

10810

Inter-Mountain Basins Mixed Salt Desert Scrub

BpS Model/Description Version: Aug. 2020

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Reviewer: Alan Sands

Vegetation Type

Shrubland

Map Zones

27, 33

Geographic Range

Only the northern half of map zone [MZ]27 should be included with this group in the future, but for now the entire zone is included.

This type extends in limited distribution into the southern Great Plains. It is a large patch type in the Western Great Plains, not matrix forming. Found in southeast Colorado and occasional patches are found in northeast Colorado. Occurs in the High Plains and the northern half of the Southwestern Tablelands level 3 ecoregions, predominately within the Piedmont Plains and Tablelands level 4 ecoregion and the ecoregions it subsumes (US EPA 2013).

Biophysical Site Description

This extensive BpS includes open canopied shrublands of typically saline basins, alluvial slopes and plains across the Intermountain West United States. Substrates are often saline and calcareous, medium to fine textured, alkaline soils, but include some coarser textured soils.

This system is comprised of arid to semi-arid shrublands on lowland and upland sites usually at elevations between 1,520-2,200m (4,987-7,218ft), although it might be lower in eastern Colorado. This type occurs from lower slopes to valley bottoms. Soils are often alkaline or calcareous. Soil permeability ranges from high to low, with more impermeable soils occurring in valley bottoms. Water ponds on alkaline bottoms. Texture is variable becoming finer toward valley bottoms. Many soils are derived from alluvium. Average annual precipitation ranges from 5-10in.

In the Great Basin, summers are hot and dry with many days reaching 100° F. Spring is the only dependable growing season with moisture both from winter and spring precipitation. Cool springs can delay the onset of plant growth and drought can curtail the length of active spring growth. Freezing temperatures are common November through April.

In the Great Plains, this is typically a system of extreme climatic conditions, with warm to hot summers and freezing winters. Annual precipitation ranges from ~5-13 in (13-33cm). In much of

the BpS, the period of greatest moisture will be mid to late summer, although in the more northern areas a moist period is to be expected in the cold part of the year (Colorado Natural Heritage Program 2006).

Vegetation Description

The vegetation is characterized by a typically open to moderately dense shrubland composed of one or more *Atriplex* species. This BpS includes low (<3ft) and medium-sized shrubs found widely scattered (often 20-30 feet apart), to high density (3-4 plants per sq. m) shrubs interspersed with low to mid-height bunch grasses. Common shrubs are shadscale, winterfat, fourwing saltbush, horsebrush, low rabbitbrush, broom snakeweed, and spiny hopsage, and *Lycium pallidum* in southeast Colorado. Some of these will dominate more than others depending on the site. Common bunch grass species are Indian ricegrass, needle-and-thread and purple three-awn, whereas common rhizomatous/sod forming grasses are galleta grass, sand dropseed and blue grama. Globe mallows are the most common and widespread forbs. The understory grasses and forbs are salt-tolerant, not particularly drought tolerant, and are variably abundant. The relative abundance of species may vary in a patchwork pattern across the landscape in relation to subtle differences in soils and reflect variation in disturbance history.

Total cover rarely exceeds 25% and annual precipitation is closely linked to prior 12 months' precipitation. Stand replacing disturbances (insects, extended wet periods and drought) shift dominance between shrub and grass species. Following drought, the system will tend more toward class C (more shrub prevalence). Following fire and extended wet periods, the system will tend more toward class A (greater grass prevalence).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ATCO	<i>Atriplex confertifolia</i>	Shadscale saltbush
GUSA2	<i>Gutierrezia sarothrae</i>	Broom snakeweed
KRLA2	<i>Krascheninnikovia lanata</i>	Winterfat
ATCA2	<i>Atriplex canescens</i>	Fourwing saltbush
TETRA3	<i>Tetradymia</i>	Horsebrush
CHVI8	<i>Chrysothamnus viscidiflorus</i>	Yellow rabbitbrush

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Under reference conditions disturbances were unpredictable, but flooding, drought, insects, and fire may all occur in these systems. Extended wet periods tended to favor perennial grass development, while extended drought tended to favor shrub development.

