flexilis*) Bristlecone Pine (*P. longaeva*) and Quaking Aspen (*Populus tremuloides*) may be found adjacent to this Alliance in different areas.

BQ

GREAT BASIN MIXED SCRUB ALLIANCE

A mixture of common Great Basin shrubs defines the Great Basin Mixed Scrub Alliance, which has been mapped extensively in the Bodie Hills - Excelsior Mountains, Mono Valley, Crowley Flowlands, Sweetwater Mountains - Pine Grove Hills and Benton - Upper Owens Valleys Subsections (Mono Section) and scattered in eleven other subsections of this zone. Slopes are mainly flat, geologic substrates are diverse and elevations are generally above about 4600 ft (1402 m). The species mixture includes Big Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*), and species of Currant (*Ribes* spp.), Snowberry (*Symphoricarpos* spp.) or Interior Rose (*Rosa woodsii*). Jeffrey Pine (*Pinus jeffreyi*) and Singleleaf Pinyon Pine (*P. monophylla*) are conifer associates of this Alliance.

BR

RABBITBRUSH ALLIANCE

This Alliance is found on dry, flat slopes that are dominated by various species of Rabbitbrush (*Chrysothamnus* spp. or *Ericameria nauseosa*) on essentially alluvial deposits or sites that may have a history of other ground disturbance. In this area, it commonly occurs around the dry margins of Mono Lake (Mono Valley Subsection) and in Adobe Valley (Crowley Flowlands) and the Benton - Upper Owens Valleys Subsection. It also has been mapped scattered in ten other subsections of this zone. Elevations are typically in the range 3800 - 8400 ft (1160 – 2562 m) where it has been mapped. Small inclusions of Great Basin shrubs such as Bitterbrush (*Purshia tridentata*), Big Basin Sagebrush (*Artemisia tridentata* ssp. *tridentata*), and Shadscale (*Atriplex confertifolia*) may occur in this Alliance. Singleleaf Pinyon Pine (*Pinus monophylla*) is a common conifer associate.

BS

BIG SAGEBRUSH ALLIANCE

The Big Sagebrush Alliance, consisting of dominant Big and/or Mountain Sagebrushes (*Artemisia tridentata* subspecies *tridentata* and *vaseyana* combined), is the most extensively mapped shrub type in this zone, occurring in sixteen subsections of the Mono, Northwest and Southeast Sections. Developing on a wide range of substrates, this Alliance has been mapped within the elevation range of about 4200 – 11,000 ft (1280 – 3355 m). It occurs in association with other Great Basin shrubs such as Bitterbrush (*Purshia tridentata*), Curlleaf Mountain Mahogany (*Cercocarpus ledifolius*) and Black Sagebrush (*A. nova*). In association with Jeffrey Pine (*Pinus jeffreyi*), it is one of the understory indicator species that identifies the Eastside Pine Alliance and is strongly associated with Singleleaf Pinyon Pine (*P. monophylla*) and Utah Juniper (*Juniperus osteosperma*) at lower elevations as well as Bristlecone, Limber and Lodgepole Pines (*P. longaeva*, *P. flexilis*, *P. contorta* ssp. *murrayana*) on higher elevation sites.

BX

GREAT BASIN - MIXED CHAPARRAL TRANSITION ALLIANCE

This Alliance has been mapped sparsely in eight subsections of the Mono Section mainly on pyroclastic and mudflow deposits and in the Sheldon Range Subsection of the Northwest Section. It is a mixture of montane hard chaparral species such as Greenleaf Manzanita (*Arctostaphylos patula*), Snowbrush (*Ceanothus velutinus*), Mountain Whitethorn (*Ceanothus cordulatus*) and Snowberry (*Symphoricarpos* spp.) with an equivalent vegetation cover of Great Basin species such as Mountain or Basin Big Sagebrush (*Artemisia tridentata* ssp. *vaseyana*, *A. t.* ssp. *tridentata*), Bitterbrush (*Purshia tridentata*), and Curleaf Mountain Mahogany (*Cercocarpus ledifolius*). This transitional type occurs mainly at mid to upper montane elevations of about 5400 – 9200 ft (1646 – 2806 m).

BZ

GREAT BASIN - DESERT MIXED SCRUB ALLIANCE

Great Basin species such as Big Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*), Curleaf Mountain Mahogany (*Cercocarpus ledifolius*), and more southerly Mojave Desert species such as Saltbush (*Atriplex* spp.), Mormon Tea (*Ephedra nevadensis*, *E. viridis*), Creosote Bush (*Larrea tridentata*), and Horsebrush (*Tetradymia glabrata*, *T. stenolepis*) occur in this transitional Alliance together with equivalent cover values. It is locally common or sparse as mapped in ten subsections of the Southeast Section and three in the Mono Section. Elevations are chiefly in the range of 4200 – 8200 ft (1280 - 2501 m); slopes and lithology are variable.

