

10790

Great Basin Xeric Mixed-Sagebrush Shrubland

BpS Model/Description Version: Aug. 202003/15/05

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Vegetation Type

Shrubland

Map Zones

6, 9, 10, 12, 16, 17, 18

Geographic Range

Western Utah, eastern/central/northern Nevada, southeastern Oregon, southern Idaho, and sporadically into the Sierra Nevada.

Biophysical Site Description

This type describes black sagebrush and low sagebrush, mostly on convex slopes with Wyoming sagebrush and basin big sagebrush occurring in concave slopes and inset alluvial fans. Can be found on Great Basin alluvial fans, piedmonts, bajadas, rolling hills, and mountain slopes. Can also be found on flats and plains. Other species include horsebrush, spiny hopsage, and rubber rabbitbrush, although these are mostly associated with Wyoming and basin big sagebrush areas. Low/green rabbitbrush is associated with black sagebrush, as well as shadscale. Elevations range from 1,500-2,600m. Low sagebrush tends to grow where claypan layers exist in the soil profile, and soils are often saturated during a portion of the year. Black sagebrush tends to grow where there is a root-limiting layer in the soil profile. Wyoming big sagebrush and basin big sagebrush generally occur on moderately deep to deep soils that are well drained.

Vegetation Description

This type includes communities dominated by black sagebrush (*Artemisia nova*), low sagebrush (*Artemisia arbuscula*), and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*), where there is a potential for pinyon (*Pinus monophylla*) and/or juniper (*Juniperus osteosperma*) establishment. (However, the potential for pinyon and Utah juniper declines as one approaches Oregon.) Black sagebrush is the dominant shrub in this system, with Wyoming big sagebrush and basin big sagebrush occurring in minor compositions, sometimes scattered but mostly continuous. Black sagebrush generally has relatively low fuel loads, with low-growing and cushion forbs and scattered bunchgrasses such as bluebunch wheatgrass (*Pseudoroegneria spicata*), needlegrasses (*Achnatherum* spp.), Sandberg bluegrass (*Poa secunda*), and Indian ricegrass (*Achnatherum hymenoides*). Forbs often include buckwheats (*Eriogonum* spp.), fleabanes (*Erigeron* spp.), phloxes (*Phlox* spp.), paintbrushes (*Castilleja* spp.), globemallows (*Sphaeralcea* spp.), and lupines (*Lupinus* spp.).

In map zone (MZ) 6, there is probably mostly low sage (Provencher, pers. comm.).

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
ARNO4	<i>Artemisia nova</i>	Black sagebrush
ACHY	<i>Achnatherum hymenoides</i>	Indian ricegrass
ACTH7	<i>Achnatherum thurberianum</i>	Thurber's needlegrass
PSSP6	<i>Pseudoroegneria spicata</i>	Bluebunch wheatgrass

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

Disturbance Description

Black sagebrush generally supports more fire than other dwarf sagebrushes. But, fuel loads and herbaceous cover are typically low and often unable to support fire spread (Fryer 2009). Bare ground acts as a micro-barrier to fire between low-stature shrubs. Stand-replacing fires can occur in this type when successive years of above-average precipitation are followed by an average or dry year. Stand-replacement fire dominates in the Late successional class, in which the herbaceous component has diminished or in which trees dominate.

Grazing by wild ungulates occurs in this type due to its high palatability (mostly for *A. nova* and *A. arbuscula*) compared to other browsers. Native browsing tends to open up the canopy cover of shrubs but does not often change the successional stage.

Severe drought is a stress factor that can thin shrubs while maintaining the state or can cause a stand-replacing event.

Burrowing animals and ants breaking through the root restrictive zone of low and black sagebrush types create mounds of mineral soil (seedbed) readily colonized by big sagebrush. Burrowing creates small patches (i.e., generally <200 sq. ft) of big sagebrush in the low-sagebrush types, which could affect fuel loads.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	95	90	100	250
Moderate (Mixed)	841	10		
Low (Surface)				
All Fires	85	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

Black sagebrush can occupy extremely large areas (>100,000ac) in eastern Nevada and western Utah. Occurrences are typically smaller toward western and northern Nevada and southern Idaho. Disturbance patch size for this type is not well known but is estimated to be tens to hundreds of acres due to the relatively small proportion of the sagebrush matrix it occupies and the limited potential for fire spread. Where these sites exist in a more herbaceous state, fire

expands readily where there is continuity of fine fuel and sufficient wind. It is usually a low-intensity burn. Fire sizes up to 800ac are possible in situations like this.

