

LANDFIRE Biophysical Setting Model

Biophysical Setting 0911250

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

Modeler 1 Louisa Evers Louisa_Evers@or.blm.gov **Reviewer** Jeff Rose/Gregg Riegel Jeffrey_rose@blm.gov

Modeler 2 Jon Bates jon.bates@oregonstate.edu **Reviewer**

Modeler 3 Jim Evans jevans@tnc.org **Reviewer**

Vegetation Type

Upland
Savannah/Shrub
Steppe

Dominant Species

ARTRW8
ARTRT

Map Zone

9

Model Zone

Alaska Northern Plains
California N-Cent.Rockies

General Model Sources

- Literature
 Local Data
 Expert Estimate

PSSP6
ACTH7
POSE

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

Geographic Range

Eastern OR adjacent to salt-desert shrub plant communities. Areas fall within the lower elevation areas of the Great Basin in southeastern OR.

Biophysical Site Description

These areas are the lower elevation, drier big sagebrush plant communities. Wyoming and xeric big sagebrush are the dominant types with basin big sagebrush intermixed. Soils are variable, ranging from sandy to clayey to pumicey. They may contain a restrictive layer or consist of ash layers many feet deep. Elevation of these plant communities is below 5000ft. Precipitation is between 8-12in annually with a majority of the precipitation coming in the winter months.

Vegetation Description

Wyoming and xeric big sagebrush are the dominant vegetative feature. Sagebrush cover varies between 3-25% in the mature stage, but averages around 12%. Other shrubs associated with sagebrush are green and gray rabbitbrush, basin big sagebrush and horsebrush. Low sagebrush may be present as an inclusion. Antelope bitterbrush can be a major component at the upper end of the precipitation range or where effective soil moisture is higher than expected based solely on average annual precipitation. On the very dry end of the distribution, salt-desert shrubs will also occur within the plant community.

An herbaceous plant layer occurs below the shrub layer. Perennial bunchgrasses and forbs predominate. Typical grass species include bluebunch wheatgrass, Thurber's needlegrass and Sandberg's bluegrass. The

**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.

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 10-45%, with most sites 20-30%. The dry nature of these communities limits the inherent productivity.

A non-vascular plant layer, comprised principally of moss, occurs under the shrub canopy. Moss cover ranges from 3-15%, averaging around 7%. Wet years may see algae in the interspaces on the soil surface. Otherwise, the interspaces are largely bare soil and rock.

Disturbance Description

Fire, climate and insects all played a role in the disturbance history of these sites. The dry nature and inherently low productivity of these plant communities limits the fire occurrence. Fires occurred on a variable return interval. Fires may have occurred as frequently as every 50yrs to as infrequently as every 150yrs. Fire occurrence is linked to rainfall over a series of years. A single year of above average precipitation may not be sufficient to produce enough fine fuel to carry a fire. A number, or 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 would be wind-driven and >1000ac.

In this biophysical setting, 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.

Climatic variability may have been as important a disturbance agent as fire in these areas. Periodic 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 to 1000s of acres and may be related to soil type.

The eroga moth, a defoliator, can reduce sagebrush canopy cover over large areas during outbreak years.

Adjacency or Identification Concerns

This vegetation type occurs in a mosaic of Wyoming, xeric and basin big sagebrush, low sagebrush, black sagebrush and salt-desert shrub plant communities. The complexity of the mosaic is based on soils, elevation, aspect and proximity to the Polar Front climatic boundary.

This vegetation type will transition to Inter-Mountain Basins Montane Sagebrush Steppe with increasing elevation, Inter-Mountain Basins Semi-Desert Shrub-Steppe with decreasing elevation and Inter-Mountain Basins Big Sagebrush Shrublands in the rain shadows of major peaks and ridges and adjacent to Pliocene lakebeds.

Currently, this system looks very different today than in the past. Primarily on Vale District BLM and to a lesser degree on Lakeview and Prineville Districts, invasive annual grasses have taken over patches of varying size. The lack of fire has resulted in a greater proportion of the late-seral closed canopy class than would have occurred in the past. Crested wheatgrass seedings, some quite large on Vale district, are interspersed throughout this type as well across southeastern Oregon. Grazing has increased the proportion of rabbitbrush and decreased the native bunchgrasses in all seral stages. On Prineville District,

**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.

juniper encroachment is starting to become widespread.

Native Uncharacteristic Conditions

Shrub canopy closure of 30-40% may occur, but is considered extremely rare. Shrub canopy closure of over 40% indicates either an uncharacteristic type or an inclusion of a different biophysical setting on deeper, more productive soils.

Scale Description

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

Issues/Problems

Invasive annual and perennial plants are a major problem in some areas with the problem expected to grow under current climate trends.

Comments

Model for MZ09 is based off the Rapid Assessment Model for dry Wyoming big sagebrush for the Pacific Northwest. The VDDT model for this and for 081125 are identical. During model review for MZ09, low severity fire was reduced to that shown.

