

LANDFIRE Biophysical Setting Model

Biophysical Setting 0811250

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 10/4/2005

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Reviewer

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Reviewer

Vegetation Type

Upland
Savannah/Shrub
Steppe

Dominant Species

ARTRW8
ARTRT

Map Zone

8

Model Zone

☐ Alaska ☐ Northern Plains
California N-Cent. Rockies

General Model Sources

- ☒ Literature
☒ Local Data
☒ Expert Estimate

PSSP6
HECO26
POSE
ARTR4
PUTR2

- ☐
☐ Great Basin ☒ Pacific Northwest
☐ Great Lakes ☐ South Central
☐ Hawaii ☐ Southeast
☐ Northeast ☐ S. Appalachians
 ☐ Southwest

Geographic Range

Lower elevations of the Columbia Basin in WA and northern OR, including the Okanogan Valley and extending into southern British Columbia.

Biophysical Site Description

These areas are the lower elevation, drier big sagebrush plant communities. Wyoming big sagebrush is dominant in the driest areas and on thinner soils, mixing with three-tip sagebrush at somewhat higher elevations on favorable aspects. Basin big sagebrush is dominant on deeper soils and more productive sites. Bitterbrush may inter-mix with sagebrush in areas with more favorable soil moisture, especially along the outer margins of the basin. Soils are variable, ranging from sandy to fine silt loam. Elevation of these plant communities is below 3500 feet. Precipitation is between 6-12in annually with a majority of the precipitation coming in the winter months.

Vegetation Description

A patchy, open canopy of large, fire-sensitive shrubs such as Wyoming big sagebrush, basin big sagebrush and bitterbrush are the dominant vegetative feature. Sagebrush cover varies between 10-30% in mature stands, but averages 15-20%. Green and gray rabbitbrush, horsebrush and needle-and-thread may be abundant on disturbed sites or where repeated fires have occurred. Antelope bitterbrush can be a major component at the upper end of the precipitation range or where effective soil moisture is higher than expected due to edaphic factors. On the very dry end of the distribution salt-desert shrubs such as spiny hopsage (*Grayia spinosa*) also occur within the plant community.

**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.

An herbaceous plant layer occurs below the shrub layer. Perennial bunchgrasses and forbs predominate. Typical grass species include bluebunch wheatgrass, needle-and-thread grass and Sandberg's bluegrass. Idaho fescue occurs on more mesic sites within this BpS, often with three-tip sagebrush. The forb component can be quite rich with 200+ different species identified over the range of this type. Native annual forbs may dominate the community following disturbance. Cover of herbaceous plants will vary between 10% to 70%, with most sites 20-30%. The dry nature of these communities limits the inherent productivity of most sites.

A non-vascular plant layer, comprised of mosses, lichens and cyanobacteria, occurs in the interspaces between the shrub canopy. Crust cover ranges from 3% to 40%. Wet years may see algae in the interspaces on the soil surface.

Disturbance Description

Fire and climate played a role in the disturbance history of these sites. The dry nature and inherently low productivity of these plant communities limited the fire frequency and extent. Fires occurred on a variable return interval. Fires may have occurred as frequently as every 30yrs to as infrequently as every 100yrs. Fire occurrence is linked to rainfall over one to several years. A single year of above average precipitation may not be sufficient to produce enough fine fuel to carry a fire. A series of above average years may be necessary to produce sufficient fine fuel to carry a fire. The size of fires would also be related to existing fuel loading and burning conditions. A large proportion of the fires would be <100ac. However, some fires might have been wind-driven and greater than 10000ac.

Although the average fire frequency would indicate this biophysical setting belongs in fire regime II, the surface fires that occur are generally not the ecologically significant fires. Surface fires, in the more traditional sense, do not actually occur in sagebrush because sagebrush does not underburn. Surface fire was chosen to represent the small fires that serve to "poke holes" in the general canopy of denser stands, preserving an overall open canopy closure, and to represent larger fires driven by very strong winds that actually result in burning less than 50% of the area within the fire perimeter. The ecologically significant fires are the mixed and high severity fires that occur on much longer intervals. Surface fires were not modeled in VDDT.

Climatic variability may have been as important a disturbance agent as fire in these areas. Prolonged drought may have helped to reduce the density and cover of sagebrush. The size of the area affected by the drought would vary from 100s-1000s of acres and may be related to soil type.

Adjacency or Identification Concerns

This vegetation type occurs in a mosaic of Wyoming, xeric and basin big sagebrush and bitterbrush. The complexity of the mosaic is based on soils, elevation and aspect.

This vegetation type will transition with increasing elevation to East Cascades Oak-Ponderosa Pine Forest and Woodland along the western edge of the BpS, and to Northern Rocky Mt. Ponderosa Pine Woodland on the northern boundary; it will transition to Columbia Steppe and (Palouse) Grassland and to Columbia Plateau Scabland Shrubland to the east, and Inter-Mountain Basins Semi-Desert Shrub-Steppe in extreme low elevations in the Pasco Basin.

Currently, this system looks very different today than in the past. Invasive annual grasses, principally cheatgrass, have taken over large areas. Grazing may have resulted in a greater proportion of the late-seral closed canopy class than would have occurred in the past. Grazing also decreased the native bunchgrasses

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in all seral stages. More frequent wildfires, promoted by cheatgrass, have removed the fire-sensitive shrub component over large areas.