Adjacency or Identification Concerns

In the transition area between the Great Basin and Columbia Plateau, biophysical setting (BpS) 1079 can be confused with Columbia Plateau Low-Sagebrush Steppe (BpS 1124), which has a greater herbaceous cover.

The black and low sagebrush types tend to occur adjacent to either Wyoming big sagebrush or basin big sagebrush types. The Wyoming big sagebrush and basin big sagebrush types create a mosaic within the black and low sagebrush types. These big sagebrush types have a different fire regime that acts to carry the fire, with black and low sagebrush serving as firebreaks most of the time.

After non-stand-replacing fires, composition is primarily islands of black sagebrush, with interspaces dominated by low rabbitbrush that resprouts, and with time, sees an increase in shadscale and herbaceous composition.

There is cheatgrass invading this system (Provencher, pers. comm.).

Issues or Problems

Cheatgrass, especially on more mesic sites, has contributed to shorter fire return intervals (FRIs) and larger fire events (Fryer 2009).

Native Uncharacteristic Conditions

Shrub cover >40% (remote sensing; on the ground, 30%) is considered uncharacteristic. Tree cover >40% (remote sensing; on the ground, 30%) is uncharacteristic.

Comments

During the 2017 review, Kori Blankenship reevaluated the use of mixed-severity fire in this model. Blankenship changed the Mid1 Open to Mid1 Open mixed-severity fire transition to replacement severity to comply with LANDFIRE fire severity definitions. LANDFIRE defines replacement-severity fire as a fire that top-kills >75% of the upper layer lifeform. Because black sagebrush is killed by fire (Fryer 2009), Blankenship assumed that the modelers used mixed fire to represent a very patchy fire, but because where fire occurred it probably killed most plants, it met LANDFIRE's replacement fire criteria.

MZs 6, 9, 10, 12, 16, 17, and 18 were collapsed during the 2015 BpS review. The primary difference between the original models was in the s-class mapping rules that, for the most part, did not comply with LANDFIRE class breaks and mapping rules. S-class rules from MZ06 were used in the combined description because they were corrected to comply with LANDFIRE rules, and it was noted in the MZ06 description that the new rules received expert review.

The effect of insect outbreaks (independent of drought) on mature pinyon and juniper in Class D can cause a 50% reduction in Class D (from 10% to 5%) if part or all of the outbreak sufficiently

thins older trees (transition to Class C). We assumed that 25% of outbreaks results in a transition to Class C from Class D.

For LANDFIRE National, Jon Bates reviewed the model for MZ18 (reviewer does not consider himself an expert of this system) and Mike Zielenski (mike_zielenski@nv.blm.gov) reviewed the model for MZs 12 and 17. Dave Schmidt (dschmidt@tnc.org) also reviewed this model for California.

LANDFIRE National reviewers for MZ09 objected to the assertion that mixed fire was the standard fire type in MZ09. Instead, MZ09 sees drought as the primary disturbance, and fires are rare, wind-driven events. We ran the model with mixed fire reduced to one third. The results were 15%, 45%, 25%, and 15% for the landscape proportions, and mean fire return interval (MFRI) is 210yrs for replacement fire, and MFRI is 475yrs for mixed-severity fires (all fire MFRI, 150yrs). Considering the limited distribution of this type in MZ09, we decided to keep the model as is for MZ10.

