

LANDFIRE Biophysical Setting Model

Biophysical Setting 1610800

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** 2/22/2005

Modeler 1 Don Major dmajor@tnc.org **Reviewer**

Modeler 2 **Reviewer**

Modeler 3 **Reviewer**

Vegetation Type

Upland Shrubland

Dominant Species

ARTRW8

CHVI8

ACHY

HECO26

Map Zone

16

Model Zone

Alaska

California

Great Basin

Great Lakes

Hawaii

Northeast

Northern Plains

N-Cent. Rockies

Pacific Northwest

South Central

Southeast

S. Appalachians

Southwest

General Model Sources

- Literature
 Local Data
 Expert Estimate

Geographic Range

This ecological system is found in western CA, central NV and UT and is common to the Basin and Range province. It is distinct from Inter-Mountain Basins Big Sagebrush Steppe (1125) found on the Columbia Plateau and in WY.

Biophysical Site Description

This widespread system ranges in elevation from 3000-7000ft, and occurs on well-drained soils on foothills, terraces, slopes and plateaus. It is found on soil depths >18in and up to 60in+. It is found between salt desert shrub at lower elevations and mountain big sagebrush at higher elevations where pinyon and juniper can establish. Occurs from 4-14in precipitation zones.

Vegetation Description

This ecological system is commonly referred to as Wyoming big sagebrush semi-desert. Shrub canopy cover generally ranges from 5-25%, but can exceed 30% at the upper elevation and precipitation zones. Wyoming big sagebrush sites have fewer understory species relative to other big sagebrush types. Rabbit rubberbrush may be co-dominant. Perennial forb cover is usually <10%. Perennial grass cover may reach 20-25% on the more productive sites. Bluebunch wheatgrass may be a dominant species following replacement fires and as a co-dominant after 20yrs. Bottlebrush squirreltail and Indian ricegrass are common. Percent cover and species richness of understory are determined by site limitations. Pinyon (generally *Pinus monophylla*) and juniper (generally *Juniper osteosperma*) present, infrequently reaching 90% canopy cover in areas that have escaped fire. This system is critical habitat for the greater sage grouse and many sagebrush obligates.

Disturbance Description

This ecological system is typically Fire Regime Group IV. It is characterized by replacement fires in mid-

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and late-development stages. Where shrub cover ranges from 10-20% (class B), mixed severity fires account for 20% of fire activity (mean FRI of 500yrs). Surface fires occur where shrub cover is <10% (class A), but are generally uncommon (FRI of 200yrs). Where pinyon or juniper has encroached after 100yrs without fire (classes D and E), mean FRI of replacement fire increases from 100yrs to 125yrs.

The Aroga moth is capable of defoliating large acreages (ie, >1000ac; mean return interval of 75yrs), but usually 10-100ac.

Prolonged drought (1 in 100yrs) on the more xeric sites may reduce shrub cover. Flooding may also cause mortality if the soil remains saturated for an extended period of time (ie, 1 in 300yr flood events).

Herbivory (non-insect); Herbivory can remove the fine fuel that supports mixed severity fires and result in woody fuel build up that leads to severe replacement fires.

Adjacency or Identification Concerns

The NatureServe description of Intermountain Basins Big Sagebrush Shrubland (BpS 1080) includes both *Artemesia tridentata* ssp. *tridentata* AND *Artemesia tridentata* ssp. *wyomingensis*. Strong concerns were voiced that these two big sagebrush species should and can be mapped separately (especially areas currently invaded by adjacent trees). This BpS does not distinguish between sagebrush systems too low in elevation to allow tree invasion (eg, as Humboldt River drainage of NV) and where trees can readily invade under fire exclusion (above 4500ft in NV). These two types of sagebrush systems need to be separated, especially for management of greater sage grouse.

This community may be adjacent to mountain big sagebrush at elevations above 6500ft, or adjacent to pinyon-juniper, ponderosa pine, at mid- to high-elevations, and salt desert shrub at low elevations. Low sagebrush or black sagebrush may form large islands within this community where soils are shallow or have root-restrictive layers.

Post-settlement conversion to cheatgrass is common and results in change in fire frequency and vegetation dynamics. Fire suppression can lead to pinyon-juniper encroachment with subsequent loss of shrub and herbaceous understory. Disturbance of this community may result in establishment of annual grasslands (eg, cheatgrass) and/or noxious weeds. Lack of disturbance can result in pinyon-juniper encroachment where adjacent to pinyon-juniper woodlands.

Native Uncharacteristic Conditions

Scale Description

Historic disturbance (fire) likely ranged from small (<10ac) to large (>10000ac) depending on conditions, time since last ignition and fuel loading. Assumed the average patch size is 250ac.

Issues/Problems

The NatureServe description of Intermountain Basins Big Sagebrush Shrubland (1080) includes both *Artemesia tridentata* ssp. *tridentata* AND *Artemesia tridentata* ssp. *wyomingensis*. Strong concerns were voiced that these two big sagebrush species should and can be mapped separately (especially areas currently invaded by adjacent trees).

There are no data, although abundant opinions, for the percentage of replacement and mixed severity fires, especially during mid-development, or whether surface fires occurred at all during early development under reference (pre-settlement) condition.

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Comments

This ecological system merged and is closely based on to Rapid Assessment models: R2SBWY and R2SBWYwt originally modeled by Gary Back (gback@srk.com) and modified by Louis Provencher (lprovencher@tnc.org) based on reviews by Stanley G. Kitchen (skitchen@fs.fed.us), Peter Weisberg (pweisberg@cabnr.unr.edu) and Jolie Pollet (jpollet@blm.gov).

