

Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004 and 2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG)

R2SBMTwc Mountain Big Sagebrush with Conifers

General Information

Contributors (additional contributors may be listed under "Model Evolution and Comments")

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Vegetation Type

Shrubland

Dominant Species*

ARTR
PUTR2
SYOR

General Model Sources

- Literature
 Local Data
 Expert Estimate

LANDFIRE Mapping Zones

12 17
13 18
16

Rapid Assessment Model Zones

- California Pacific Northwest
 Great Basin South Central
 Great Lakes Southeast
 Northeast S. Appalachians
 Northern Plains Southwest
 N-Cent.Rockies

Geographic Range

Pacific Northwest, Columbia Plateau, Northern Rockies, Great Basin

Biophysical Site Description

This type occupies moist, productive rolling upland sites. Elevation ranges from 4000' to 9000'. PNVG is found to elevations of 10,000 ft in the White and Inyo Mountains, and on some areas of the eastern escarpment of the Sierra Nevada. Mean annual precipitation is generally between 11 and 22 inches. Soils are typically deep and have well developed dark organic surface horizons.

Mountain big sagebrush often occurs at ecotones with conifer forests (mid-high elevation) and meadow habitats. At lower elevations mountain big sagebrush often occurs at ecotones with pinyon-juniper and juniper woodlands. This PNVG, where adjacent to conifers, is readily invaded by conifers (ponderosa pine, Douglas-fir, sub-alpine fir, whitebark pine, limber pine, pinyon-pine, juniper spp.) in the absence of historic fire regimes (Miller and Rose 1999)

Vegetation Description

This vegetation type is a mosaic of mountain big sagebrush (*Artemisia tridentata* var. *vaseyana* or *A. tridentata* var. *pauciflora* depending on taxonomic choices) and herbaceous communities where conifers can potentially establish. Codominant shrubs can include antelope bitterbrush, mountain snowberry, and viscid rabbitbrush. Graminoids are very diverse. Dominant graminoids include Idaho fescue, bluebunch wheatgrass, mountain brome, needlegrasses, slender wheatgrass, bluegrasses, or rough fescue. Among the large number of possible forb species, common forbs may include sulphur buckwheat, pussytoes, lupine, phlox, arrowleaf balsamroot, prairie smoke, and sticky geranium. Mueggler and Stewart (1980), Hironaka et al. (1983), and Tart (1996) described several of these types.

Disturbance Description

Mean fire return intervals in and recovery times of mountain big sagebrush are subjects of lively debate in

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit <http://plants.usda.gov>.

recent years (Welch and Criddle 2003). Mountain big sagebrush communities were historically subject to stand replacing fires with a mean return interval ranging from 10 years at the Ponderosa pine ecotone, 40+ years at the Wyoming big sagebrush ecotone, and up to 80 years in areas with a higher proportion of low sagebrush in the landscape (Crawford et al. 2004, Johnson 2000, Miller et al. 1994, Burkhardt and Tisdale 1969 and 1976, Houston 1973, Miller and Rose 1995, Miller et al. 2000). Under pre-settlement conditions mosaic burns generally exceeded 75% topkill due to the relatively continuous herbaceous layer. Brown (1982) reported that fire ignition and spread in big sagebrush is largely (90%) a function of herbaceous cover. These communities were also subject to periodic mortality due to insects, disease, rodent outbreaks, drought, and winterkill (Winward 2004). Periodic mortality events may result in either stand-replacement or patchy die-off depending on the spatial extent and distribution of these generally rare (50 to 100 years) events.

Recovery rates for shrub canopy cover vary widely in this type, depending post fire weather conditions, sagebrush seed-bank survival, abundance of resprouting shrubs (e.g., snowberry, bitterbrush), and size and severity of the burn. Mountain big sagebrush typically reaches 5% canopy cover in 8 to 14 years. This may take as little as 4 years under favorable conditions and longer than 25 years in unfavorable situations (Pedersen et al. 2003, Miller unpublished data). Mountain big sagebrush typically reaches 25% canopy cover in about 25 years, but this may take as few as nine years or longer than 40 years (Winward 1991, Pedersen et al. 2003, Miller unpublished data). Mountain snowberry and resprouting forms of bitterbrush may return to pre-burn cover values in a few years. Bitterbrush plants less than fifty years old are more likely to resprout than older plants (Simon 1990).

Adjacency or Identification Concerns

This type may be adjacent to forests dominated by aspen, ponderosa pine, Douglas-fir, limber pine, bristlecone pine, or lodgepole pine. It also occurs adjacent to pinyon-juniper woodlands. This type probably served as an ignition source for adjacent aspen stands. Mountain big sagebrush is commonly found adjacent or intermingled with low sagebrush and mountain shrublands.

At lower elevational limits on southern exposures there is a high potential for cheatgrass invasion/occupancy where the native herbaceous layer is depleted. This post-settlement, uncharacteristic condition is not considered here.

Scale Description

Sources of Scale Data Literature Local Data Expert Estimate

This type occupies areas ranging in size from 10's to 10,000's of acres. Disturbance patch size can also range from 10's to 1,000's of acres. The distribution of past burns was assumed to consist of many small patches in the landscape.