CG

GREENLEAF MANZANITA ALLIANCE

Greenleaf Manzanita (*Arctostaphylos patula*) may dominate some sites at upper montane elevations in the Great Basin area. This Alliance has been mapped sparsely on the western edge of the Fort Sage Mountains – Lemmon Valley Subsection (Mono Section), generally at elevations between about 5000 - 7000 ft (1525 - 2135 m). In this area, the Greenleaf Manzanita Alliance is frequently found adjacent to Jeffrey Pine (*Pinus jeffreyi*) stands and to the Eastside Pine and to the transitional Great Basin - Mixed Chaparral Alliances. Great Basin species such as Low and Big Sagebrush (*Artemisia arbuscula*, *A. tridentata*), Bitterbrush (*Purshia tridentata*) and Curleaf Mountain Mahogany (*Cercocarpus ledifolius*) may be found within or in the vicinity of these sites.

CV

SNOWBRUSH ALLIANCE

Snowbrush (*Ceanothus velutinus* var. *velutinus*) is a locally common shrub species on the eastside slopes of the Southern Sierra Nevada, but rarely becomes dominant as an Alliance in this zone. It has been mapped very sparingly in five subsections of the Mono Section and one in the Northwest Section at elevations between 7200 – 9200 ft (2196 – 2806 m). Shrub associates in this area include Great Basin species such as Bitterbrush (*Purshia tridentata*), Big Sagebrush (*Artemisia tridentata*) and Curleaf Mountain Mahogany (*Cercocarpus ledifolius*). Jeffrey Pine (*Pinus jeffreyi*) and Quaking Aspen (*Populus tremuloides*) may also be associated with this Alliance.

CX

UPPER MONTANE MIXED CHAPARRAL ALLIANCE

The Upper Montane Mixed Chaparral Alliance is a mid to high elevation shrub type in which no single species is dominant. Not well represented in this zone, it has been mapped sparsely in six subsections of the Mono Section and one in the Northwest Section. Characteristic, non-dominant species in this area generally include only Greenleaf Manzanita (*Arctostaphylos patula*), Mountain Whitethorn (*Ceanothus cordulatus*), and Snowbrush (*Ceanothus velutinus*). Slopes tend to be south and west facing within the general elevation mapped, about 4400 - 10,400 ft (1342 - 3172 m).

DA

BLACKBUSH ALLIANCE

Blackbush (*Cologlyne ramosissima*) becomes a locally dominant desert shrub chiefly on shallow, rocky or calcareous soils in the Northwestern Nevada Basins (Northern Mono Section) and in this zone, found scattered in three other subsections of the Mono Section. Blackbush appears to occupy areas colder or higher than those of Creosote Bush (*Larrea tridentata*) and at elevations below those of Big or Mountain Sagebrush (*Artemisia tridentata*), generally below about 5400 ft (1646 m). Other desert shrubs, especially Mormon Tea (*Ephedra* spp.) and Saltbush (*Atriplex* spp.) in this area, may be present in minor cover values in this type.

DB

DESERT BUCKWHEAT ALLIANCE

This alliance identifies the occurrence of California Buckwheat (*Eriogonum fasciculatum*) or other shrub or subshrub Buckwheats such as Heermann's (*E. heermanni*), Slender (*E. microthecum*), Marumleaf (*E. marifolium*), Money (*E. nummular*), Rock (*E. sphaerocephalum*) and Sulphur (*E. umbellatum*) in any mixture. They are found in true desert or desert-fringe environments in contrast to those found in more coastal or dry chaparral areas in the Buckwheat Alliance. This type has been mapped only on one site in the Sweetwater Mountains – Pine Grove Hills Subsection of the Mono Section at elevations below about 2200 ft (671 m). Associated species on this site include Antelope Bitterbrush (*Purshia tridentata* var. *tridentata*), Big Sagebrush (*Artemisia tridentata*) and Singleleaf Pinyon Pine (*Pinus monophylla*).

DI

INDIGO BUSH ALLIANCE

Two species of Indigo Bush (*Psorothamnus arborescens* and *P. polydenius*) commonly occur in this area and the combination of one or both as dominant shrub(s) defines the Alliance. It occurs in the Owens, Hammil, and Chalfant Valleys within the Crowley Flowlands, Benton - Upper Owens Valleys and White Mountains Subsections of the Mono Section and more sparsely in the Inyo Mountains Subsection of the Southeast Section. This type has been most often mapped on flat to low-gradient alluvial fans, often on tuffaceous or volcanic mudflow deposits just above the floor of Owens Valley. Elevations are usually in the 4000 - 5400 ft (1220 - 1648 m) range. Other desert shrubs such as Horsebrush (*Tetradymia* spp.), Saltbush (*Atriplex* spp.), and Mormon Tea (*Ephedra* spp.) may be present in minor amounts in this Alliance.

DJ

SPINY MENODORA ALLIANCE

Spiny Menodora (*Menodora spinescens*), a spiny, intricately branched shrub, occurs in California on rocky slopes and canyons from the east Mojave Desert north to Owens Valley. As a dominant shrub, it has been mapped only in small areas of the Silver Peak Mountains - Fish Lake Valley and Panamint Range Subsections of the Southeast Section. It occurs there in the range 6200 - 7000 ft (1890 - 2135 m) in association with Big Sagebrush (*Artemisia tridentata*), Bitterbrush (*Purshia tridentata*) and other desert shrubs.

