Plant Formations in the Great Basin BioProvince

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Great Basin Sagebrush Associations
This vegetation is largely characterized by species of Artemisia of the Tridentatae section with Artemisia tridentata being one of the most widespread species. These formations were formerly very widespread throughout the northern Great Basin before human intervention and would have covered large parts of Nevada, Utah, northeast California, southeast Oregon and western Wyoming. It mainly occurs on deep, permeable soil free of salt, and where there is sufficient soil moisture it can reach heights of up to 2 m but it is often in a more stunted state. Grasses can be an important feature in natural stands but heavy domestic grazing often eliminates these. However, both domestic and native ruminants usually avoid sagebrush because it contains oils that inhibit microbial activity in their digestive systems and so they usually target more palatable grasses and forbs. Vegetation thought to be close to the natural condition where there has been an absence or near absence of domestic grazing can be seen, for example, on the Fishtail Mesa, a plateau in northwest Arizona, and at Boysag Point on the Kaibab Plateau. At the latter site the main shrub species include Artemisia tridentata var. tridentata, A. bigelovii, Agave utahensis, Atriplex canescens, Ceratoidees lanata, Chrysothamnus greenei, Coleogyne ramosissima, Ephedra viridis, Fallugia paradoxa, Gutierrezia sarothrae, Polygala rusbyi and Yucca baccata. Typical grasses are Bouteloua eriopoda, B. gracilis, Hilaria jamesii, Poa secunda, Sporobolus cryptandrus and Stipa species. In fact, at Boysag Point the total cover of perennial grasses equals that of sagebrush and on that basis this vegetation could be regarded as a form of steppe or scrub steppe. Near natural sagebrush vegetation can also be seen on parts of the rangelands of northeastern Nevada. Here are elevation ranging from 2200-3100 m the more natural stands are largely dominated by Artemisia tridentata subsp. vaseyana and Symphoricarpos oreophilus but at least five association involving these species have been identified. In general other associated shrubs include Amelanchier pallida, Chrysothamnus viscidiflorus and Purshia tridentata, while common grasses are Agropyron spicatum, A. trachycaulon, Bromus carinatus, B. marginatus, B. tectorum, Festuca idahoensis, Poa secunda and Sitanion hystrix. The characteristic forbs include Agastache urticifolia, Agoseris glauca, Astragalus beckwithii, Balsamorhiza sagittata, Collinsia parviflora, Crepis acuminata, Eriogonum ovalifolium, Lupinus caudatus, Mertensia oblongifolia, Penstemon hymilis, Phlox longifolia and Viola beckwithii. Endemic or near endemic species associated with this formation may include Agave utahensis (Agavaceae), Ephedra nevadensis (Ephedraceae) and Xanthocephalum sarothrae (Asteraceae).

Great Basin Shadscale Associations
Named after the dominant species Atriplex confertifolia this is a widespread saltbush association but it is only in or adjacent to the Great Basin that A. confertifolia is a wide-ranging dominant. In the Great Basin studies of the vegetation have been carried out in Colorado and Utah. The vegetation was initially thought to be indicative of saline conditions but these studies show that is not always the case. However, it tends to grow where precipitation is lower than sagebrush areas and is considered to be characteristic of the driest Great Basin desert scrub areas. Domestic grazing has altered the natural species composition in a number of areas since in addition to the perennial grasses two of the shrub Artemisia spinescens and Ceratoidees lanata are also palatable. Other important shrubs include Atriplex gardneri, A. nuttallii, Chrysothamnus greenei, C. nauseosus, Gutierrezia sarothrae, Sarcobatus vermiculatus and Suaeda fruticosa. Grasses may be present but they always tend to be widely scattered and represented by just a few species.
These mainly include *Hilaria jamesii*, *Oryzopsis hymenoides*, *Sitanion hystrix*, *Sporobolus airoides* and *Stipa speciosa*. In spring a number of annual and perennial herbaceous species make their appearance but never in abundance. These may include *Delphinium bicolor*, *Eriogonum hookeri*, *Montezia albicaulis*, *Salsola pestifer*, *Sphaeraclea grossulariaefolia*, *Stanleya arcuata* or the endemic or near endemic *Senecio uintahensis* (Asteraceae) and *Sphaerostigma utahense* (Onagraceae).

