

LANDFIRE Biophysical Setting Model

Biophysical Setting 1910800

Inter-Mountain Basins Big Sagebrush Shrubland

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

General Information

Contributors (also see the Comments field) **Date** 11/18/2005

Modeler 1 Dana Perkins	dana_perkins@blm.gov	Reviewer Susan Miller	smiller03@fs.fed.us
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<u>Vegetation Type</u>	<u>Dominant Species</u>	<u>Map Zone</u>	<u>Model Zone</u>	
Upland Shrubland	ARTRW8 ARTRT	19	<input type="checkbox"/> Alaska	<input type="checkbox"/> Northern Plains
<u>General Model Sources</u>	ERNA10		<input type="checkbox"/> California	<input checked="" type="checkbox"/> N-Cent. Rockies
<input checked="" type="checkbox"/> Literature	PSSP6		<input type="checkbox"/> Great Basin	<input type="checkbox"/> Pacific Northwest
<input checked="" type="checkbox"/> Local Data	HECO26		<input type="checkbox"/> Great Lakes	<input type="checkbox"/> South Central
<input checked="" type="checkbox"/> Expert Estimate	ELTR7		<input type="checkbox"/> Hawaii	<input type="checkbox"/> Southeast
			<input type="checkbox"/> Northeast	<input type="checkbox"/> S. Appalachians
				<input type="checkbox"/> Southwest

Geographic Range

Sagebrush occurs throughout much of the west. For MZ19, Wyoming and basin big sagebrush are found in southwest MT and east-central ID.

Biophysical Site Description

This type is found between 3000-7000ft elevation on deep, well drained, alluvial soils. Artemisia tridentata ssp. tridentata occurs in swales with deeper soils at lower elevations. Artemisia tridentata ssp. wyomingensis is the more common subspecies in MZ19 and occurs on toeslopes and alluvial fans at mid-elevations.

Vegetation Description

Wyoming and big basin sagebrush subspecies form a mosaic of patches throughout much of this BpS in MZs 10 and 19. Wyoming sagebrush (Artemisia tridentata ssp. wyomingensis) is the dominant species in valley bottoms and on alluvial fans.

In deep soils basin big sagebrush (Artemisia tridentata ssp. tridentata) is the dominant subspecies, except on alkaline soils, where greasewood (Sarcobatus vermiculatus) and rabbitbrush (Chrysothamnus spp) may also be present.

Understory grasses include bluebunch wheatgrass (Pseudoroegneria spicata), Thurber needlegrass (Achnatherum thurberianum), needle and thread (Hesperostipa comata), basin wildrye (Leymus cinerius), squirreltail (Elymus elymoides) and western wheatgrass (Pascopyrum smithii). Forbs include hawksbeard (Crepis acuminata), bird's beak (Cordylanthus spp), blue bell (Mertensia spp), Rocky mountain aster (Aster scopulorum), phlox species, lupine (Lupinus spp) and buckwheat (Eriogonum spp).

**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.

Disturbance Description

Fire regime group IV, but may also encompass III and IV. Fire return intervals are estimated to average approximately 60yrs, and range from 10-150yrs. However, questions have recently been raised about the frequency of fire as related to neighboring vegetation types (Baker 2004, in press). Fires were mostly stand replacing (Tirmenstein 1999). Mixed severity fire was probably present where fuel were discontinuous, though there is disagreement about the role of replacement versus mixed severity fire in this type. Ignition sources probably included burning by native Americans under reference conditions (Barrett and Arno 1982, 1999).

It has been hypothesized that prolonged drought has resulted in significant die off in this type.

Insects and disease may have resulted in replacement and mixed-severity disturbances in this type, but little information exists on the frequency of these disturbances under reference conditions. They are not modeled here.

Antelope, mule deer and pygmy rabbits are native herbivores that browse sagebrush.

Adjacency or Identification Concerns

Basin big sagebrush grows in association with Wyoming big sagebrush, mountain big sagebrush and desert shrub communities. Distribution is a result of local soil characteristics on a fine scale (1-500ac). Much of this type has been lost due to land clearing for agriculture or converted to a cheatgrass or greasewood type.

Native Uncharacteristic Conditions

Scale Description

Fuel may be continuous resulting in spread throughout patches. Disturbance size therefore probably resembles the patch size of the vegetation.

Disturbance patch sizes range from 10s - 100s of hectares.

Issues/Problems

It is difficult to map and identify the subspecies of big sagebrushes (*Artemisia tridentata*) without the aid of field assessments.

Fire size, frequency and severity are variable.

Comments

This model is based on the Rapid Assessment model R0SBBB by Diane Abendroth (diane_abendroth@nps.gov) and reviewed by Bill Baker (bakerwl@uwyo.edu), Don Bedunah (bedunah@forestry.umt.edu), Shannon Downey (shannon_downey@blm.gov), Karen Clause (karen.clause@wy.usda.gov), Dennis Knight (dhknight@uwyo.edu), Thor Stephenson (thor_stephenson@blm.gov), Curt Yanish (curt_yanish@blm.gov), Gavin Lovell (gavin_lovell@blm.gov) and Eve Warren (eve_warren@blm.gov). Only descriptive changes were made to the model.

Peer review for the Rapid Assessment was incorporated 4/26/2005. There was considerable disagreement among reviewers about how to model this type. All comments were incorporated into the description. The following changes were made to the quantitative model based on peer review:

1.) Mixed severity fire was added to the model without changing the overall MFI. Several reviewers

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agreed that mixed fire should be included, though they disagreed at what proportion.

- 2.) Drought was added as a disturbance agent, causing both replacement type disturbances (once in 1000yrs) and mixed-severity disturbances (once every 50yrs).
- 3.) The proportion of fire was redistributed among the three classes so that class B had a higher likelihood of fire than class A or C.

