

LANDFIRE Biophysical Setting Model

Biophysical Setting 2210801

**Inter-Mountain Basins Big Sagebrush
Shrubland - Basin Big Sagebrush**

☐ This BPS is lumped with:

☒ This BPS is split into multiple models: Differences in fire regime, floral component and habitat. Soils are deeper, vegetative structure is taller/larger than Wyoming big sagebrush. Split so that Wyoming big sagebrush could be modeled separately. Basin big is found at lower elevations and is usually restricted to comparatively moist ravines or valleys (Barker and McKell 1986 in Knight 1994). It also grows taller than any other species of *Artemisia* (up to two meters or more.). Wyoming big sagebrush is the most common shrub of the intermountain basins. It is normally less than 0.5m tall and occupies the drier uplands, with the taller basin big sagebrush occurring in adjacent ravines (Knight 1994). Basin big sagebrush is more common on sandy soils, and Wyoming big sagebrush is more common on fine-textured soils (Knight 1994). There is more available moisture in basin big sagebrush sites than Wyoming big sagebrush sites. Basin big sagebrush - drainages and areas of greater soil depth (moderately deep to deep soils). Shallower soils on Wyoming big sagebrush sites. Basin big sagebrush tends to grow in deep, fertile soils, and is an indicator of productive sites.

General Information

Contributors (also see the Comments field)

Date 2/8/2006

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<u>Vegetation Type</u>	<u>Dominant Species</u>	<u>Map Zone</u>	<u>Model Zone</u>	
Upland	ARTRT	22	☐ Alaska	☐ Northern Plains
Savannah/Shrub	SAVE4		California	N-Cent. Rockies
Steppe			☐	☒
<u>General Model Sources</u>	LECI4		☐ Great Basin	☐ Pacific Northwest
☒ Literature	ELTR7		☐ Great Lakes	☐ South Central
☒ Local Data	POSE		☐ Hawaii	☐ Southeast
☒ Expert Estimate	SPAI		☐ Northeast	☐ S. Appalachians
				☐ Southwest

Geographic Range

Basin big sagebrush is found throughout WY. Could occur in all the sections of this map zone.

Biophysical Site Description

This type is found between 3000-8000ft elevation on deep, well drained, alluvial soils and have been observed on sandy sites where soil moisture prevails until August.

**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.

This type can be a few meters wide on ephemeral streams. This could be 100m wide on larger streams. It tends to follow the stream. This system is in a riparian setting, but not wet enough to support willows, cottonwoods and other riparian vegetation.

Vegetation Description

A dense canopy of basin big sagebrush (*Artemisia tridentata* ssp. *tridentata*) dominates the shrub layer, except on alkaline soils, where greasewood (*Sarcobatus vermiculatus*) makes up as much as 25%. Rabbitbrush (*Chrysothamnus* spp) and Wyoming big sagebrush (*Artemisia tridentata* ssp. *wyomingensis*) may also be present. This type may intergrade with the Wyoming big sagebrush. Some stands have silver sagebrush (*Artemisia cana* ssp. *cana*) intermixed (Williams, Pers. Comm.) and in early seral states *Artemisia dracunculus* may occur in the understory.

Understory grasses include, needle and thread (*Hesperostipa comata*), basin wildrye (*Leymus cinerius*), squirreltail (*Elymus elymoides*), slender wheatgrass (*Elymus trachycaulus*), bluebunch wheatgrass (*Pseudoroegneria spicata*) and *Poa nevadaensis*.

Forbs were sparse, and included hawksbeard (*Crepis acuminata*), bird's beak (*Cordylanthus* spp), blue bell (*Mertensia* spp), lupine (*Lupinus* spp) and buckwheat (*Eriogonum* spp).

Disturbance Description

Fire regime group IV. Fire return intervals are estimated to average approximately 100yrs, and range from 50-150yrs. Fires were mostly replacement severity (Tirmenstein 1999, Sapsis and Kaufman 1991).