DL

CREOSOTE BUSH ALLIANCE

In contrast to other desert areas elsewhere where it is abundant, Creosote Bush (*Larrea tridentata*) has been mapped as a dominant shrub species mainly on south facing, low-gradient slopes in a small area of the Inyo Mountains Subsection (Southeast Section) in this zone. Elevations are of the order 3800 - 4400 ft (1160 - 1342 m). Associated with this type are other desert shrubs such as Cacti and Cholla (*Opuntia* spp.) and Horsebrush (*Tetradymia* spp.).

DS

SHADSCALE ALLIANCE

In this zone, Shadscale (*Atriplex confertifolia*) is abundant as a dominant shrub on alkaline alluvial flats in the elevation range of approximately 3600 – 6800 ft (1098 – 2074 m). It has been mapped extensively in the Benton - Upper Owens Valleys Subsection (Mono Section) and less commonly in five other subsections of this zone. Shadscale is strongly associated with species of similar tolerance, including other Saltbushes (*Atriplex* spp.), Indigo Bush (*Psorothamnus* spp.) and Horsebrush (*Tetradymia* spp.) and alkaine-tolerant herbaceous species such as Nevada Sumpweed (*Iva nevadensis*).

DX

DESERT MIXED SCRUB ALLIANCE

Moderate elevations east of the Sierra Nevada crest may develop a Desert Mixed Scrub Alliance where no single desert shrub species is dominant. This type has been mapped in scattered areas of the Mono and Southeast Sections. Creosote Bush (*Larrea tridentata*) is an important component of this type, associated with Cacti such as Cholla species (*Opuntia* spp.), minor amounts of Mormon Tea (*Ephedra* spp.), Blackbush (*Coleogyne ramosissima*), Saltbushes (*Atriplex* spp.), Bursage (*Ambrosia dumosa*) and other true desert species. This Alliance has been mapped on a variety of slopes, such as in dry washes or other desert drainages as well as on low gradient to moderately steep slopes up to about 7200 ft (2196 m).

FD

EPHEDRA ALLIANCE

Single species or a mixture of several species of Mormon Tea (Ephedra californica, E. funerea, E. nevadensis, E. viridis) may dominate an arid site in this zone. The Ephedra Alliance has been mapped sparsely in the Crowley Flowlands, Benton - Upper Owens Valleys and White Mountains Subsections of the Mono Section and Northwestern Nevada Basins Subsection of the Northern Mono Section within the elevation range of 4600 - 7800 ft (1402 - 2380 m). Associated species include Singleleaf Pinyon Pine (Pinus monophylla), Big Sagebrush (Artemisia tridentata), Rabbitbrush (Chrysothamnus spp.) and Saltbush (Atriplex spp.).

KQ

ASPEN (SHRUB) ALLIANCE

Quaking Aspen (Populus tremuloides) will persist in a shrub form as snow-sculpted clones in leeward slopes. Such "krummholz aspen" stands have been mapped prominently only in the extreme northwestern border of the Sheldon Range Subsection of the Northwest Section adjacent to the northeastern edge of the Warner Mountains in Modoc County. Elevations are between about 6000 – 8000 ft (1830 – 2440 m). Such sites are often surrounded by tree-sized aspen clones where conditions are more favorable and are associated with species such as Lodgepole Pine (Pinus contorta ssp. murrayana) and Mountain Sagebrush (Artemisia tridentata ssp. vaseyana).

NA

ALKALINE MIXED SCRUB ALLIANCE

Interior drainage basins evaporate quickly in this zone and often precipitate saline or alkaline salt deposits. Shrubs that tolerate this habitat, where no single genus is dominant, identify the Alkaline Mixed Scrub Alliance. It occurs extensively in patches within the Mono Valley, Benton - Upper Owens Valleys (Mono Section) and Inyo Mountains Subsections (Southeast Section) and more sparsely in seven other subsections in these sections as well as in the Northern Mono Section. This type often forms a transition zone between the Saltbush, Big Sagebrush, and High Desert Mixed Scrub Alliances, occupying mostly flat, depositional sites within an elevation range of about 3600 - 6800 ft (1098 - 2074 m). The shrub mixture lacks a significant cover of Cacti (Opuntia spp.) and includes, among others, species of Saltbush (Atriplex spp.), Iodine Bush (Allenrolfea occidentalis), Horsebrush (Tetradymia spp.), Kochia spp., Budsage (Artemisia spinescens), Greasewood (Sarcobatus vermiculatus), and Hopsage (Grayia spinosa).

NM

RIPARIAN MIXED SHRUB ALLIANCE

A community of shrubs in riparian and moist meadow areas has been mapped sparsely and in scattered locations in fourteen subsections and all four sections of this zone. No single species or genus is dominant in this Alliance. Sites are often derived from granitic sources in a wide elevation range from about 4800 - 11,400 ft (1464 - 3478 m). The shrub mixture may include species of shrub Willow (Salix spp.), Blue Elderberry (Sambucus mexicana), White-stemmed Gooseberry (Ribes inermis), California Blackberry (Rubus ursinus), Interior Rose (Rosa woodsii), and various species of moist site shrub or perennial Sagebrushes: Silver (Artemisia cana), Lemon Sagewort (A. michauxiana), Mugwort (A. douglasiana), Tarragon (A. dracunculus), Rothrock (A. rothrockii) and Snowfield (A. spiciformis).