Native Uncharacteristic Conditions

Cover >40% of fire-sensitive large shrubs would be outside the historic range of variability, or would indicate a different BpS.

Scale Description

Patches occur on the scale of 100s to 100000s of acres

Issues/Problems

Invasive annual and perennial plants are a major problem throughout the BpS with the problem expected to grow under current climate trends.

Comments

This model is based off the Rapid Assessment Model for dry Wyoming big sagebrush for the Pacific Northwest. The VDDT model for this and for 091125 are identical. Review for LANDFIRE resulting in removing surface fire (with consultation with Louisa Evers) from the VDDT model, as these fires are so small in area as to have negligible effect on system dynamics.

Vegetation Classes															
Class A	15 %	Indicator Species and Canopy Position	Structure Data (for upper layer lifeform)												
Early Development 1 All Structure		DEPI	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>Cover</td> <td>0 %</td> <td>60 %</td> </tr> <tr> <td>Height</td> <td>Herb 0m</td> <td>Herb 1.0m</td> </tr> <tr> <td>Tree Size Class</td> <td colspan="2">None</td> </tr> </tbody> </table>		Min	Max	Cover	0 %	60 %	Height	Herb 0m	Herb 1.0m	Tree Size Class	None	
	Min	Max													
Cover	0 %	60 %													
Height	Herb 0m	Herb 1.0m													
Tree Size Class	None														
Upper Layer Lifeform		Low-Mid													
<input checked="" type="checkbox"/> Herbaceous		EPPA2													
<input type="checkbox"/> Shrub		Low-Mid													
<input type="checkbox"/> Tree		POSE	<input type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
Fuel Model		Lower													
1		PSSP6													
Description		All													
<p>Stage is dominated by forbs and grasses. Annuals may provide most of the cover on high-severity burn sites. Post-fire cover and recovery rates varied greatly depending on fire severity and post-fire precipitation amounts and timing as well as pre-fire species composition. This stage lasts 9-15yrs, depending on how quickly fire-sensitive shrubs are able to begin re-occupying the area. Biological soil crusts may be absent or minor.</p> <p>Succession to class B after 15 yrs. Replacement fire (MFRI=100yrs) resets.</p>															

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Class B 30 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
☒ Shrub
☐ Tree

Fuel Model

1

Description

Scattered and usually small sagebrush or bitterbrush is present, but perennial grasses and forbs dominate. The general formation is that of a shrub savannah. Sagebrush and/or bitterbrush cover is usually 1-5% in this stage. Succession to class B after 20yrs. Replacement fire (MFRI=100yrs) resets to class A, but surface fire (MFRI=1000yrs) maintains in B.

Indicator Species and Canopy Position

PSSP6
 All
 HECO26
 All
 PUTR2
 All
 ARTR2
 All

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	10 %
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

- ☒ Upper layer lifeform differs from dominant lifeform.

Dominant lifeform is herb. Min cover = 20%,
 Max cover = 70%. Min height = Herb 0.6m;
 Max height = Herb 1.0m

Class C 35 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
☒ Shrub
☐ Tree

Fuel Model

2

Description

Sagebrush and/or bitterbrush is co-dominant with the perennial grasses and forbs. The general formation is that of a shrub-steppe. Microbiotic soil crusts may vary from 2-40% cover of interspaces between vascular plants. Succession to class D after 35yrs. Replacement fire (MFRI=100yrs) resets to class A. Mixed fire (MFRI= 50yrs) opens the stand up to class B. Surface fire (MFRI=1000yrs) maintains in C.

Indicator Species and Canopy Position

ARTR2
 All
 PUTR2
 All
 HECO26
 Middle
 PSSP6
 Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	11 %	20 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class	None	

- ☐ Upper layer lifeform differs from dominant lifeform.

Class D 20 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
☒ Shrub
☐ Tree

Fuel Model

6

Description

After about 70yrs the type is dominated by sagebrush and/or bitterbrush, with reduced cover of perennial grasses and forbs. Sagebrush and/or bitterbrush cover can be variable with the lowest productivity sites reaching only about 15% canopy cover with areas of bare ground and rock in the interspaces. The general formation is that of a shrubland. Microbiotic soil crusts may vary from 2-40% cover of interspaces between

Indicator Species and Canopy Position

ARTR2
 All
 PUTR2
 All
 HECO26
 Middle
 PSSP6
 Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	21 %	30 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class	None	

- ☐ Upper layer lifeform differs from dominant lifeform.

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vascular plants. Replacement fire (MFRI=80yrs) resets to class A. Mixed fire (MFRI= 80yrs) opens the stand up to class C. In the absence of disturbance this class maintains.

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)

	<i>Min</i>	<i>Max</i>
<i>Cover</i>	%	%
<i>Height</i>		
<i>Tree Size Class</i>		

☐ Upper layer lifeform differs from dominant lifeform.

Description

Disturbances

Fire Regime Group:** **III**

Historical Fire Size (acres)

Avg
Min
Max

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

	<i>Avg FI</i>	<i>Min FI</i>	<i>Max FI</i>	<i>Probability</i>	<i>Percent of All Fires</i>
<i>Replacement</i>	95			0.01053	51
<i>Mixed</i>	105			0.00952	46
<i>Surface</i>	1600			0.00063	3
<i>All Fires</i>	48			0.02068	

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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