This model assumes the sites are near pinyon-juniper savanna or woodlands and without frequent fire, pinyon or juniper will encroach into the sagebrush range site. In areas without a potential for tree invasion (eg, lower elevation), the Historic Range of Natural Variability for classes A, B and C, respectively, is 10%, 55% and 35% (results of R2SBWY).

The first three development classes chosen for this ecological system correspond to the early, mid-, and late seral stages familiar to range ecologists. The two classes with conifer invasion (classes D and E) approximately correspond to Miller and Tausch's (2001) phases 2 and 3 of pinyon and juniper invasion into shrublands.

This model was subject to a bug in version 5.0.53 of VDDT and was corrected in version 5.0.55 on 4/6/2005 by Pohl.

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

Vegetation Classes															
Class A	15 %	Indicator Species and Canopy Position	Structure Data (for upper layer lifeform)												
Early Development 1 All Structure		ACHY	<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 0m</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 0m	Shrub 1.0m	Tree Size Class	None	
	Min	Max													
Cover	0 %	10 %													
Height	Shrub 0m	Shrub 1.0m													
Tree Size Class	None														
Upper Layer Lifeform		Upper													
<input type="checkbox"/> Herbaceous		HECO8													
<input checked="" type="checkbox"/> Shrub		Upper													
<input type="checkbox"/> Tree		CHVI8	<input checked="" type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
Fuel Model		Upper	Early development is dominated by grasses and forbs with scattered shrubs at <10% cover.												
1		ARTRW8													
		Upper													
Description															
Post-replacement disturbance; grass dominated with scattered shrubs. Fuel loading discontinuous. Surface fire occurs every 200yrs on average. Succession to class B after 20yrs.															
Class B	50 %	Indicator Species and Canopy Position	Structure Data (for upper layer lifeform)												
Mid Development 1 Open		ARTRW8	<table border="1"> <thead> <tr> <th></th> <th>Min</th> <th>Max</th> </tr> </thead> <tbody> <tr> <td>Cover</td> <td>10 %</td> <td>30 %</td> </tr> <tr> <td>Height</td> <td>Shrub 0m</td> <td>Shrub 1.0m</td> </tr> <tr> <td>Tree Size Class</td> <td colspan="2">None</td> </tr> </tbody> </table>		Min	Max	Cover	10 %	30 %	Height	Shrub 0m	Shrub 1.0m	Tree Size Class	None	
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Tree Size Class	None														
Upper Layer Lifeform		Upper													
<input type="checkbox"/> Herbaceous		ACHY													
<input checked="" type="checkbox"/> Shrub		Lower	<input type="checkbox"/> Upper layer lifeform differs from dominant lifeform.												
<input type="checkbox"/> Tree		CHVI8													
Fuel Model		Mid-Upper													
2		HECO26													

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Description

Lower

Shrubs and herbaceous vegetation can be co-dominant, fine fuel bridges the woody fuel, but fuel discontinuities are possible. Replacement fire accounts for 80% of fire activity in this class (mean FRI of 125yrs), whereas mixed severity fire occurs every 500yrs on average (20% of fire activity) and maintains vegetation in class B. Succession to class C after 40yrs.

Class C 25 %

Mid Development 1 Closed

Indicator Species and Canopy Position

ARTRW8

Upper

CHVI8

Mid-Upper

ELEL5

Lower

HECO26

Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	31 %	40 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

2

Upper layer lifeform differs from dominant lifeform.

Description

Shrubs dominate the landscape; fuel loading is primarily woody vegetation. Shrub density sufficient in old stands to carry the fire without fine fuel. Establishment of pinyon and juniper seedlings and saplings widely scattered. Replacement fire (mean FRI of 100yrs) and rare flood events (return interval of 333yrs) cause a transition to class A. Prolonged drought (mean return interval of 100yrs) and insect/disease (every 75yrs on average) cause a transition to class B. Succession to class D after 40yrs.

Class D 5 %

Late Development 1 Open

Indicator Species and Canopy Position

JUNIP

Upper

PIMO

Upper

ARTRW8

Mid-Upper

HECO26

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	20 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

2

Upper layer lifeform differs from dominant lifeform.

Shrubs may still represent the dominant lifeform with pinyon and juniper saplings common.

Description

Pinyon-juniper encroachment where disturbance has not occurred for 100yrs+ (tree species cover <15%). Saplings and young trees are the dominant lifeform. Sagebrush cover (<25%) and herbaceous cover decreasing compared to class C. Replacement fire occurs every 120yrs on average. Insect/disease (every 75yrs) and prolonged drought (every 100yrs) thin both trees and shrubs, causing a transition to class C. Succession to class E after 50yrs.

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Class E 5 %

Late Development 1 Closed

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model

6

Indicator Species and Canopy Position

JUNIP
 Upper
 PIMO
 Upper
 SYOR
 Lower
 HECO26
 Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	21 %	90 %
Height	Tree 0m	Tree 10m
Tree Size Class	None	

Upper layer lifeform differs from dominant lifeform.

Description

Shrubland encroached with mature pinyon and/or juniper (cover 16-90%). Shrub cover <10% and graminoids scattered. Replacement fire occurs every 125yrs on average. Prolonged drought thins trees, causing a transition to class B.

Disturbances

Fire Regime Group:** IV

Historical Fire Size (acres)

Avg 500
 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	137	30	200	0.0073	84
Mixed	1000			0.001	11
Surface	2500			0.0004	5
All Fires	115			0.0087	

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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