LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710110 Rocky Mountain Aspen Forest and Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

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Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

POTR5
SYOR2
RIBES

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs throughout much of the western US and north into Canada, in the montane and subalpine zones and in the Great Basin and throughout the western US on drier sites.

Biophysical Site Description

Elevations generally range from 1525-3050m (5000-10000ft), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is limited primarily by adequate soil moisture required to meet its high evapotranspiration demand, and secondarily by the length of the growing season or low temperatures.

Vegetation Description

These are upland forests and woodlands dominated by Populus tremuloides without a significant conifer component (<25% relative tree cover), often termed "stable aspen". On many ranges of NV, conifers other than pinyon and juniper (eg, limber pine, white fir and subalpine fir) are largely absent or uncommon.

The understory structure may be complex with multiple shrub and herbaceous layers, or simple with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Common shrubs include Acer glabrum, Amelanchier alnifolia, Artemisia tridentata, Juniperus communis, Prunus virginiana, Rosa woodsii, Shepherdia canadensis, Symphoricarpos oreophilus and the dwarf-shrubs Mahonia repens and Vaccinium spp. The herbaceous layers may be lush and diverse. Common graminoids may include Bromus carinatus, Calamagrostis rubescens, Carex siccata (=Carex foenea), Carex geyeri, Carex rossii, Elymus glaucus, Elymus trachycaulus, Festuca thurberi and Hesperostipa comata. Associated forbs may include Achillea millefolium, Eucephalus engelmannii (=Aster engelmannii), Delphinium spp, Geranium viscosissimum, Heracleum sphondylium, Ligusticum filicinum, Lupinus argenteus, Osmorhiza berteroi (=Osmorhiza chilensis), Pteridium aquilinum, Rudbeckia occidentalis, Thalictrum fendleri,

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Valeriana occidentalis, Wyethia amplexicaulis and many others.

Disturbance Description

Replacement fire and ground fire were common in stable aspen and both depended heavily on native burning. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal lightining season, yet evidence of fire scars and historical studies show that fires occurred mostly during the spring and fall due to native burning.

This BpS has elements of Fire Regime Groups III, II and IV. Replacement fire has a mean annual FRI of 60yrs. Mean annual fire return intervals for mixed severity fire may have been as frequent as 20yrs, averaging approximately 50yrs. Where conifers were present, due to extended periods without fire, the mean FRI of mixed severity fire increased to 20yrs while that of replacement fire remained unchanged.

Under presettlement conditions, disease and insect mortality did not appear to have major effects, however older aspen stands would be susceptible to outbreaks every 200yrs on average. We assumed that 20% of outbreaks resulted in heavy insect/disease stand-replacing events (average return interval 1000yrs), whereas 80% of outbreaks would thin older trees >40yrs (average return interval 250yrs). Disturbance effects would also have varied from clone to clone. Many aspen clones situated on steep slopes are prone to disturbance caused by avalanches and mud/rock slides. Riparian aspen is prone to flooding and beaver clearcutting. Conifers, where co-dominant in aspen stands, would experience insect/disease outbreaks every 300yrs on average.

Adjacency or Identification Concerns

If conifers are present in significant amount, please review BpS 1061- Inter-Mountain Basins Aspen and Mixed Conifer Forest and Woodland. On Great Basin mountain ranges that do not support fir trees, stable aspen occurs at all elevations but tend to be more common at higher elevations. Sagebrush groups, especially mountain big sagebrush and high elevation Wyoming big sagebrush, occurred below and around this group. Forest types such as ponderosa pine or warm/dry mixed conifer with more frequent fire may influence fire frequency in stable aspen to facilitate regeneration.

Aspen decline varies across the region. Declines have been documented in UT, NV, AZ, NM, but not in CO (especially SW CO). Drought is currently impacting many stands in the Great Basin. Nearly a hundred years of fire suppression and uncharacteristic ungulate grazing have reduced clones or created senecent stands lacking suckers (Kay 2001 a,b,c).

Under current conditions, herbivory can significantly effect stand succession. Kay (1997, 2001a, b and c) found the impacts of burning on aspen stands were overshadowed by the impacts of herbivory. In the reference state the density of ungulates was low due to efficient Native American hunting, so the impacts of ungulates were low. Herbivory was therefore not included in the model.