NQ

HIGH DESERT MIXED SCRUB ALLIANCE

A mixture of desert shrubs occupies flat, open areas at elevations in the range of about 3800 – 8000 ft (1158 – 2440 m) in this alliance. It often forms a band between the Great Basin - Desert Mixed Scrub Alliance and other desert types such as the Indigo Bush, Desert Mixed Scrub, and Alkaline Mixed Scrub Alliances. In contrast to the mixture of shrubs in the Desert Mixed Scrub Alliance which often has an abundance of Creosote Bush (Larrea tridentata), this type is defined by the presence of abundant (but not dominant) Ephedra species, especially Green Ephedra (E. viridis); Spiny Menodora (Menodora spinescens) and Horsebrush (Tetradymia spp.) are also common associates. White Bursage (Ambrosia dumosa) and Blackbush (Coleogyne ramosissima) may be in the mixture at lower elevations, and some alkaline tolerant shrubs such as Saltbush (Atriplex spp.), Greasewood (Sarcobatus vermiculatus) and Hopsage (Grayia spinosa) may also be found in this Alliance. It has been mapped prominently in the Crowley Flowlands and White Mountains Subsections (Mono) as well as more sparsely in seven other subsections of the Mono, Southeast and Northern Mono Sections.

SB

BUCKWHEAT ALLIANCE

California Buckwheat (Eriogonum fasciculatum var. polifolium) occasionally dominates flat, dry slopes and washes, but has been mapped as a dominant shrub only in one area in the Benton - Upper Owens Valleys Subsection (Mono Section). It occurs there on alluvium from about 4800 - 5800 ft (1464 - 1770 m) in an area that had completely burned several years ago. In other areas of this zone, it mixes in small patches with a variety of xeric shrubs and subshrubs such as Big Sagebrush (Artemisia tridentata), Bitterbrush (Purshia tridentata), Blackbush (Coleogyne ramosissima) and Creosote Bush (Larrea tridentata).

TB

BITTERBRUSH – SAGEBRUSH ALLIANCE

A combination of Bitterbrush (Purshia tridentata), an important browse species for a variety of grazing animals, and any xeric species of Sagebrush (Artemisia) has been identified in any combination that dominates the shrub layer in portions of the Great Basin zone. The Bitterbrush – Sagebrush Alliance has been mapped abundantly along the western edge of the Fort Sage Mountains – Lemmon Valley, frequently in the Sweetwater Mountains – Pine Grove Hills, and occasionally in other subsections of the Mono and Northwest Sections. Mapped locations are found in the elevation range of about 5000 – 10,000 ft (1525 – 3050 m). Associated trees and shrubs near and in this Alliance include Singleleaf Pinyon Pine (Pinus monophylla), Jeffrey Pine (P. jeffreyi), Quaking Aspen (Populus tremuloides), Mountain and Big Basin Sagebrush (A. tridentata ssp. vaseyana, A. tridentata ssp. tridentata), Curlleaf Mountain Mahogany (Cercocarpus ledifolius), and Black Sagebrush (A. nova).

TM

HORSEBRUSH ALLIANCE

Species of Horsebrush (or Cottonthorn) occasionally dominate areas in four subsections of the Mono Section and one in the Southeast Section. These include any mixture of Cottonthorn (Tetradymia axillaris), Gray Horsebrush (T. canescens), Little Horsebrush (T. glabrata), Mojave Horsebrush (T. stenolepis) and Spiny Horsebrush (T. spinosa). Associated shrub species in this Alliance that may be present in minor amounts are Salbush (Atriplex spp.), Greasewood (Sarcobatus vermiculatis), Spiny Hopsage (Grayia spinosa), Ephedra spp., Yellow Rabbitbrush (Chrysothamnus viscidiflorus), Big Sagebrush (Artemisia tridentata), and Bitterbrush (Purshia tridentata). Singleleaf Pinyon Pine (Pinus monophylla) and grasses such as Cheatgrass (Bromus tectorum) and Galleta (Pleuraphis jamesii) may also occur. Sites are generally on flat or low gradient slopes in the elevation range of 4000 - 7600 ft (1220 - 2318 m).

TN

BLACK SAGEBRUSH ALLIANCE

Black Sagebrush (Artemisia nova), most often a low growing, spreading shrub, may occasionally form pure stands in the Great Basin area. The Black Sagebrush Alliance has been frequently mapped in northeast areas of the Sweetwater Mountains – Pine Grove Hills, southern areas of the Antelope – Mason Valleys and Hills Subsections (Mono Section), and southern portions of the Northeastern Nevada Basins Subsection of the Northern Mono Section. It also has been mapped more sparsely in five other subsections of this zone. Elevations of these sites are typically in the 5000 -8000 ft (1525 - 2440 m) range. In contrast to Big Sagebrush (A. tridentata) and Low Sagebrush (A. arbuscula), another dwarf shrub, Black Sagebrush, typically grows on warmer, more calcareous sites and those having coarse textured shallow soils, such as alluvial flats. In this region, it occurs in close proximity to Bitterbrush (Purshia tridentata), other Sagebrushes and Singleleaf Pinyon Pine (Pinus monophylla). It is also often found adjacent to the Great Basin – Desert Mixed Scrub Alliance.