**Great Basin Blackbrush Associations**

Blackbrush (*Coleogyne ramosissima*) dominates some of the southern parts of the Great Basin and largely found in southern Nevada, southeastern California, north central Arizona and southeastern Utah. It has been suggested that this vegetation represents a transition between the Great Basin and the Mohave desert scrub, but it seems to be best developed along the valleys of the Colorado and Green rivers both of which are considered to be part of the Great Basin biome. Nevertheless, it does straddle the boundary between these two biomes. Associated shrubs include *Artemisia filifolia*, *A. parryi*, *A. tridentata*, *Atriplex confertifolia*, *Ephedra nevadensis*, *E. torreyana*, *Eriogonum fasciculatum*, *Gutierrezia microcephala*, *Opuntia ramosissima* and *Stenopsis linearifolius*. In south Nevada crown coverage can exceed 50%, which is a higher percentage than any other desert scrub community. This is possible a reflection of the higher rainfall at sites it occupies.

**Great Basin Greasewood Associations**

Associations dominated by greasewood (*Sarobatus vermiculatus*) usually require good soil moisture levels. They can occur in saline situations but are not a particularly good indicator of high salt levels. In the White Valley, Utah, for example, virtually all the valley floor is occupied by this formation. Here the associated shrubs include *Artemisia spinescens*, *Atriplex confertifolia* and *Suaeda fruticosa*, while other species are *Kochia vestita* and the salt grass *Distichilis stricta*. However, when soil salt content exceeds about one percent, salt grasses like *Distichilis spicata* and *D. stricta* become more conspicuous together with other salt tolerant species like pickleweed (*Allenvolkea occidentalis*) and samphire (*Salicornia utahensis*).

**Great Basin Winterfat Associations**

Winterfat (*Krascheninnikovia lanata*) associations were probably much more widespread before human intervention. The dominant species is palatable and has been described as a superior winter browse for livestock and wildlife. Consequently it is very susceptible to overgrazing and often fails to re-grow or reproduce under these conditions. The association also has a high water requirement and is intolerant of high concentrations of salt. The best stands, which can grow to about 0.5 m in height, occur on permeable, sandy soil that absorbs at large proportion of the available precipitation. Associated species typically include *Atriplex confertifolia*, *Hilaria jamesii*, *Oryzopsis hymenoides*, *Sphaeralcea grossulariaefolia* and *Tetradymia glabrata*. These formations often occur as ‘islands’ in a ‘sea’ of extensive shadscale and are clearly discernable due to their lighter colour.

**Great Basin Iodinebush Associations**

The dominant plant here, *Allenrolfea occidentalis*, is very tolerant of salt and largely found in areas where the concentration is too high for other desert shrubs such as the greasewoods. Because of this it is seldom accompanied by many other species. The main ones may include shrubs like *Sarcobatus vermiculatus*, grasses like *Distichlis stricta*, *Leymus cinereus*, *Sporobolus airoides* and succulent forbs like *Suaeda suffrutescens* and species of *Nitrophila* and *Salicornia*. If greasewoods are present they are invariably unhealthy looking with a stunted, yellow appearance. The association is often confined to
marginal areas and occurs, for example, as a narrow fringe around the barren playa adjacent to the greasewood associations at Tula Springs, Utah.

