10790

Great Basin Xeric Mixed-Sagebrush Shrubland

BpS Model/Description Version: Aug. 2020

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| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
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| None | None | None | None |

Reviewers: Kori Blankenship, Andrea Laliberte

Vegetation Type

Shrubland

Map Zone

13

Geographic Range

Western Utah and throughout Nevada. In map zone (MZ) 13, especially common in the Desert National Wildlife Refuge (Sheep Range [Ackerman 2003]).

Biophysical Site Description

This type describes black sagebrush and low sagebrush, mostly on convex slopes, with big sagebrush occurring in concave slopes and inset alluvial fans. Found on 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 they are mostly associated with 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 where 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. Big sagebrush generally occurs 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 big sagebrush (*Artemisia* *tridentata*), where there is a potential for pinyon (*Pinus* *monophylla*) and/or juniper (*Juniperus* *osteosperma*) establishment. Black sagebrush is the dominant shrub in this system, with big sagebrush and winterfat 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 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.), lupines (*Lupinus* spp.), and milkvetches (*Astragalus* spp.).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| ARNO4 | *Artemisia nova* | Black sagebrush |
| ACHY | *Achnatherum hymenoides* | Indian ricegrass |
| ACTH7 | *Achnatherum thurberianum* | Thurber’s needlegrass |

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 fire can occur in this type when successive years of above-average precipitation are followed by an average or dry year. Stand-replacement fires dominate 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*). Native browsing tends to open up the canopy cover of shrubs but does not often change the successional stage. Native grazing was not included in the model.

Severe drought is a stress factor that occurs, on average, every 75yrs (duration, 10yrs) and 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 <200ft2) 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 | 99 | 88 |  |  |
| Moderate (Mixed) | 724 | 12 |  |  |
| Low (Surface) |  |  |  |  |
| All Fires | 87 | 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 large areas (50,000ac) in MZ13. 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 to carry it to the extent that there is wind in a low-intensity burn. Fire sizes up to 800ac are possible in situations like this.

Adjacency or Identification Concerns

The black and low sagebrush types tend to occur adjacent to either big sagebrush (nearly exclusively basin big sagebrush in the Mojave Desert [biophysical setting (BpS) 131080]) types and adjacent to Mojave Desert mixed scrub and blackbrush (BpS 131082) at lower elevations. The 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, increases in shadscale and herbaceous composition.

Issues or Problems

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

This model was reviewed by Kori Blankenship and Andrea Laliberte during the 2016 BpS review. During the review, 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 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.

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 result in a transition to Class C from Class D.

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 | A | A | B | B | UN | UN | UN | UN | UN | UN |
| Shrub | 0.5-1.0 | A | A | B | B | UN | UN | UN | UN | UN | UN |
| Shrub | 1.0-3.0 | A | A | B | B | UN | UN | UN | UN | UN | UN |
| Shrub | >3.0 | A | A | B | B | UN | UN | UN | UN | UN | UN |
| Tree | 0-5 | C | C | C | C | 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 18 Early Development 1 - All Structures

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| ACTH7 | Achnatherum thurberianum | Thurber’s needlegrass | Middle |
| POSE | Poa secunda | Sandberg bluegrass | Low-Mid |
| ACHY | Achnatherum hymenoides | Indian ricegrass | Middle |

Description

Early-seral community dominated by herbaceous vegetation with some resprouting rabbitbrush; <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 58 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 |

Description

Mid-seral community with a mixture of herbaceous and shrub vegetation.

*Maximum Tree Size Class*  
None

Class C 18 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 |
| POSE | Poa secunda | Sandberg bluegrass | 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 6 Late Development 1 - Closed

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.

*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** |
| Replacement Fire | Early1:ALL | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.013 | 77 | No | 0 |
| Alternative Succession | Mid1:OPN | Late1:OPN | 1 | 1 | Yes | 120 |
| Replacement Fire | Mid1:OPN | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Wind or Weather or Stress | Mid1:OPN | Mid1:OPN | 0.0067 | 149 | No | 0 |
| Wind or Weather or Stress | Mid1:OPN | Early1:ALL | 0.0067 | 149 | Yes | 0 |
| Replacement Fire | Mid1:OPN | Mid1:OPN | 0.01 | 100 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Late1:OPN | 0.0067 | 149 | No | 0 |
| Wind or Weather or Stress | Late1:OPN | Mid1:OPN | 0.0076 | 132 | 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 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.0043 | 233 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.0067 | 149 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:CLS | 0.0067 | 149 | No | 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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