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	A	UN	UN	UN	UN	UN	UN
Herb	0.5-1.0	A	A	A	A	UN	UN	UN	UN	UN	UN
Herb	>1.0	A	A	A	A	UN	UN	UN	UN	UN	UN
Shrub	0-0.5	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	0.5-1.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	1.0-3.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Shrub	>3.0	B	B	C	C	UN	UN	UN	UN	UN	UN
Tree	0-5	C	D	D	D	UN	UN	UN	UN	UN	UN
Tree	5-10	D	D	D	D	UN	UN	UN	UN	UN	UN
Tree	10-25	D	D	D	D	UN	UN	UN	UN	UN	UN
Tree	25-50	D	D	D	D	UN	UN	UN	UN	UN	UN
Tree	>50	D	D	D	D	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 **13** **Early Development 1 - All Structures**

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSSP6	Pseudoroegneria spicata	Bluebunch wheatgrass	Middle

POSE	Poa secunda	Sandberg bluegrass	Low-Mid
ACHY	Achnatherum hymenoides	Indian ricegrass	Middle
ACTH7	Achnatherum thurberianum	Thurber's needlegrass	Middle

Description

Early-seral community dominated by herbaceous vegetation; <6% sagebrush canopy cover. Fire-tolerant shrubs (green/low rabbitbrush) are first sprouters after stand-replacing, high-severity fire.

Maximum Tree Size Class

None

Class B 63 Mid Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ARNO4	Artemisia nova	Black sagebrush	Upper
POSE	Poa secunda	Sandberg bluegrass	Lower
ACHY	Achnatherum hymenoides	Indian ricegrass	Mid-Upper
PSSP6	Pseudoroegneria spicata	Bluebunch wheatgrass	Mid-Upper

Description

Mid-seral community with a mixture of herbaceous and shrub vegetation; 6-25% sagebrush (sagebrush/brush) canopy cover present.

Maximum Tree Size Class

None

Class C 16 Late Development 1 - Open

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
ARNO4	Artemisia nova	Black sagebrush	Upper
JUOS	Juniperus osteosperma	Utah juniper	Upper
PSSP6	Pseudoroegneria spicata	Bluebunch wheatgrass	Mid-Upper
ACHY	Achnatherum hymenoides	Indian ricegrass	Mid-Upper

Description

Late-seral community with a mixture of herbaceous and shrub vegetation; 10-25% sagebrush canopy cover present. Dispersed conifer seedlings and saplings established at <6% cover.

Maximum Tree Size Class

Seedling <4.5ft

Class D	8	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
JUOS	Juniperus osteosperma	Utah juniper	Upper
PIMO	Pinus monophylla	Singleleaf pinyon	Upper
ARNO4	Artemisia nova	Black sagebrush	Middle
ACHY	Achnatherum hymenoides	Indian ricegrass	Lower

Description

Late-seral community with a closed canopy of conifer trees. The degree of tree canopy closure differs depending on whether it is a low sagebrush (maximum, 15%) or black sagebrush (maximum, 40%) community. In low sagebrush communities, a mixture of herbaceous and shrub vegetation with >10% sagebrush canopy cover is still present. In black sagebrush communities, the herbaceous and shrub component is greatly reduced (<1%). When ips beetle outbreaks occur, the pinyon component is reduced. Seventy-five percent of the time, thinning is not intense enough to cause a transition, whereas in 25% of cases, a transition to Class C occurs. Replacement fire is driven by a greater amount of woody fuel than in previous states.

Maximum Tree Size Class

Pole 5-9" DBH

Model Parameters**Deterministic Transitions**

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	1	Mid1:OPN	24
Mid1:OPN	25	Mid1:OPN	999
Late1:OPN	120	Late1:CLS	194
Late1:CLS	195	Late1:CLS	999

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
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.002	500	No	0
Replacement Fire	Early1:ALL	Early1:ALL	0.004	250	Yes	0
Alternative Succession	Mid1:OPN	Late1:OPN	1	1	Yes	120
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.0025	400	No	0

Wind or Weather or Stress	Mid1:OPN	Early1:ALL	0.0025	400	Yes	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.004	250	Yes	0
Replacement Fire	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Wind or Weather or Stress	Late1:OPN	Mid1:OPN	0.0025	400	Yes	0
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.0025	400	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Mixed Fire	Late1:OPN	Mid1:OPN	0.0077	130	Yes	0
Insects or Disease	Late1:OPN	Late1:OPN	0.017	59	No	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.0025	400	Yes	0
Wind or Weather or Stress	Late1:CLS	Late1:CLS	0.0025	400	No	0
Insects or Disease	Late1:CLS	Late1:OPN	0.0043	233	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.0067	149	Yes	0
Insects or Disease	Late1:CLS	Late1:CLS	0.0128	78	No	0

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