LANDFIRE Biophysical Setting Model

**Biophysical Setting 2811250**

Inter-Mountain Basins Big Sagebrush Steppe

This BPS is lumped with:

This BPS is split into multiple models:

### General Information

<table>
<thead>
<tr>
<th>Contributors</th>
<th>Date</th>
</tr>
</thead>
<tbody>
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<table>
<thead>
<tr>
<th>Vegetation Type</th>
<th>Dominant Species</th>
<th>Map Zone</th>
<th>Model Zone</th>
</tr>
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<tbody>
<tr>
<td>Upland Shrubland</td>
<td>ARTRW8 CAMO ARTR2 POSE PUTR2 FEID</td>
<td>28</td>
<td>□ Alaska □ California □ Great Basin □ Great Lakes □ Hawaii □ Northeast □ Northern Plains □ N-Cent.Rockies □ Pacific Northwest □ South Central □ Southeast □ S. Appalachians □ Southwest</td>
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### Geographic Range

This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and WY and is found at slightly higher elevations farther south.

### Biophysical Site Description

Sagebrush steppe is found in continental, semi-arid climate, highly variable annual precipitation greater than 7-12in (~180-300mm) (McArthur 2000) but may also include 14in precipitation zone. Common on foothills, undulating terraces, slopes and plateaus, but also in basins and valley bottoms. Soil depths range from shallow to moderately deep, well-drained with an effective rooting depth of <40in (~1m). NRCS Range Site: (Droughty) Loam 8-10in precipitation zone. Elevation ranges between 1500-2300m (5000-7600ft).

### Vegetation Description

Typical herbaceous components usually contribute <25% of cover. Shrubs may include Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. wyomingensis, Artemisia tripartita ssp. tripartita and/or Purshia tridentata dominating or codominating the open to moderately dense (10-40% cover) shrub layer. Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa, Tetradyphia spp or Artemisia frigida may be common especially in disturbed stands. Associated graminoids include Achnatherum hymenoides, Calamagrostis montanensis, Elymus lanceolatus ssp. Lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda and Pseudoroegneria spicata. Common forbs are Phlox hoodii, Arenaria spp and Astragalus spp. Areas with deeper soils more commonly support Artemisia tridentata ssp. tridentata but have largely been converted for other land uses.

The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated phases (West 2000). Forbs have low diversity but are important for wildlife, including the greater sage grouse. Species

**Fire Regime Groups are:**  
I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.
diversity is lower in Wyoming big sagebrush communities than in other big sagebrush types (FEIS). Wyoming big sagebrush communities are critical habitat for greater sage grouse and other sagebrush obligate species.

**Disturbance Description**

Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects (eg, moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75yrs), periods of drought and wet cycles and shifts in climate (return interval of 100yrs). Intervals between natural wildfires varied between 25yrs (northern Yellowstone National Park [Houston 1973], cited in West 2000 ) and 100yrs+ (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRI <100yrs for replacement fire. FEIS cites fire return interval ranges between 10-70yrs with mean of 40yrs for Wyoming sagebrush steppe. Studies cited in FEIS may underestimate FRIs or not hold up to scrutiny (Welch and Criddle 2003). It was assumed that dominant fires were stand replacement (mean FRIs of 75-94yrs) due to the continuity of fine fuel typical of steppe ecosystems. Mixed severity (25-75% of area inside burn perimeter topkilled) played a minor role during mid-development. Assuming an all FRI of 75yrs and that mixed fires comprised approximately 20% of all fires, a mixed FRI of 375yrs was calculated and applied to the late development class (B). Re-establishment following fire is from seed germination and establishment. Establishment is dependent upon soil seedbank and/or proximity of seed sources, fire size and continuity and climatic conditions.

**Adjacency or Identification Concerns**

The NatureServe description of BpS 1125 includes different species of sagebrush and steppe ecosystems that are structurally and ecologically different such as Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. wyomingensis and Artemisia tripartita ssp. tripartita. We highly recommend that, at least, Artemisia tridentata ssp. tridentata, which is a taller shrub found in drainages and deeper soils, be separated from the other shrubs.

Wyoming big sagebrush is known to hybridize with other subspecies of the big sagebrush complex; ie, basin big sagebrush, A. tridentata ssp. tridentata and mountain big sagebrush, A. tridentata ssp. vaseyana (Freeman et al. 1991, McArthur et al. 1998). Across ecotones, populations of Wyoming big sagebrush probably intergrade with basin big sagebrush and mountain big sagebrush. Soils and elevation may help determine which species is present.