Drought may have caused replacement disturbances, but rarely. Mortality by drought is more common in Wyoming big sagebrush than basin big sagebrush, due to better soils, better water availability, deeper rooted. Death by drought in basin big sagebrush is more isolated than in Wyoming big sagebrush. The frequency of drought that would be severe enough to broadly affect basin big sagebrush is probably once every 100-200yrs, not considering global warming. (Williams, personal correspondence).

Insects and disease would have been 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.

Normal relatively less severe native grazing by large ungulates, including bison, elk, mule deer and pronghorn might have maintained more of an open condition and caused rare, small degraded sites (ie, wallows) that may have occupied less than five percent of the landscape. This disturbance is not modeled here.

Some believe that sagebrush is fire-adapted (Harrell, pers comm), although others do not show classic types of fire adaptations. Fine fuel in the shrub canopy and on the ground along with grasses and forbs will help carry the fire; however, in sagebrush it is a canopy fire (Harrell, pers comm). The later the successional stage, the more likely it will be stressed by competition and drought. This competition may decrease live fuel moisture and cause drought mortality or dry fuel conditions, which could increase the flammability of the fuel and send it to an earlier seral stage or state. The fire frequency may be shorter for later seral conditions and longer for earlier seral stages (Harrell, personal correspondence).

The fire return intervals could be over 100yrs on average. Some stands will burn more frequently; especially those at higher elevations that are surrounded by mountain big sagebrush - it is generally accepted that the surrounding vegetation will have a large effect on fire regimes. For additional evidence,

****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.**

Williams presents a graph on recovery rates in basin big sagebrush communities following prescribed fires - some of the burns are almost 20yrs old now. The mean data points have a linear pattern. Extrapolating, the data suggest that it will take at least 50yrs on average for these communities to reach 40% canopy cover. This is the threshold we have defined as entering the late seral closed class. So give this community 20 or 30 additional years and following the advice of Baker (in press), an estimate of 140-160yrs. Since this data was collected from southern WY, which is probably on the high end within the zone with respect to recovery, we averaged the return to 110yrs. This number may be higher than the folks in the northern part of the zone want to use - down here we are looking at mainly a 6-12in precipitation zone for basin big sagebrush and it is generally confined to riparian areas.

For MZ22, basin big sagebrush is influenced by the surrounding vegetation, including riparian areas. The FRI could be longer than in other areas, as basin big sagebrush extends from Cody through Rawlins. The Cody area probably burns more often than Rawlins; however, the 120yr interval was retained, as it is thought that overall the FRI might be higher in this area of WY, versus, for instance, Yellowstone or other areas (Williams, pers comm). In MZ21 in the Yellowstone area, recovery is much faster than in this part of WY (Williams, pers comm). Some reviewers for MZ22, however, felt that 120yr interval was too long for basin big sagebrush (Warren, pers comm); however, the interval was retained since the majority of review did not request a change of the interval - since it varied so much in this area.

Kitchen (pers comm) states that the interval for basin big sagebrush could range from 75-150yrs.

For the RA, there was disagreement about the frequency of fire in this system. Estimates ranged from 40yrs to 150yrs. For the RA, FRI was modeled at 60yrs.

Adjacency or Identification Concerns

Basin big sagebrush grows along streams, ephemeral drainages, sometimes with greasewood or silver sagebrush intermixed or adjacent, often with Wyoming big sagebrush and mountain big sagebrush on adjoining drier slopes. Distribution is a result of local soil characteristics on a fine scale (1-500ac).

This system (basin big) is sometimes confused with the riparian systems. It is also sometimes mistaken for the mountain big sage communities if the basin big sagebrush occurs at higher elevations.

Much of this type has been lost due to land clearing for agriculture. Some stands have been converted to cheatgrass, others have substantial cheatgrass component. Occasionally, in some areas, stands may have been replaced by greasewood after burning (Williams, Pers. Comm.).

Sometimes, insized channels may decrease the contact with the watertable and the resulting terrace may provide conditions for basin big sagebrush.

There is much variability for this type and its site dynamics.

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. Smaller patches throughout the map zone compared to the other sagebrush subspecies.