Issues/Problems

Reviewers and modelers had very different opinions on the range of mean FRIs and mountain big sagebrush recovery times (see Welch and Criddle 2003). It is increasingly agreed upon that a MFI of 20 years, which used to be the accepted norm, is simply too frequent to sustain populations of Greater Sage Grouse and mountain big sagebrush ecosystems whose recovery time varies from 10-70 years. Reviewers consistently suggested longer FRIs and recovery times. The revised model is a compromise with longer recovery times and FRIs. Modeler and reviewers also disagreed on the choice of FRG: II (modeler) vs. IV (reviewers).

Model Evolution and Comments

Additional modeler included Steven Bunting (sbunting@uidaho.edu).

The first three development classes chosen for this PNVG 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. A PNVG for mountain big sagebrush without tree invasion (R2SBMT; due to high elevation or soils) was developed.

Resprouting bitterbrush in mountain big sagebrush types is potentially important to wildlife in early stand development.

Succession Classes**
Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 20%

Early1 PostRep

Description

Herbaceous vegetation is the dominant lifeform. Herbaceous cover is variable but typically >50% (50-80%). Shrub cover is 0 to 5%. Replacement fire (mean FRI of 80 years) setbacks succession by 12 years. Succession to class B after 12 years.

Dominant Species* and Canopy Position

PSSP6
FEID
SYMPH
ARTRV

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	no data	no data
Tree Size Class	no data	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class B 50%

Mid1 Open

Description

Shrubs are the dominant lifeform. Shrub cover 6-25%. Mountain big sagebrush cover up to 20%. Herbaceous cover is typically >50%. Initiation of conifer seedling establishment. Mean FRI for replacement fire is 40 years. Succession to class C after 37 years.

Dominant Species* and Canopy Position

ARTRV
PUTR2
CONIF
SYMPH

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	25 %
Height	no data	no data
Tree Size Class	no data	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class C 15%

Mid1 Open

Description

Shrubs are the dominant lifeform. Shrub cover 26-45+%. Herbaceous cover is typically <50%. Conifer (juniper, pinyon-juniper, ponderosa pine, or Douglas-fir) cover <10%. Insects and disease every 75 yrs on average will thin the stand and cause a transition to class B. Replacement fire occurs every 50 years on average. In the absence of fire for 80 years, vegetation will transition to class D. Otherwise, succession keeps vegetation in class C indefinitely.

Dominant Species* and Canopy Position

ARTRV
PUTR2
SYMPH
CONIF

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	26 %	45 %
Height	no data	no data
Tree Size Class	no data	

- Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

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Class D 10%

Late I Open

Description

Conifers are the dominant lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or Douglas-fir). Conifer cover is 11- 25%. Shrub cover generally decreasing but remains between 26-40%. Herbaceous cover <30%. The mean FRI of replacement fire is 50 years. Insects/diseases thin the sagebrush, but not the conifers, every 75 years on average, without causing a transition to other classes. Succession is from C to D after 44 years.

Dominant Species* and Canopy Position

CONIF
ARTRV
PUTR2
SYMPH

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	<i>Min</i>	<i>Max</i>
Cover	10 %	25 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Class E 5%

Late I Closed

Description

Conifers are the dominant lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine, or Douglas-fir). Conifer cover 26-80% (pinyon-juniper 36-80%(Miller and Tausch 2000), juniper 26-40% (Miller and Rose 1999), Douglas-fir 26-80%) Shrub cover 0-20%. Herbaceous cover <20%. The FRI for replacement fire is longer than in previous states (75 yrs). Conifers are susceptible to insects/diseases that cause diebacks (transition to class D) every 75 years on average. Succession from class E to E.

Dominant Species* and Canopy Position

CONIF
ARTRV
PUTR2
SYMPH

Upper Layer Lifeform

- Herbaceous
- Shrub
- Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	<i>Min</i>	<i>Max</i>
Cover	26 %	80 %
Height	no data	no data
Tree Size Class	no data	

Upper layer lifeform differs from dominant lifeform. Height and cover of dominant lifeform are:

Disturbances

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Disturbances Modeled

- Fire
- Insects/Disease
- Wind/Weather/Stress
- Native Grazing
- Competition
- Other:
- Other

Historical Fire Size (acres)

Avg: no data
 Min: no data
 Max: no data

Sources of Fire Regime Data

- Literature
- Local Data
- Expert Estimate

Fire Regime Group: 4

I: 0-35 year frequency, low and mixed severity
 II: 0-35 year frequency, replacement severity
 III: 35-200 year frequency, low and mixed severity
 IV: 35-200 year frequency, replacement severity
 V: 200+ year frequency, replacement severity

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. All values are estimates and not precise.

	<i>Avg FI</i>	<i>Min FI</i>	<i>Max FI</i>	<i>Probability</i>	<i>Percent of All Fires</i>
<i>Replacement</i>	49	15	100	0.02041	100
<i>Mixed</i>					
<i>Surface</i>					
<i>All Fires</i>	49			0.02043	

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