**Great Basin Saltmarsh**

These are largely confined to saline wet depressions and often dominated by the desert salt grass *Distichlis stricta*, but species composition can vary from place to place depending on levels of salinity and water availability. In hyper saline zones with seasonal water supplies, very few additional species occur, but may include other well developed halophytes such as *Cordylanthes maritimus*, *Salicornia europaea*, *Sporobolus airoides*, *Suaeda depressa*, *Triglochin maritima* and the endemic or near endemic *Salicornia utahensis* (Chenopodiaceae). Examples are found at Goshen Playa, Utah County, and Plover Playa, Tooele County. In less saline situations where water supplies are more consistent more diverse communities can develop. Here additional species may include *Allenrolfea occidentalis*, *Eleocharis palustris*, *Juncus balticus*, *Puccinellia nuttalliana*, *Scirpus americanus* and the endemic or near endemic *Centaurium exaltatum* (Gentianaceae). Around the Great Salt Lake in Utah there are some remarkable saltmarsh strandline zonations. At Garfield and Saltair beaches the pioneer zone is dominated by *Salicornia rubra* and *S. utahensis*. Moving landward this is followed by a further four zones: a *Suaeda erecta* zone, a *Distichlis spicata* zone, a zone that includes *Abronia salsa*, *Bromus tectorum*, *Eriocoma cuspidata*, *Puccinellia nuttalliana*, *Spartina gracilis* and the endemic or near endemic *Sphaerostigma utahensis* (Onagraceae), and finally a zone with *Atriplex hastata*, *Distichlis spicata* and *Sporobolus asperifolius*. Other species that may be present are *Atriplex rosea*, *Chrysothamnus pulcherrimus*, *Gutierrezia microcephala*, *Iva axillaris*, *Pachylophus marginatus*, *Poa nevadensis* and *Sporobolus cryptandrus*.

**Great Basin (Byrce Canyon) Breaks Associations**

The Breaks are an extremely dry and rugged environment composed of Claron Limestone. This is a Tertiary deposit that includes red Eocene beds and white Oligocene beds with may eroding cliffs and slopes. In fact, it is said to have one of the most rapid natural erosion rates on the planet. The vegetation is varied but can be broadly divided into open stands characterized by *Pinus longaeva*, stands characterized by *Pinus ponderosa*, and stands with *Pinus pungens* and *Abies concolor*. *Pinus longaeva* is the famous Great Basin Bristlecone Pine, which is endemic to the Great Basin and the Mojave Desert, and said to be the world’s longest living tree. Estimates suggest that it can live for over 5000 years. The famous ‘Methuselah’ tree in the White Mountains of California is now reckoned to be about 4838 years of age. However, none of the tree in Bryce Canyon exceeds more than about 1500 years. Stands of *Pinus longaeva* are only well defined in the true badlands of the Claron formation and are especially characteristic of ridgelines where little of no soil occurs. Other trees may include *Pinus flexilis* and *P. ponderosa*, but all trees are stunted and twisted. Shrubs are sparsely distributed with only *Arctostaphylos patula* in any abundance, but others may include *Ceanothus martini*, *Cercocarpus montanus* and *Mahonia repens*. The herb layer, on the other hand, is quite distinctive with *Ivesia sabulosa*, *Linum kingii* and the local endemic *Eriogonum panguicense* var. *panguicense* (Polygonaceae) being the most common species. Others include *Agropyron scribneri*, *Aguilegia scopulorum*, *Aster glaucaedes*, *Erigeron simplex*, *Monardella odoratissima*, *Senecio atratus* and the local endemics *Castilleja revealii* (Scrophulariaceae), *Cymoptanthra ochroleuca* (Boraginaceae), *Lesquerella rubicundula* (Brassicaceae), *Lomatium minimum* (Apiaceae), *Penstemon bracteatus* (Scrophulariaceae), *Silene pattersonii* var. *minor* (Caryophyllaceae) and *Townsendia minimum* (Asteraceae). In fact, *Pinus longaeva* stands support more endemic species than any other plant formation in the Breaks. Stands of *Pinus ponderosa* comprise various associations depending on location, which
includes north and south facing slopes and canyon bottoms. Associated trees may include Juniperus scopulorum, Picea pungens, Pinus flexilis, Pinus longaeva and Pseudotuga menziesii. Thickets of Quercus gambelii may also occur in south facing situations or in valley bottoms, but in these situations Arctostaphylos patula and Mahonia repens often dominate the shrub layer. The herb layer also varies and may include species such as Cirsium arizonicum and the endemic Lesquerella rubicundula (Brassicaceae) and Townsendia minima (Asteraceae). Stands dominated by Abies concolor and Pinus pungens may also support a few endemic species such as Draba subalpina (Brassicaceae).

Further information required particularly with regard to endemic plant species.

References


