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

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Vegetation Type
Upland Shrubland

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Dominant Species
ARTRW8
CAMO
ARTR2
POSE
PUTR2
FEID

Map Zone
28

Model Zone
☐ Alaska
☐ California
☐ Great Basin
☐ Great Lakes
☐ Hawaii
☐ Northeast
☐ Northern Plains
☐ N-Cent.Rockies
☐ Pacific Northwest
☐ South Central
☐ Southeast
☐ S. Appalachians
☑ Southwest

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) Loamy 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, Tetradymia 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

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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

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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

Indicator Species and Canopy Position

ARTR2 Upper
PUTR2 Upper
POSE Lower
ARTRW8 Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	10 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Vegetation is primarily herbaceous with a few scattered shrubs.

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

Indicator Species and Canopy Position

ARTR2 Upper
FEID Lower
ARTRW8 Upper
POSE Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	11 %	30 %
Height	Shrub 1.1m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

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.

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Class C **30 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model

2

Indicator Species and Canopy Position

ARTRW8
Upper
ARTR2
Upper
FEID
Lower
POSE
Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	40 %
Height	Shrub 1.1m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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.

Class D **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Indicator Species and Canopy Position

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	%	%
Height		
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

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Fire Regime Group:** IV

Historical Fire Size (acres)

Avg 250
Min 10
Max 10000

Sources of Fire Regime Data

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

Additional Disturbances Modeled

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

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	92	30	120	0.01087	89
Mixed	714	120	500	0.00140	11
Surface					
All Fires	81			0.01228	

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.

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