**Native Uncharacteristic Conditions**

**Scale Description**

Sagebrush steppe covers vast landscapes >10000ac with inclusions of low sagebrush and basin big sagebrush. Historic disturbance (fire) likely ranged from small (<10ac) to large (>10000ac) depending on conditions, time since last ignition and fuel loading. Assumed the average patch size is 250ac.

**Issues/Problems**

West (2000) cites wide range in FRI (25-100yrs+). West (1983) and Miller and Eddelman (2000) recommend a FRI of <100yrs for replacement fire. FEIS gives 10-70yrs range (40 y average) (but see Welch and Criddle 2003). Current scientific opinion (Mike Pellant, BLM Range Ecologist on the Great Basin Restoration Initiative) puts the natural fire return interval at about 100yrs (confirmed by Stephen Bunting and Dave Pyke). Given uncertainties and opinions of reviewers, a MFI of 75yrs was chosen. Without this shorter MFI and differences in fire behavior, there would be no difference between Wyoming sagebrush steppe from the Snake River plains and Wyoming big sagebrush semi-desert from central NV, UT and eastern CA. Because replacement fire is by far dominant over mixed severity fire, a FRG IV was
selected to the recommendation of reviewers.

**Comments**

This is identical to the model for the same BpS in MZs 16, 23 and 24. It was based on the Rapid Assessment model R2SBWYse developed by Eric Limbach (eric_limbach@blm.gov) for Wyoming big sagebrush steppe and reviewed by Krista Waid-Gollnick/Sarah Heidi (krista_waid@blm.gov), Stanley Kitchen (skitchen@fs.fed.edu), Michael Zielinski (mike_zielinski@nv.blm.gov), Jolie Pollet (jpollet@blm.gov) and Gary Back (gback@srk.com).

### Vegetation Classes

#### Class A 20%

**Early Development 1 Open**

- **Upper Layer Lifeform**
  - Herbaceous
  - Shrub
  - Tree

- **Fuel Model**: 1

**Description**

Perennial grasses and forbs dominate where woody shrub canopy has been top killed / removed by wildfire. Shrub cover less than five percent. (~0-19yrs). Replacement fire every 120yrs on average resets succession back to zero. Succession to class B after 20yrs.

#### Class B 50%

**Mid Development 1 Open**

- **Upper Layer Lifeform**
  - Herbaceous
  - Shrub
  - Tree

- **Fuel Model**: 1

**Description**

Shrubs dominate (5-25% cover) with diverse perennial grass and forb understory (20-60yrs). MFI is 75yrs with 80% replacement fire (FRI of 94yrs) and 20% mixed severity fire (FRI of 375yrs). Mixed severity fire, insect/disease (return interval of 75yrs) and weather related stress (return interval of 100yrs) maintains vegetation in class B. Succession to class C after 40yrs.

**Fire Regime Groups are: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity. V: 200+ year frequency, replacement severity.
Disturbances

Mature shrub canopy >25% cover with proportional reduction in understory productivity as canopy cover increases. The mean FRI for replacement fire is 75yrs. Insect/diseases (return interval of 75yrs), and weather related stress (return interval of 100 yrs) thin the shrub canopy, causing a transition to class B. Succession from class C to C.

**Fire Regime Groups are:** I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.
**Fire Regime Group**: IV

**Historical Fire Size (acres)**

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<th></th>
<th>Avg</th>
<th>Min</th>
<th>Max</th>
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<tr>
<td>Replacement</td>
<td>250</td>
<td>10</td>
<td>10000</td>
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</table>

**Sources of Fire Regime Data**

- Literature
- Local Data
- Expert Estimate

**Additional Disturbances Modeled**

- Insects/Disease
- Native Grazing
- Wind/Weather/Stress
- Competition
- Other (optional 1)
- Other (optional 2)

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**References**


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**Fire Intervals**

<table>
<thead>
<tr>
<th></th>
<th>Avg FI</th>
<th>Min FI</th>
<th>Max FI</th>
<th>Probability</th>
<th>Percent of All Fires</th>
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<tbody>
<tr>
<td>Replacement</td>
<td>92</td>
<td>30</td>
<td>120</td>
<td>0.01087</td>
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<tr>
<td>Mixed</td>
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<tr>
<td>Surface</td>
<td></td>
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<tr>
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<td>81</td>
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<td>0.01228</td>
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**Fire Intervals (FI):**

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class.

**Fire Regime Groups**: I: 0-35 year frequency, surface severity; II: 0-35 year frequency, replacement severity; III: 35-100+ year frequency, mixed severity; IV: 35-100+ year frequency, replacement severity; V: 200+ year frequency, replacement severity.


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