These changes resulted in the following changed results in the model: class A changed from 30% to 20%; class B changed from 40% to 30%; class C changed from 30% to 50%.

The following items reviewers disagreed upon or did not have data to support and so were not included in the model, but were added to the description:

- 1.) The frequency and severity of insects, disease and native grazing disturbances.
- 2.) Whether or not two additional classes (mid-closed and late-open) should be added.
- 3.) The frequency of fire in this system. Estimates ranged from 40yrs to 150yrs. The model was left at an overall MFI of 60yrs, as several reviewers agreed upon this number.

Vegetation Classes

Class A 20 %	<u>Indicator Species and Canopy Position</u>	<u>Structure Data (for upper layer lifeform)</u>												
Early Development 1 All Structure	LECI4	<table border="1" style="width: 100%;"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Min</i></th> <th style="text-align: center;"><i>Max</i></th> </tr> </thead> <tbody> <tr> <td><i>Cover</i></td> <td style="text-align: center;">0 %</td> <td style="text-align: center;">50 %</td> </tr> <tr> <td><i>Height</i></td> <td style="text-align: center;">Herb 0m</td> <td style="text-align: center;">Herb 1.0m</td> </tr> <tr> <td><i>Tree Size Class</i></td> <td colspan="2" style="text-align: center;">None</td> </tr> </tbody> </table>		<i>Min</i>	<i>Max</i>	<i>Cover</i>	0 %	50 %	<i>Height</i>	Herb 0m	Herb 1.0m	<i>Tree Size Class</i>	None	
	<i>Min</i>	<i>Max</i>												
<i>Cover</i>	0 %	50 %												
<i>Height</i>	Herb 0m	Herb 1.0m												
<i>Tree Size Class</i>	None													
<u>Upper Layer Lifeform</u>	Upper	<input type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
<input checked="" type="checkbox"/> Herbaceous	ELTR7													
<input type="checkbox"/> Shrub	Upper													
<input type="checkbox"/> Tree	HECO26													
<u>Fuel Model</u>	Upper													
	PSSP6													
	Upper													
<u>Description</u>														
Grass-dominated community following replacement disturbance. Sagebrush will begin to return within ~five years, but relatively low canopy cover (<10%) will remain. This class lasts up to 20yrs post disturbance and succeeds to mid-development open (class B) unless drought or replacement fire cause stand-replacing disturbance.														

Class B 30 %	<u>Indicator Species and Canopy Position</u>	<u>Structure Data (for upper layer lifeform)</u>												
Mid Development 1 Open	ARTRT	<table border="1" style="width: 100%;"> <thead> <tr> <th></th> <th style="text-align: center;"><i>Min</i></th> <th style="text-align: center;"><i>Max</i></th> </tr> </thead> <tbody> <tr> <td><i>Cover</i></td> <td style="text-align: center;">0 %</td> <td style="text-align: center;">40 %</td> </tr> <tr> <td><i>Height</i></td> <td style="text-align: center;">Shrub 0m</td> <td style="text-align: center;">Shrub 3.0m</td> </tr> <tr> <td><i>Tree Size Class</i></td> <td colspan="2" style="text-align: center;">None</td> </tr> </tbody> </table>		<i>Min</i>	<i>Max</i>	<i>Cover</i>	0 %	40 %	<i>Height</i>	Shrub 0m	Shrub 3.0m	<i>Tree Size Class</i>	None	
	<i>Min</i>	<i>Max</i>												
<i>Cover</i>	0 %	40 %												
<i>Height</i>	Shrub 0m	Shrub 3.0m												
<i>Tree Size Class</i>	None													
<u>Upper Layer Lifeform</u>	Upper	<input type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
<input type="checkbox"/> Herbaceous	ARTRW8													
<input checked="" type="checkbox"/> Shrub	Upper													
<input type="checkbox"/> Tree	PSSP6													
<u>Fuel Model</u>	Lower													
	LECI4													
	Lower													
<u>Description</u>														
Sagebrush dominated (>10% canopy cover), open shrub community with abundant grasses. This class lasts approximately 20-50yrs post disturbance and succeeds to late-development closed (class B) unless replacement fire or drought cause a transition to class A. Mixed severity fire maintains this condition.														

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Class C 50 %

Late Development 1 Closed

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

Indicator Species and Canopy Position

ARTRT
 Upper
 POSE
 Lower
 ARTRW8
 Upper
 PSSP6
 Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	80 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

Upper layer lifeform differs from dominant lifeform.

Description

Mature and overmature sagebrush with suppressed understory. Cover may range from 40-80%, but will rarely exceed 60%. This condition begins at age 50 and can perpetuate until disturbance causes a transition to another class. Replacement fire and drought may cause a transition to class A. Mixed severity fire will cause a transition to class C, but is relatively rare.

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 0

Min 0

Max 0

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	80	10	150	0.0125	100
Mixed					
Surface					
All Fires	80			0.01252	

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

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Baker, W.L. In press. Fire and restoration of sagebrush ecosystems. *Wildlife Society Bulletin*.

Barrett, S.,W. and S.F. Arno. 1982. Indian fires as an ecological influence in the Northern Rockies. *Journal of Forestry*. 80(10): 647-651.

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Tirmenstein, D. *Sarcobatus vermiculatus*. 1987. In: Fire Effects Information System, [Online]. USDA Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: <http://www.fs.fed.us/database/feis/> [2004, September 10].

Wyoming Interagency Vegetation Committee. 2002. Wyoming Guidelines for Managing Sagebrush Communities with Emphasis on Fire Management. Wyoming game and Fish Department and Wyoming BLM. Cheyenne, WY. 53 pp.

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