TS

SNOWBERRY ALLIANCE

Snowberry (Symphoricarpos) has several species of deciduous shrubs that grow in different elevations and habitats. The Snowberry Alliance consists of one or more of these species that are dominant in the shrub layer, mainly Roundleaf Snowberry (S. rotundifolius) in this zone. The Snowberry Alliance has been mapped sparsely at upper montane to subalpine elevations, mainly between about 6600 - 10,000 ft (2013 - 3050 m) in the Sweetwater Mountains - Pine Grove Hills and Pine Nut Mountains Subsections (Mono Section) and in the Sheldon Range Subsection of the Northwest Section. Trees such as Quaking Aspen (Populus tremuloides), Singleleaf Pinyon Pine (Pinus monophylla) and Lodgepole Pine (P. contorta ssp. murrayana) and shrubs such as Mountain Sagebrush (Artemisia tridentata ssp. vaseyana), and Curlleaf Mountain Mahogany (Cercocarpus ledifolius) are often present on these sites.

TT

BIG BASIN SAGEBRUSH ALLIANCE

Big Basin Sagebrush (*Artemisia tridentata* ssp. *tridentata*) is identified as a distinctive subspecies of Big Sagebrush (*A. tridentata*) and forms dominant stands in this Alliance. It has been mapped abundantly in two subsections of the Mono Section (Antelope – Mason Valleys and Hills and Bodie Hills – Excelsior Mountains), one in the Northern Mono Section (Northwest Nevada Basins) and occasionally in nine other subsections of this zone. Elevations mapped for this Alliance in some areas indicate that the higher elevation Mountain Sagebrush (*A. t.* ssp. *vaseyana*) may have been included in this type as well. Eastside species such as Jeffrey Pine (*Pinus jeffreyi*), Bitterbrush (*Purshia tridentata*), Singleleaf Pinyon Pine (*P. monophylla*), and Black Sagebrush (*A. nova*) occur in close proximity to these sites. Alliances of mixed shrubs such as the Alkaline Mixed Scrub and Great Basin Mixed Scrub are also closely associated with the Big Basin Sagebrush Alliance.

TU

SILVER SAGEBRUSH ALLIANCE

Silver Sagebrush (*Artemisia cana*) is more common towards the west of this zone in Modoc County. However, as a dominant shrub, it has been mapped sparsely in the northwestern edge of the Surprise Valley Subsection of the Northwest Section at elevations below about 5200 ft (1586 m). It often occupies relatively moist to wet sites to the exclusion of other Sagebrush species. In these areas, it is closely associated with Big Basin Sagebrush (*A. tridentata* ssp. *tridentata*) and occasionally with Western Juniper (*Juniperus occidentalis* var. *occidentalis*), but usually is present as a dominant shrub on cooler or moister sites.

TV

MOUNTAIN SAGEBRUSH ALLIANCE

The Mountain Sagebrush subspecies (*Artemisia tridentata* ssp. *vaseyana*) of Big Sagebrush (*A. tridentata*) has been differentiated from Big Basin Sagebrush in certain areas of the Great Basin region but a few mapped sites also include the lower elevation Big Basin Sagebrush (*A. t.* ssp. *tridentata*) in abundance. Mountain Sagebrush forms dominant stands and has been mapped prominently in the Sweetwater Mountains - Pine Grove Hills and Bodie Hills - Excelsior Mountains Subsections (Mono Section), and more sparsely in seven other subsections of the Mono and Northwest Sections. Elevations are generally higher than those of Big Basin Sagebrush, up to about 10,000 ft (3050 m). Low Sagebrush (*A. arbuscula*) and Singleleaf Pinyon Pine (*Pinus monophylla*) often occur near and within these sites, as do the Bitterbrush – Sagebrush, Big Basin Sagebrush and Great Basin Mixed Scrub Alliances.

WL

SHRUB WILLOW ALLIANCE

Shrub forms of Willow (*Salix* spp.) are mapped as this Alliance where they dominate the shrub layer in a riparian, seep or meadow site. In this region, they have been identified at low to high elevations, often on gravel bars adjacent to or in permanent water sources, and chiefly in middle to upper montane locations. These sites are widely scattered within fifteen subsections of the four sections (Mono, Northern Mono, Southeast and Northwest). Willows in this Alliance may include any combination of Narrow-leaved (*S. exigua*), Geyer's (*S. geyeriana*), Lemmon's (*S. lemmonii*), Shining (*S. lucida*), Yellow (*S. lutea*), and Gray-leaved Sierra (*S. orestera*). Grasses and grasslike plants such as Water Sedge (*Carex aquatilis*), Meadow Barley (*Hordeum brachyantherum*), Nebraska Sedge (*Carex nebrascensis*), and Woolly Sedge (*C. lanuginosa*) may be common in this Alliance. Associated trees and shrubs in this wide ranging type may include Quaking Aspen (*Populus tremuloides*), Interior Rose (*Rosa woodsii*), Blue Elderberry (*Sambucus mexicana*), Gooseberry (*Rubus* spp.), and moist site Sagebrush species (*Artemisia* spp.) in the Riparian Mixed Shrub Alliance.