Documented Mormon cricket/grasshopper outbreaks since settlement were associated with drought; outbreaks cause shifts in composition amongst dominant species, but do not typically cause shifts to different seral stages. Therefore, insect disturbance was not modeled. During outbreaks Mormon crickets prefer open, low plant communities. Herbaceous communities and the herbaceous component of mixed communities were more susceptible to cricket grazing.

Fire was rare and limited to more mesic sites (and moist periods) with high grass productivity. Great Plains modelers felt that this BpS would probably experience more frequent fire on the Plains than in the Great Basin and Southwest because the plains receive more precipitation and

therefore have more grass cover. Fire could also move into this BpS from adjacent prairies in the Plains. In some cases this system is more productive than shortgrass with the same weather fluctuations (so higher fire frequency?) but often with patchy cover with lots of bare ground (might be related to management of the last 100yrs, not pre-European) that might limit fire spread. Reviewers for Great Basin indicated that there is no evidence for fire in salt desert shrub in the Great Basin during presettlement (see Comments for more discussion).

Native American manipulation of salt desert shrub plant communities was minimal. Grass seed may have been one of the more important salt desert shrub crops. It is unlikely that native Americans manipulated the vegetation to encourage grass seed.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	237	100		
Moderate (Mixed)				
Low (Surface)				
All Fires	237	100		

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Disturbance scale was variable during presettlement. Droughts and extended wet periods could be region wide, or more local. A series of high water years or drought could affect whole basins.

Mormon cricket disturbances could affect 100s-1,000s of acres for years, to 1-2 decades.

Most fires were rare and less than one acre in the Great Basin, but may exceed 100s/acres with a good grass crop. In the Great Plains, it was more likely that fires would be bigger because there is more consistent grass cover.

Adjacency or Identification Concerns

This BpS contains the typical Great Basin salt desert shrub communities. Salt desert shrub is also common in the Wyoming big sagebrush community and there is some species overlap with other BpS, including Inter-Mountain Basins Semi-Desert Shrub Steppe (1127). A wide range of salt desert shrubs can occur in this group.

Upland salt desert shrub communities are easily invaded and, in the short term at least, replaced by cheatgrass. Other nonnative problematic annuals include halogeton, Russian thistle, and several mustards. Through central Utah and east central Nevada this group is susceptible to invasion by squarrose knapweed. More mesic areas can be invaded by tall whitetop and hoary cress. All three are noxious weeds in Great Basin states. Many of these species can also occur in the Great Plains.

This group generally lies above playas and lakes. It tends to be the lowest vegetation group in elevation. Both to the north and up slope it is bordered by low elevation big sagebrush groups, commonly *Artemisia tridentata* ssp. *wyomingensis*, *Artemisia arbuscular*, and *Artemisia nova* communities, and sometimes by juniper and pinyon steppe. To the south this group is bordered by Mojave Desert transition communities.

In the Great Plains, this type is often adjacent to greasewood flats, sandsage or shortgrass prairie.

Issues or Problems

Lack of references limited model development. There was little to no information about the early succession species and their relationships in this system prior to the advent of aggressive and noxious non-natives. Because of the pervasive replacement of native, early succession species by non-natives today, an adequate description of the forb and grass early seral communities may be difficult to complete.

Since disturbance is rare and unpredictable, the disturbance and succession pathways were difficult to model. Little to no information on fire frequency, so mean fire return intervals for Great Plains are conjecture.

Native Uncharacteristic Conditions

Comments

During the BpS Review in 2017, this model was part of a “macro-review” where all models representing this BpS were reviewed and evaluated relative to one another. One goal of the review was to check for logical consistency between the models. Outstanding questions from this review that should be evaluated in the future include:

- What is an appropriate fire frequency and severity for this BpS? There is a wide variance in fire frequencies listed among the model set for this BpS ranging from a couple hundred to a couple thousand years. Sands stated in his review that this variation “is a reflection of the lack of data and knowledge on this system rather than actual variation among the mapzones.”