Native Uncharacteristic Conditions

Scale Description

Patch size for this type ranges from the 10s to 100-1000s of acres. Patches may be linear along riparian areas and cover large areas with aspen reaching on side slopes.

Issues/Problems

East of the Great Basin, Baker (1925) studied closely the presettlement period for aspen and noted fire scars on older trees and evidence of frequent fire. Bartos and Campbell (1998) support these findings. We

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interpreted ground fires that scarred trees, probably started by Native Americans, as mixed severity fire that also promoted abundant suckering.

Aspen stands tend to remain dense througout most of their life-span, hence the open stand description was not used unless it described conifer coverage. These are typically self-perpetuating stands. While not dependent upon disturbance to regenerate, aspen was adapted to a diverse array of disturbances.

Comments

BpS 1011 for MZs 12 and 17 is intended to represent stable aspen as found on many ranges of Nevada. BpS 1011 for MZs 12 and 17 is different from BpS 1011 for MZ16. The model and description for MZs 12 and 17 is a compromise between VDDT model R2ASPN from the rapid assessment and the model for MZ16. One class (D) representing moderate conifer encroachment to stable aspen (as per NatureServe description of ecological system 1011) was added to the Rapid Assessment model R2ASPN and the mean annual FRIs and insect/disease probabilities of BpS 1011 for MZ16 were adopted. R2ASPN was modeled by Linda Chappell (lchappell@fs.fed.us), Robert Campbell (rbcampbell@fs.fed.us), and Bill Dragt (William_Dragt@nv.blm.gov). R2ASPN was reviewed by Cheri Howell (chowell02@fs.fed.us), Wayne Shepperd (wshepperd@fs.fed.us) and Charles Kay (ckay@hass.usu.edu). BpS 1011 for MZ16 was modeled by Linda Chappell, Robert Campbell, Stanley Kitchen (skitchen@fs.fed.us), Beth Corbin (ecorbin@fs.fed.us) and Charles Kay.

Vegetation Classes

Class A 14%

Early Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR5	Upper
SYOR2	Middle
RIBES	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Aspen suckers less than six feet tall. Grass and forbs present. Succession to class B after 10yrs.

Class B 40%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR5	Upper
SYOR2	Lower
RIBES	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	100 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Aspen over six feet tall dominate. Canopy cover is highly variable. Replacement fire occurs every 60yrs on average. Mixed severity fire (average FRI of 50yrs) maintains this class, but may consumes litter and woody debris and stimulate suckering. Succession to class C after 30yrs.

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Class C 45 %

Late Development 1 Closed

Indicator Species* and Canopy Position

POTR5	Upper
SYOR2	Lower
RIBES	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	40 %	100 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 8

Description

Aspen trees 5-16in DBH. Canopy cover is highly variable. Replacement fire occurs every 60yrs on average. Mixed severity fire (mean FRI of 50yrs), while thining some trees, promotes suckering and maintains vegetation in this class. Insect outbreaks and diseases occur every 200yrs on average, causing stand thinning (transition to class B) 80% of the time and stand replacement (transition to class A) 20% of the time. Succession maintains vegetation in this class, however a lack of fire for 100yrs will allow moderate conifer encroachment with a transition to class D.

Class D 1 %

Late Development 1 Open

Indicator Species* and Canopy Position

POTR5	Upper
ABLA	Upper
ABCO	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	40 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 10

Description

Aspen 5-16in+ DBH and conifers co-dominate, with conifers present in the mid-story and overtopping aspen in older stands. Aspen comprises 80% of the overstory in younger stands, whereas conifers can reach up to 40% cover in overstory in older stands. Mean FRIs for replacement and mixed severity fire, respectively, are 60 and 20yrs. Mixed severity fire and insect/disease outbreaks (mean return interval of 300yrs) thin conifers, thus causing a return to class C.