HERBACEOUS

AC

ALPINE GRASSES AND FORBS ALLIANCE

Many alpine regions close to or above treeline are dominated by grasses and herbaceous species, some of which take on a cushion plant form that is adapted to protect plants under these severe climatic conditions. Minor amounts of alpine shrubs may be included. This Alliance has been mapped prominently in the White Mountains Subsection and less abundantly in five other subsections of the Mono Section as well as in the Inyo Mountains of the Southeast Section. Slopes are variable and elevations are generally in the 9000 – 13,000 ft (2745 - 3965 m) range. Much of the alpine research and plant lists for this zone have been done in the White Mountains, as follows:

Species that may be found in this Alliance include a mixture that appear to be limited by substrate, for example, (1) the calcaceous group limited to dolomites: White Mountain Buckwheat (*Eriogonum gracilipes*), Covilles Phlox (*Phlox*

condensata), Dwarf Alpine Indian Paintbrush (Castilleja nana), Prairie Flax (Linum lewisii), Stemless Goldenweed (Stenotus acaulis) and Alpineflames (Pyrocoma apargioides; (2) the group abundant on sandstones or granites: Spikerush Sedge (Carex eleocharis), Needleleaf Sedge (Carex duriuscula), Beatleys Clover (Trifolium andersonii var. beatleyae), Cushion Buckwheat (Eriogonum ovalifolium), the fern ally Watsons Spikemoss (Selaginella watsonii), Pussypaws (Calyptridium umbellatum), Rock-Jasmine (Androsace septentrionalis), Heller's Sedge (C. helleri), Bottlebrush Squirreltail (Elymus elymoides), Pine Needlegrass (Achnatherum pinetorum) and Granite Pricklyphlox (Leptodactylon pungens). Other species in this variable Alliance may include Junegrass (Koeleria macrantha), Dwarf Lupine (Lupinus lepidus), Pale Agoseris (Agoseris glauca var. monticola), Pennsylvania Cinquefoil (Potentilla pensylvanica), Pigmy Bitterroot (Lewisia pygmaea), Prickly Sandwort (Arenaria kingii var. glabrescens), Nearlyblack Sedge (C. subnigricans), Cushion Whitlowgrass (Draba breweri), Rocky Mountain Pussytoes (Antennaria media), Alpine Fescue (Festuca brachyphylla), Tufted Hairgrass (Deschampsia caespitosa), Spiked Woodrush (Luzula spicata), Masons Sky Pilot (Polemonicum chartaceum), Rambling Fleabane (Erigeron vagus), Roundspike Catseye (Cryptantha humilis), Coopers Hymonoxys (Hymenoxys cooperi), Sierra Draba (Draba sierrae), Sierran Beardtongue (Penstemon heterodoxus), Nuttalls Deserttrumpet (Linanthus nuttallii), Fewleaved Dock (Rumex paucifolius), Blackandwhite Sedge (C. albonigra), Clubmoss Mousetail (Ivesia lycopodioides ssp. scandalaris), Spike Fescue (Festuca kingii), Torrey's Milk-Vetch (Astragalus calycosus), Dunhead Sedge (C. phaeocephala), and Mertens Rush (Juncus mertensianus). At these elevations, subalpine conifers such as Bristlecone Pine (Pinus longaeva), Whitebark Pine (P. albicaulis) and Limber Pine (P. flexilis) are often found in association with this alliance.

HA

ALKALINE MIXED GRASSES AND FORBS ALLIANCE

Alkaline and hyper-saline soils occur extensively in this xeric zone in internal drainage basins that accumulate soluble salts and may have moist pockets. Areas occupied by herbaceous species and grasses adapted to these conditions have been mapped as the Alkaline Mixed Grasses and Forbs Alliance in portions of the Crowley Flowlands and Pine Nut Mountains Subsections (Mono Section) and Inyo Mountains and Silver Peak Mountains – Fish Lake Valley Subsections (Southeast Section). Herbaceous species and graminoids in this area may include Bush Seepweed (Suaeda moquinii), Western Miterwort (Nitrophila occidentalis), Alkali Weed (Cressa truxillensis), Saltgrass (Distichlis spicata), Salt Heliotrope (Heliotropium curassavicum), Nevada Sumpweed (Iva nevadensis), Alkali Sacaton (Sporobolus airoides), Galleta (Pleuraphis jamesii), Torrey's Blazing Star (Mentzelia torreyi), Sandberg Bluegrass (Poa secunda), and invasive weeds such as Halogeton (Halogeton glomeratus) and Rocky Mountain Goosefoot (Chenopodium glaucum). They are often adjacent to other halophytic shrubs such as Saltbushes (Atriplex spp) and Iodine Bush (Allenrolfea occidentalis). These sites are usually on flat or low-gradient alluvium within the elevation range of about 3600 – 8000 ft (1098 – 2440 m).