LANDFIRE National reviewers for MZs 7, 8, 9, 15, 16, 22, 23, 24, 27 and 28 indicated that there is no evidence for fire in salt desert shrub during pre-settlement. Research from the US Forest Service Desert Experimental Range supports this, and indicates that the reference condition would have been shifting mosaics of communities based of drought, flooding and insect outbreaks.

- Should the concept represented by this BpS/Ecological System be revised? Sands noted that this type actually includes a number of very different vegetation communities: 1) greasewood communities, occupying seasonally saturated lowland soils, grow large, dense shrublands, sometimes with a dense saltgrass herbaceous layer and 2) shadscale communities, occupying well drained upland soils, grow, short, widely spaced shrubs with sparse herbaceous interspaces. Kori Blankenship noted that MZs 6/12/13/17, 18/19/21, and 27/33 describe greasewood as an adjacent community, but in MZs 7/8/9 greasewood is included in the Mixed Salt Desert Scrub BpS concept.

During the 2017 BpS review, the MZ33 model was combined with MZ27 (BpS 10812 from MZ27, northern split of this model for MZ27) because the models and descriptions were identical. During LANDFIRE National Terri Schulz adjusted the model for MZs27 and 33.

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		0-10	11-20	21-30	31-40	41 - 50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	A	A	A	UN	UN	UN	UN	UN	UN	UN
Herb	0.5-1.0	A	A	A	UN	UN	UN	UN	UN	UN	UN
Herb	>1.0	A	A	A	UN	UN	UN	UN	UN	UN	UN
Shrub	0-0.5	B	B	C	UN	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	B	B	C	UN	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	B	B	C	UN	UN	UN	UN	UN	UN	UN
Shrub	>3.0	B	B	C	UN	UN	UN	UN	UN	UN	UN
Tree	0-5	C	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	5-10	C	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	10-25	C	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	25-50	C	UN	UN	UN	UN	UN	UN	UN	UN	UN
Tree	>50	C	UN	UN	UN	UN	UN	UN	UN	UN	UN

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 4 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ATCA2	Atriplex canescens	Fourwing saltbush	Upper
ATCO	Atriplex confertifolia	Shadscale saltbush	Upper

Description

Community dominated by herbaceous vegetation with widely scattered shrubs. Herbaceous vegetation seldom more than 20% cover. Extended wet periods were modeled as wind/weather/stress. During a drought vegetation will follow an alternative succession pathway to class C.

Maximum Tree Size Class

None

Class B 60 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ATCA2	Atriplex canescens	Fourwing saltbush	Upper
ATCO	Atriplex confertifolia	Shadscale saltbush	Upper

Description

Discontinuous grass patches, and higher shrub canopy cover than in class A. Extended wet periods were modeled as wind/weather/stress. During extended drought periods, vegetation will shift to class C.

Maximum Tree Size Class

None

Class C	36	Mid Development 2 - Open
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ATCA2	Atriplex canescens	Fourwing saltbush	All
ATCO	Atriplex confertifolia	Shadscale saltbush	All

Description

Grass is lacking, and shrub canopy cover is even higher than class B. Extended wet periods were modeled as wind/weather/stress. The vegetation eventually moves back to class B through succession, but drought will maintain this class. Fire would not carry in this class.

This seems to be the class that occurs due to drought.

Maximum Tree Size Class

None

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	9
Mid1:OPN	10	Mid1:OPN	999
Mid2:OPN	10	Mid1:OPN	29

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Replacement Fire	Early1:ALL	Early1:ALL	0.0067	149	Yes	0
Alternative Succession	Early1:ALL	Mid2:OPN	0.03	33	Yes	0
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.03	33	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.0067	149	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid2:OPN	0.03	33	Yes	0

Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.03	33	No	0
Wind or Weather or Stress	Mid2:OPN	Mid2:OPN	0.035	29	No	0

References

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