Class E 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Disturbances

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Fire Regime Group:** I

Historical Fire Size (acres)

Avg 10
Min 1
Max 100

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	68	50	300	0.01471	46
Mixed	57	20	60	0.01754	54
Surface					
All Fires	31			0.03226	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710120 Rocky Mountain Bigtooth Maple Ravine Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 4/10/2005

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Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

ACGR3
CAGE2
SYOR2

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

Northern and central Wasatch Mountains. Scattered occurrences in SW UT, central AZ and NM. BpS 1012 is believed to be rare to absent in MZ17 and completely absent from MZ12 (NV).

Biophysical Site Description

Rocky colluvial or alluvial soils with favorable soil moisture, from flat or gentle to steep slopes. Generally deep soils. Found on all aspects, but more commonly on north and east-facing slopes, and more on lower slopes than exposed slopes or ridges. Elevations range from about 5000-8000ft.

Vegetation Description

Generally dominated by Acer grandidentatum, but may be mixed with Quercus gambelii or scattered conifers on drier sites, or with Acer negundo or Populus tremuloides on moister sites. Understory may include elk sedge, snowberry and various herbs. Maple stands are generally dense and often continuous, although may be patchy with various grass or herbs between clones. Open maple stands (of any seral stage) are uncommon. Mature stands are generally tall shrub to low tree height.

Disturbance Description

Fire is the primary disturbance factor in this system, probably originating from the outside landscape. Fires are generally moderately infrequent and mixed severity, with a fair component of stand-replacement. (No fire modeled in class A; Class B and C modeled 75yr mixed and 125yr replacement intervals.) Bigtooth maple sprouts readily after fire, and recovery is generally rapid.

Insect and disease impacts are rare and were not modeled. Occasional avalanche, mud, or rock slides will have minor, localized effects on seral stages (also not modeled). Floods will occasionally create conditions for seedling establishment (modeled at 400yr return interval for big floods which return conditions to early

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seral.

Adjacency or Identification Concerns

BPS 1012 is rare in MZs 12 and 17.

Often adjacent to and grading into the Rocky Mountain Gambel Oak - Mixed Montane Shrubland (1107), which will occur on slightly drier and more southern sites. May be just below the Rocky Mountain Montane Mixed Conifer BpS (1051, 1052) or Rocky Mountain Subalpine Spruce-fir or Aspen BpS (1056, 1057). This type is generally continuous patches of maple; landscapes with scattered maple patches would be a different type.

Maple may be susceptible to non-native gypsy moth in today's ecology.

Literature suggests that bigtooth maple is replacing Gambel oak in the absence of fire, although personal observation suggests that both sprout equally well where they occur. Rather than replacing Gambel oak, bigtooth maple may be becoming a component within the oak system. Maple is more shade-tolerant than Gambel oak and can replace oaks during long fire-free intervals.

Native Uncharacteristic Conditions

Scale Description

This type is found on fairly large elevation bands between the valley grasslands and montane aspen/conifer or sagebrush stands. Disturbance patch sizes within this type are generally small, from a few acres to hundreds of acres, and are influenced by topography and geology.

Issues/Problems

Comments

BpS 1012 for MZ17 was adopted as-is from MZ16. Gary Medlyn (gary_medlyn@nv.blm.gov), Jack Sheffey (Jack_Sheffey@blm.gov), Bryan Bracken (bryan_bracken@blm.gov) and Sandy Gregory (s50gergo@nv.blm.gov) examined description of BpS for MZs 12 and 17 and did not believe that bigtooth maple ravine woodlands are found in MZs 12 and 17 as they have never observed the species in these zones. BpS 1012 for MZ16 was reviewed by Doug Page (doug_page@blm.gov) and Mark Loewen (mloewen@fs.fed.us).

Vegetation Classes

Class A **10 %**

Early Development 1 All Structures

Indicator Species* and Canopy Position

ACGR3	Upper
CAGE2	Lower
MARE11	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	80 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Description

Post-replacement stage dominated by a mix of various herbs and grasses and low maple sprouts. Since bigtooth maple sprouts rapidly, the early seral stage will last less than eight years. This vegetation not likely to carry fire (fire was not modeled in this class). Large floods are stand-replacing events and occur with a frequency of approximately 400 years.