HG

ANNUAL GRASSES AND FORBS ALLIANCE

This Alliance is found predominantly on flat and generally non-alkaline alluvial areas at elevations from about 4000 – 10,800 ft (1220 – 3294 m) in this zone. It is identified by annual grasses such as Bromes (Bromus spp.), many of which are not native to this state, native annual grasses such as Mexican Lovegrass (Eragrostis mexicana), Witchgrass (Panicum capillare) and Sixweeks Fescue (Vulpia octoflora) and non-native grasses such as Common Barley (Hordeum vulgare), Foxtail Fescue (Vulpia myuros) and Oats (Avena spp.). Non-native annual forbs such as Stork's Bill (Erodium spp.), Tumbleweed (Amaranthus albus), Tumble Mustard (Sisymbrium altissimum), Russian Thistle (Salsola tragus), Little Mallow (Malva parviflora), Prickly Lettuce (Lactuca serriola), Flix Weed (Descurainia sophia) and Wart Cress (Coronopus didymus) may invade these areas to displace native forbs such as Shortflowered Owl's Clover (Orthocarpus cuspidatus ssp. cryptanthus.) and Freckled Milkvetch (Astragalus lentiginosus). This type has been mapped in widely scattered or locally common sites within eighteen subsections of this zone in three sections. On some sites, this alliance may include species more characteristic of alkaline conditions, as it in frequently occurs in proximity to the Saltbush (Atriplex spp.) Alliance.

HJ

WET MEADOWS ALLIANCE

Despite the general aridity of this zone, surface and near-surface waters are plentiful in some areas, such as the Owens River watershed in the Crowley Flowlands Subsection of the Mono Section. These seasonally or permanently wet herbaceous sites have been mapped in widely scattered areas over seventeen subsections. The Wet Meadows Alliance has been chiefly identified on saturated alluvium and coarse substrates within a wide elevation range from below 4000 ft (1220 m) to about 12,000 ft (3660 m). Indicator forbs and graminoids of this area include Hartweg Iris and Western Blue Flag (Iris hartwegii, Iris missouriensis), various Rushes (Juncus spp.), False Hellebore (Veratrum californicum), Buttercup (Ranunculus spp.), Stinging Nettle (Urtica dioica), Water Sedge and various other Sedges (Carex aquatilis, Carex spp.), Mat Muhly (Muhlenbergia richardsonis), Streamside Bluebells (Mertensia ciliata), Scented Shootingstar (Dodecatheon redolens), Dwarf Larkspur (Delphinium depauperatum), Fringed Willowherb (Epilobium ciliatum) and Sierra Woodrush (Luzula orestera). Since this

type has been mapped extensively within all subsections of the Northwest Section, some of these sites share alkaline-tolerant species more characteristic of the Alkaline Mixed Grasses and Forbs Alliance as well.

HM PERENNIAL GRASS / FORB ALLIANCE

The Alliance consisting of perennial grasslands and forbs has been identified in scattered patches within the broad elevation range of about 4000 - 12,000 ft (1220 - 3660 m). It has been mapped within twelve subsections of the Mono, Northwest and Southeast Sections. Mules Ears (Wyethia mollis) is a diagnostic species on many sites, but this Alliance includes some species within the Alpine Grasses and Forbs Alliance at the highest elevations. The mixture may include both native and introduced Bluegrass (Poa spp.), the natives Indian Ricegrass (Achnatherum hymenoides), Nevada Needlegrass (Achnatherum nevadense), Pine Needlegrass (Achnatherum pinetorum), Thingrass (Agrostis pallens), Great Basin Wild Rye (Leymus cinereus), and Squirreltail (Elymus elymoides) at most elevations; the non-native Crested Wheatgrass (Agropyron desertortum), Tall Wheatgrass (Elytrigia elongata) and Quackgrass (Elytrigia repens) on the lowest and more disturbed sites; and many native perennial forbs such as Eaton's Daisy (Erigeron eatonii), Glaucous Willowherb (Epilobium glaberrimum), Congdon's False Horkelia (Horkeliella congdonis) and Desert Biscuitroot (Lomatium foeniculaceum).

HT TULE - CATTAIL ALLIANCE

This marsh type has been identified very sparsely in this zone, mainly in the elevation range of 4000 – 6800 ft (1220 – 2074 m) within four subsections of the Mono Section. Saline accumulations of surface water occur in small patches on alluvium derived from the adjoining volcanic slopes in this area. These sites are identified by hydrophytic perennial monocots such as Tule (Scirpus acutus var. occidentalis), Great Basin Bulrush (Scirpus nevadensis), and Southern or Broad-leaved Cattail (Typha domingensis, T. latifolia).

NON-NATIVE VEGETATION

IB URBAN-RELATED BARE SOIL

Urban development in California occurs in phases. When land is cleared prior to being paved, this category represents the occurrence of non-vegetated barren ground that is caused by urbanization projects. This land-use type also represents other mechanically-caused barren ground, such as open quarries or mined areas, barren ground along highways, and other areas cleared of vegetation prior to construction. This type has been mapped sparsely only in the Cottonwood – Skedaddle Mountains Subsection of the Northwest Section., usually adjacent to agricultural areas, already established urbanized centers or paved areas of the landscape.