Issues/Problems

****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.

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

Comments

This model for MZ22 was adapted from Rapid Assessment model R0SBBB created by Diane Abendroth and reviewed by Dan Bedunah, Shannon Downey and an anonymous reviewer. Other modelers for MZ22 included Dave Roberts: dave_a_roberts@blm.gov, Destin Harrell (Destin_harrell@blm.gov), Tim Kramer (tim_kramer@blm.gov), and Eve Warren (eve_warren@blm.gov). Other reviewers included Carrie Dobey and Jay Esperance. FRI was lengthened a large amount for MZ22.

Workshop code for RA model was BSAG.

Additional reviewers for RA model included: Karen Clause (karen.clause@wy.usda.gov), Dennis Knight (dhknight@uwoy.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).

Vegetation Classes

Class A 15 %		<u>Indicator Species and Canopy Position</u>	<u>Structure Data (for upper layer lifeform)</u>									
Early Development 1 All Structure		LECI4	<table><tr><td></td><td>Min</td><td>Max</td></tr><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></table>		Min	Max	Cover	0 %	50 %	Height	Herb 0m	Herb 1.0m
	Min	Max										
Cover	0 %	50 %										
Height	Herb 0m	Herb 1.0m										
<u>Upper Layer Lifeform</u>		Upper										
☒ Herbaceous		ELTR7										
☐ Shrub		Mid-Upper										
☐ Tree		SAVE4										
<u>Fuel Model</u>		Mid-Upper										
		SPAI										
		Mid-Upper										
<u>Description</u>			☒ Upper layer lifeform differs from dominant lifeform. The upper layer lifeform are shrubs with cover of approximately 10-15% with heights up to one meter. Grasses are dominant.									

Grass-dominated community. Grass cover percentage depends on potential for basin wildrye, for example. Shrub cover is approximately 0-10% or 15% with height up to 1 meter.

If soils are alkaline, resprouting greasewood may also be present. This class lasts up to approximately 15yrs (10yrs was suggested based on recovery rates in Big Horn Basin) post disturbance and succeeds to mid-development open (class B) unless drought (not modeled) or replacement fire cause stand-replacing disturbance.

Replacement fire occurs every 150-200yrs.

Greasewood is not necessarily an indicator of all classes.

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Class B 30 %

Mid Development 1 Open

Upper Layer Lifeform☐ Herbaceous☒ Shrub☐ Tree **Fuel Model****Indicator Species and Canopy Position**

ARTRT

Upper

ELTR7

Low-Mid

LECI4

Low-Mid

SAVE4

Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	11 %	40 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class		

☐ Upper layer lifeform differs from dominant lifeform.**Description**

Sagebrush dominated open shrub community with abundant grasses. This class lasts approximately 20-50yrs post disturbance and succeeds to late-development closed (class C) unless replacement fire causes a transition to class A, approximately every 130yrs.

Another indicator species would be SPAI.

Maximum height in this class is more like 1.5m.

Greasewood is not necessarily an indicator of all classes.

It will take at least 50yrs on average for these communities to reach 40% cover.

Class C 55 %

Late Development 1 Closed

Upper Layer Lifeform☐ Herbaceous☒ Shrub☐ Tree **Fuel Model****Indicator Species and Canopy Position**

ARTRT

Upper

SAVE4

Mid-Upper

ELTR7

Low-Mid

LECI4

Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	90 %
Height	Shrub 0.6m	Shrub >3.1m
Tree Size Class		

☐ 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 80%. There is some disagreement as to whether cover gets this high everywhere in this mapzone. Height of shrubs could reach 15ft. Average height might be approximately 4.5ft. This class begins at age 50 and can perpetuate until disturbance causes a transition to another class.

Replacement fire may cause a transition to class A, approximately every 100yrs.

Another indicator species would be SPAI.

Wind/weather/stress/drought can also cause a transition back to A at 0.005 probability.

Greasewood is not necessarily an indicator of all classes.

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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

Fire Regime Group:** IV

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	110	50	150	0.00909	100
Mixed					
Surface					
All Fires	110			0.00911	

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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