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)

R2SBWYse Wyoming Sagebrush Steppe

General Information

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

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Vegetation Type

Shrubland

Dominant Species*

ARTR
AGSP
STTH2
POSA1

General Model Sources

- [x] Literature
- [x] Local Data
- [x] Expert Estimate

LANDFIRE Mapping Zones

12 17 9
13 18
16 8

Rapid AssessmentModel Zones

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

Geographic Range

This PNVG is found in the States of Arizona, California, Colorado, Idaho, Montana, Nebraska, New Mexico, northeastern Nevada, North Dakota, Oregon, South Dakota, northern Utah, and Wyoming (Howard 1999). In the Great Basin mapping zone, this PNVG is more closely associated with the Columbia Plateau (Snake River plains) as opposed to Wyoming big sagebrush semi-desert found in eastern California, central Nevada, and Utah (R2SBWY and R2SBWYwt).

Biophysical Site Description

Wyoming Sagebrush Steppe is found in continental, semi-arid climate, highly variable annual precipitation greater than 7" to 12" (~180 to 300 mm) (McArthur 2000) but may also include 14" P.Z. Common on foothills, undulating terraces, slopes, and plateaus, but also in basins and valley bottoms. Soil depths range from shallow to moderately deep, well-drained with an effective rooting depth of less than 40 inches (~ 1 m). NRCS Range Site: (Droughty) Loamy 8-10" P. Z.

Vegetation Description

Wyoming big sagebrush, Artemisia tridentata ssp. Wyomingensis (ARTRW8). The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated phases (West 2000). NRCS Range Site Description, PNV: Shrub (~30% by weight of current years production), Grass (~60%), Forb (~10%). The PNVG is dominated by Wyoming big sagebrush, bluebunch wheatgrass, bottlebrush squireltail, Sandberg bluegrass, and Thurber needlegrass. The shrub component may also include varying proportions of rabbitbrush, antelope bitterbrush, winterfat, and hopsage among others. Grasses may also include basin wildrye, Indian ricegrass, Idaho fescue, and western wheatgrass among others. Forbs have low diversity but are important for wildlife, including the Greater Sage Grouse. Species diversity is lower in Wyoming big sagebrush communities than in other big sagebrush types (Howard 1999). Wyoming big sagebrush steppe is less productive than basin big sagebrush communities but more productive than Great Basin Wyoming Sagebrush Shrubland (i.e., R2SBWY; sagebrush semi-desert as found in Nevada and Utah). Wyoming big sagebrush communities are critical habitat for Greater Sage Grouse and other sagebrush obligate species.

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

Disturbance Description

Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects (e.g., moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75 years), periods of drought and wet cycles and shifts in climate (return interval of 100 yrs). Intervals between natural wildfires varied between 25 y (northern Yellowstone National Park [Houston 1973], cited in West 2000) and 100+ years (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRI <100 years for replacement fire. Howard (1999) cites fire return interval ranges between 10 to 70 years with mean of 40 years for Wyoming sagebrush steppe. Studies cited in Howard (1999) may underestimate FRIs or not hold up to scrutiny (Welch and Criddle 2003). It was assumed that dominant fires were stand replacement (mean FRIs of 75-94 years) due to the continuity of fine fuels typical of steppe ecosystems. Mixed severity (25-75% of area inside burn perimeter top killed) played a minor role during mid-development. Assuming a MFI of 75 years (from the total fire probability), the FRI of mixed severity fire was 20% of fires, thus a FRI of 375 years, during mid-development. Re-establishment following fire is from seed germination and establishment. Establishment is dependent upon soil seed bank and/or proximity of seed sources, fire size and continuity, and climatic conditions.

Adjacency or Identification Concerns

Wyoming big sagebrush is known to hybridize with other subspecies of the big sagebrush complex; i.e., basin big sagebrush A. tridentata ssp. Tridentata and mountain big sagebrush A. tridentata ssp. Vaseyana (Freeman et al. 1991, McArthur et al. 1998). Across ecotones, populations of Wyoming big sagebrush probably intergrade with basin big sagebrush and mountain big sagebrush. Soils and elevation may help determine which species is present.

This PNVG is similar to the PNVG R0SBWEwy for the Northern and Central Rockies model zone.

Scale Description

Sources of Scale Data ☐ Literature ☐ Local Data ☐ Expert Estimate

Issues/Problems

West (2000) cites wide range in FRI (25 to +100 years). West (1983) and Miller and Eddelman (2000) recommend a FRI of <100 yrs for replacement fire. FEIS gives 10 to 70 range (40 y average) (but see Welch and Criddle 2003). Current scientific opinion (Mike Pellant, BLM Range Ecologist on the Great Basin Restoration Initiative) puts the natural fire return interval at about 100 years (confirmed by Stephen Bunting and Dave Pyke). Given uncertainties and opinions of reviewers, a MFI of 75 years was chosen. Without this shorter MFI and differences in fire behavior, there would be no difference between Wyoming sagebrush steppe (R2SBWYse) from the Snake River plains and Wyoming big sagebrush semi-desert from central Nevada, Utah, and eastern California (R2SBWY and R2SBWYwt). Because replacement fire is by far dominant over mixed severity fire, a FRG IV was selected to the recommendation of reviewers.

Model Evolution and Comments

This PNVG replaces the PNVG R#SBWYhi from the Pacific Northwest.

Other reviewers: Jolie Pollet (jpollet@blm.gov) and Gary Back (gback@srk.com).

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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

Perennial grasses and forbs dominate where woody shrub canopy has been top killed / removed by wildfire. Shrub cover < 5%. (~ 0 to 19 years). Replacement fire every 120 years on average resets succession back to zero. Succession to class B after 20 years.

Dominant Species* and Canopy Position

AGSP
STTH2
POSA1

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	4 %
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 dominate (5-25% cover) with diverse perennial grass and forb understory (20 to 60 years). MFI is 75 years with 80% replacement fire (FRI of 94 years) and 20% mixed severity fire (FRI of 375 years). Mixed severity fire, insect/disease (return interval of 75 years), and weather related stress (return interval of 100 yrs) maintains vegetation in class B. Succession to class C after 40 years.

Dominant Species* and Canopy Position

AGSP
STTH2
ARTR
POSA1

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	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 30 %

Late1 Closed

Description

Mature shrub canopy > 25% cover with proportional reduction in understory productivity as canopy cover increases. The mean FRI for replacement fire is 75 years. Insect/diseases (return interval of 75 years), and weather related stress (return interval of 100 yrs) thin the shrub canopy, causing a transition to class B. Succession from class C to C.

Dominant Species* and Canopy Position

ARTR
AGSP
STTH2
POSA1

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	26 %	35 %
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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*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

Class D **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

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

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

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

Fuel Model no data

Class E **0 %**

Late1 Open

Description

Dominant Species* and Canopy Position

Structure Data (for upper layer lifeform)

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

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

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

Fuel Model no data

Disturbances

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.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	92	30	120	0.01087	89
Mixed	714	120	500	0.00140	11
Surface					
All Fires	81			0.01228	

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