IC NON-NATIVE/ORNAMENTAL CONIFER ALLIANCE

Planted conifers comprise this Alliance, including species such as Canary or Norfolk Island Pines (Araucaria spp.), Deodar and Atlas Cedars (Cedrus deodar, C. atlantica), Redwood (Sequoia sempervirens), Scotch Pine (Pinus sylvestris), etc. Other non-native hardwoods, shrubs, and grasses may be associated in minor amounts. Mapped areas of this Alliance are usually in developed areas, including urban and residential landscapes, parks, recreational areas, highways, cemeteries, etc. This type has been mapped only sparsely in this zone and only in the Benton – Upper Owens Valleys Subsection of the Mono Section.

IG NON-NATIVE/ORNAMENTAL GRASS ALLIANCE

Ornamental or non-native grass species define this Alliance. Other non-native conifers, hardwoods, and shrubs may be associated as minor elements. Mapped areas of this Alliance are usually in developed areas, including urban and residential landscapes, parks, recreational areas, highways, cemeteries, etc. It has been mapped sparsely within four subsections of the Mono Sections and in one subsection of the Northwest Section.

IH NON-NATIVE/ORNAMENTAL HARDWOOD ALLIANCE

Ornamental or non-native hardwood species dominate this Alliance. Other non-native conifers, shrubs, and grasses may be present in this Alliance. Mapped areas of this Alliance are usually in developed areas, including urban and residential landscapes, parks, recreational areas, highways, cemeteries, etc. This type is mapped sparsely in the Benton – Upper Owens

Valleys and Fort Sage Mountains – Lemmon Valley Subsections of the Mono Section and within the Surprise Valley Subsection of the Northwest Section.

IM NON-NATIVE/ORNAMENTAL CONIFER/HARDWOOD ALLIANCE

Mixtures of ornamental or non-native conifer and hardwood species comprise the dominant species of this Alliance. Small amounts of non-native pure stands of hardwood, conifer, shrubs, and grasses may be also associated with this Alliance. Mapped areas of this Alliance are usually in developed areas, including urban and residential landscapes, parks, recreational areas, highways, cemeteries, etc., having been mapped sparsely only in the Fort Sage Mountains – Lemmon Valley Subsection of the Mono Section.

IS NON-NATIVE/ORNAMENTAL SHRUB ALLIANCE

Ornamental or non-native shrub species dominate this Alliance. Other non-native conifers, hardwoods, and grasses may be present in this Alliance. Mapped areas of this Alliance are usually in developed areas, including urban and residential landscapes, parks, recreational areas, highways, cemeteries, etc.

LAND USE AND NON-VEGETATED CLASSES

A6 GRAIN AND CROP AGRICULTURE

Irrigated or dry crop agriculture is usually harvested in rows as edible herbaceous products such as cereals (wheat, sorghum, oats, millets, corn, rye, etc.) and vegetables (squash, celery, beans, peas, etc.) for stock and human uses. Agricultural crop fields are also occasionally planted for both animal forage and to improve nitrogen levels, as with legumes such as alfalfa and sweet clovers. Certain crops are grown for multiple uses, such as flax and cotton for their seed oils (linseed and cottonseed oils), fibers and medicinal uses, if any.

AG AGRICULTURE

Agricultural land is used primarily for the production of food and fiber. High-altitude imagery indicates agricultural activity by distinctive geometric field and road patterns on the landscape and traces produced by mechanized equipment. Agricultural land uses include forest landscapes such as orchards as well as non-forested land uses such as vineyards and field crops. Land used exclusively for livestock pasture may, however, be mapped as Annual Grassland in those cases in which land uses are not recognizable.

AK ALKALINE FLATS

Evaporation of ponds or lakes in lower elevations of this zone often creates alkaline pans or flats, which are essentially barren of vegetation. Such areas have been mapped in scattered locations in seven subsections of the Mono, Southeast and Northern Mono Sections at elevations between 3600 – 8000 ft (1098 - 2440 m) in this zone.

BA BARREN

Landscapes generally devoid of vegetation as seen from a high-altitude image source such as aerial photography, are labeled as Barren. This category includes mappable landscape units in which surface lithology is dominant, such as exposed bedrock, cliffs, interior sandy or gypsum areas, and the like. It does not include areas considered as modified or developed, as in urban areas.

SN SNOW/ICE

Permanent or long-term snow and ice fields found on the tallest peaks of the White and Sweetwater Mountains of the Mono Section. Snow/Ice may be mapped in areas that are typically barren in drier years but were covered in snow or ice at the time of mapping imagery acquisition.

UB
URBAN OR DEVELOPED

This category applies to landscapes that are dominated by urban structures, residential units, or other developed land use elements such as highways, city parks, cemeteries, and the like. In those cases in which the managed landscapes may have a considerable vegetation component, other land use categories may be more appropriate, such as Ornamental Conifer and Hardwood mixtures within city parks.

WA
WATER

Water is labeled in Calveg mapping in those cases in which permanent sources of surface water are identified within a landscape unit of sufficient size to be mapped. The category includes lakes, streams and canals of various size, bays and estuaries and similar water bodies. These areas are considered to have a minimum of vegetation components, except along the edges, which may be mapped as types such as Wet Meadows, Tule-Cattail freshwater marshes, or Pickleweed-Cordgrass saline or mixed marshes. Islands within water bodies may be mapped according to their terrestrial dominant vegetation types.