

LANDFIRE Biophysical Setting Model

Biophysical Setting 1611250

Inter-Mountain Basins Big Sagebrush Steppe

- This BPS is lumped with:
 This BPS is split into multiple models:

General Information

Contributors (also see the Comments field) **Date** 2/23/2005
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<u>Vegetation Type</u>	<u>Dominant Species</u>	<u>Map Zone</u>	<u>Model Zone</u>	
Upland Savanna and Shrub-Steppe	ARTRW8 PSSPS	16	<input type="checkbox"/> Alaska <input type="checkbox"/> California <input type="checkbox"/>	<input type="checkbox"/> Northern Plains <input type="checkbox"/> N-Cent. Rockies <input type="checkbox"/>
General Model Sources	STTH2 POSA12		<input checked="" type="checkbox"/> Great Basin <input type="checkbox"/> Great Lakes <input type="checkbox"/> Hawaii <input type="checkbox"/> Northeast	<input type="checkbox"/> Pacific Northwest <input type="checkbox"/> South Central <input type="checkbox"/> Southeast <input type="checkbox"/> S. Appalachians <input type="checkbox"/> Southwest
<input checked="" type="checkbox"/> Literature				
<input checked="" type="checkbox"/> Local Data				
<input checked="" type="checkbox"/> Expert Estimate				

Geographic Range

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

Biophysical Site Description

Sagebrush steppe is found in continental, semi-arid climate where annual precipitation generally ranges from 7-12in (~180-300mm) (McArthur 2000), but occasionally ranging into the 14in precipitation zone. This system is 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 is (Droughty) Loamy 8-10in precipitation zone.

Vegetation Description

This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with *Artemisia tridentata* ssp. *tridentata*, *Artemisia tridentata* ssp. *xericensis*, *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. In southern ID and northern UT, *Artemisia tridentata* ssp. *wyomingensis* dominates large landscape. *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.

**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.

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 diversity is lower in Wyoming big sagebrush communities than in other big sagebrush types (Howard 1999). 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. Intervals between natural wildfires varied between 25yrs (eg, northern Yellowstone National Park, West 2000) and 100yrs+ (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRIs of <100yrs for replacement fire. Howard (1999) cites mean FRIs of 10-70yrs with a mean of 40yrs for Wyoming sagebrush steppe. Studies cited in Howard (1999) may underestimate FRIs or not hold up to scrutiny (Welch and Criddle 2003). This BpS was modeled with a MFI of 75yrs for the system as a whole. Eighty percent of fires modeled were replacement severity. 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.

Other disturbances included insects (eg, moths and grasshoppers that eat leaves, moth larval grubs that eat roots) with an average return interval of 75yrs. Periods of drought, wet cycles, and shifts in climate would have also affected this system with an average return interval of 100yrs.

Adjacency or Identification Concerns

The NatureServe description of Inter-Mountain Basin Big Sagebrush Steppe (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. Ultimately, all three sagebrush species should be modeled separately.

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.

Invasion of cheatgrass has transformed this ecological system into large areas of uncharacteristic annual grasslands and shrublands with understories where annual grasses replaced perennial grasses.

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. The average patch size was assumed to be approximately 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. Howard (1999) gives 10-70yrs range (40yrs average)

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(but see Welch and Criddle 2003). Current scientific opinion (Mike Pellant, BLM Range Ecologist on the Great Basin Restoration Initiative, Stephen Bunting, and David Pyke, personal communication) puts the natural fire return interval at about 100yrs. Given uncertainties and opinions of reviewers, a MFI of 75yrs was modeled. 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 by recommendation of reviewers.

Comments

BpS 1125 is completely based on the Rapid Assessment PNVG 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).

As a result of final QC for LANDFIRE National by Kori Blankenship the user-defined min and max fire return intervals for mixed severity fire were deleted because they were not consistent with the modeled fire return interval for this fire severity type.

Vegetation Classes

Class A 20 %

Early Development 1 Open

Upper Layer Lifeform

Herbaceous
 Shrub
 Tree

Fuel Model
1

Indicator Species and Canopy Position
PSSPS
Upper
STTH2
Upper
POSA12
Upper
ARTRW8
Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	4 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

Upper layer lifeform differs from dominant lifeform.

Vegetation is primarily herbaceous with a few scattered shrubs accounting for less than five percent cover.

Description

Perennial grasses and forbs dominate where woody shrub canopy has been top killed/removed by wildfire. Shrub cover less than five percent. 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
PSSPS
Lower
STTH2
Lower
ARTRW8
Upper
POSA12
Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	30 %
Height	Shrub 0m	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. MFI is 75yrs with 80% replacement fire (mean FRI of 94yrs) and 20% mixed severity fire (mean FRI of 375yrs). Mixed severity fire, insect/disease (return interval of 75yrs), and weather related stress (return interval of 100yrs) maintains

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vegetation in class B. Succession to class C after 40yrs.

Class C 30 %

Late Development 1 Closed

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model
2

Indicator Species and Canopy Position

ARTRW8
Upper
PSSPS
Lower
STTH2
Lower
POSA12
Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	31 %	40 %
Height	Shrub 0m	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 100yrs) thin the shrub canopy, causing a transition to class B. Otherwise, this class persists indefinitely.

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

- Literature
- Local Data
- Expert Estimate

Additional Disturbances Modeled

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