Vegetation Classes															
Class A	15 %	Indicator Species and Canopy Position	Structure Data (for upper layer lifeform)												
Early Development 1 All Structure		MIGR	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>Cover</td> <td>0 %</td> <td>50 %</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 %	50 %	Height	Herb 0m	Herb 1.0m	Tree Size Class	None	
	Min	Max													
Cover	0 %	50 %													
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		All													
<input type="checkbox"/> Tree		COPA	<input type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
Fuel Model		Low-Mid													
1		PSSP													
		All													
Description															
This class is dominated by forbs with varying presence of grasses. Post-fire cover and recovery rates vary 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 sagebrush is able to begin reoccupying the area. Replacement fire (MFRI= 100yrs) resets.															
Class B	30 %	Indicator Species and Canopy Position	Structure Data (for upper layer lifeform)												
Mid Development 1 Open		PSSP6	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>Cover</td> <td>0 %</td> <td>10 %</td> </tr> <tr> <td>Height</td> <td>Shrub 0.6m</td> <td>Shrub 1.0m</td> </tr> <tr> <td>Tree Size Class</td> <td colspan="2">None</td> </tr> </tbody> </table>		Min	Max	Cover	0 %	10 %	Height	Shrub 0.6m	Shrub 1.0m	Tree Size Class	None	
	Min	Max													
Cover	0 %	10 %													
Height	Shrub 0.6m	Shrub 1.0m													
Tree Size Class	None														
Upper Layer Lifeform		Middle													
<input type="checkbox"/> Herbaceous		ACTH7													
<input checked="" type="checkbox"/> Shrub		Middle	<input checked="" type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
<input type="checkbox"/> Tree		CREPI													
Fuel Model		Low-Mid	Dominant lifeform is herb. Min cover = 20%, Max cover = 40%. Min height = Herb 0.6m; Max height = Herb 1.0m												
1		ARTRW8													
		Upper													
Description															
Scattered and usually small sagebrush is present, but perennial grasses and forbs continue to dominate. The															

**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.

general formation is that of a shrub savannah. Sagebrush cover is usually 1-5% in this stage. Stands are 15-35yrs old. Succession to class C. Replacement fire (MFRI= 100yrs) reset to class A. Surface fires (MFRI=1000 yrs) maintain in class B.

Class C 35 %

Late Development 1 Open

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

2

Indicator Species and Canopy Position

ARTRW8
Upper
PSSP6
Middle
ACTH7
Middle
CREPI
Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	11 %	20 %
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

Upper layer lifeform differs from dominant lifeform.

Description

Sagebrush is co-dominant with the perennial grasses and forbs. The general formation is that of a shrub-steppe. Stands are 35-70 yrs old; succession to class D. Replacement fire (MFRI=100yrs) reset to class A. Mixed fire (MFRI= 50 yrs) opens up the stand to class B. Surface fire (MFRI=1000 yrs) keeps in class C.

Class D 20 %

Late Development 1 Closed

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

6

Indicator Species and Canopy Position

ARTRW8
Upper
PSSP6
Middle
ACTH7
Middle
CREPI
Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	21 %	30 %
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

Upper layer lifeform differs from dominant lifeform.

Description

Sagebrush is dominant with relatively low cover of perennial grasses and forbs. Sagebrush cover can be variable, with the lowest productivity sites reaching only about 15% canopy cover with large areas of bare ground and rock in the interspaces. The general formation is that of a shrubland. Stands are greater than about 70yrs old. Replacement fire (MFRI=85yrs) reset to class A. Mixed fire (MFRI= 85 yrs) opens up the stand to class B.

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

**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

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

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	95			0.01053	51
Mixed	105			0.00952	46
Surface	1600			0.00063	3
All Fires	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.

References

Anderson, E.W., M.M. Borman and W.C. Krueger. 1998. The ecological provinces of Oregon: A treatise on the basic ecological geography of the state. Oregon Agricultural Experiment Station, Oregon State University, Corvallis OR.

Bailey, R.G. 1994. Descriptions of the Ecoregions of the United States. 2nd Edition. Washington, D.C, Forest Service, USDA Misc. Publication 1391.

Bates, J., K. Davies and R.F. Miller. 2004. Responses of Wyoming big sagebrush communities to wildfires. In: J. Bates, K. Davies, and R. Miller. Ecology of Wyoming Big Sagebrush alliance in the Northern Great Basin: 2003 Progress Report. Eastern Oregon Agricultural Research Center, Burns, OR.

Bates, J., K. Davies and R. Miller. 2005. Ecology of Wyoming big sagebrush alliance in the northern Great Basin: 2004 progress report. Eastern Oregon Agricultural Research Center, Burns, OR. 61 pp.

Blaisdell, J.P., R.B. Murry and E.D. McArthur. 1982. Managing Intermountain Rangelands: Sagebrush-grass Ranges. General Technical Report INT-134. USDA Intermountain Forest and Range Experiment Station. Ogden, UT.

EOARC data File. Eastern Oregon Agricultural Research Center, Oregon State University and USDA Agric. Res. Service. Burns, OR.

Hironaka, M. 1978. Basic synecological relationships of the Columbia River sagebrush type. Page 27032 In: G.F. Gifford, F.E. Busby and J.D. Shaw. Sagebrush Ecosystem Symposium. Utah State University Press. Logan, UT.

Jenson, M.E. G.H. Simonson and M. Doskey. 1990. Correlation between soils and sagebrush dominated plant communities of northeastern Nevada. Soil Science Society of America Journal. 54: 902-910.

Miller, R.F. and L.E. Eddleman. 2000. Spatial and temporal changes of sage grouse habitat in the

**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.

sagebrush biome. Oregon Agricultural Experiment Station Technical Bulletin 151. Oregon State University, Corvallis, OR.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Passey, H.B., V.K. Hugie, E.W. Williams and D. E. Ball. 1982. Relationships between soil, plant community and climate on rangelands of the Intermountain West. USDA Soil Conservation Service Technical Bulletin 1662.

Winward, A.H. and E.W. Tisdale. 1977. Taxonomy of the Artemisia tridentata Complex in Idaho. University of Idaho, Forest, Wildlife and Range Experiment Station Bulletin 15. Moscow, ID.

**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.