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Class B 20 %

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ACGR3	Upper
SYOR2	Lower
CAGE2	Lower
MARE11	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	21 %	80 %
Height	Shrub 1.1m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mid-seral, closed stands of maple (sometimes associated with Gambel oak or other shrubs). Mid-seral stages generally start at about nine years of age and become late seral at about 30yrs of age. Sprout sizes generally are about 1-3m high, with high canopy cover. Stem diameters are generally less than three inches. Understory herb and grass cover can range from very low (when shrub and litter cover is high) to fairly high. Replacement fire (mean 125yrs FRI) and flooding (return interval of 400yrs) are stand replacing events, whereas mixed severity fire (mean 75yrs FRI) maintains vegetation structure.

Class C 70 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ACGR3	Upper
SYOR2	Low-Mid
CAGE2	Lower
MARE11	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	21 %	80 %
Height	Shrub 3.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Late seral, generally closed stands of maple. Stand stem ages are generally greater than 30yrs, and greater than three inches diameter in size. Stand heights are generally greater than three meters. Overstory canopy cover is generally 30-80%; understory cover is similar to mid-seral. Scattered conifers can occur at this stage. Disturbance dynamics are the same as in class B.

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

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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

not present

Disturbances

Fire Regime Group: III**

Historical Fire Size (acres)

Avg 40
Min 1
Max 200

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	135			0.00741	38
Mixed	82			0.0122	62
Surface					
All Fires	51			0.01961	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

References

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710160 Colorado Plateau Pinyon-Juniper Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

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Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

PIED	HECO26
JUOS	BASA3
PIMO	ARTEM
SYOR	CEMO2

General Model Sources

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Geographic Range

This ecological system occurs in dry mountains and foothills of the Colorado Plateau region including the western slope of CO to the Wasatch Range, south to the Mogollon Rim and east into the northwestern corner of NM.

Biophysical Site Description

These woodlands occur on warm, dry sites on mountain slopes, mesas, plateaus and ridges. The system is typically found at lower elevations, ranging from 1500-2440m. Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay.

Vegetation Description

Pinus edulis and/or Juniperus osteosperma dominate the tree canopy. Pinus monophylla may be present. Juniperus scopulorum may codominate or replace Juniperus osteosperma at higher elevations.

Understory layers are variable and may be dominated by shrubs, graminoids or be absent. Associated species include Arctostaphylos patula, Artemisia tridentata, Cercocarpus intricatus, Cercocarpus montanus, Coleogyne ramosissima, Purshia stansburiana, Purshia tridentata, Quercus gambelii, Bouteloua gracilis, Pleuraphis jamesii or Poa fendleriana.

Disturbance Description

The fire regime is characterized by somewhat frequent mixed severity fire (mean FRI of 150-200yrs) with very infrequent replacement fires (mean FRI of 200-500yrs) (Rondeau 2001). Surface fire occurs only in the earliest successional class every 200yrs on average. There is frequent fire importation from adjacent types.

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Weather-related stress thins trees every 150yrs on average in more closed stands. Insects/disease has a similar effect, with a greater greater frequency in closed stands (mean return interval of 100yrs) than open ones (mean return interval of 1000yrs). Competition from grasses and older trees in late-open stands is also included as a disturbance that maintains open conditions.

Adjacency or Identification Concerns

This system occurs at higher elevations than Great Basin Pinyon-Juniper Woodland (1019) and Colorado Plateau shrubland systems where sympatric.

Native Uncharacteristic Conditions

Scale Description

This ecological system occupies small fire-proof sites (1ac+) to mid-elevation mountain slopes >1000ac. The most common disturbance in this type is very small scale, either single tree or small groups. If the conditions are just right, then it will have replacement fires that burn stands up to 1000s of acres. This type may also have mixed-severity fires of 10-100s of acres.

Issues/Problems

The original Rapid Assessment PNVG R3PIJUff includes three AltSuccession pathways that were not consistent in probabilities, but were adopted here.

Comments

This is essentially the same system as PNVG R3PIJUFF and BpS 1016 for MZ16. The major difference is that Pinus monophylla occurs in MZ12 (thus not BpS 1016) and Pinus edulis may occur in MZ17. Also, the insect/disease probability/year were all set to 0.001 in the open stands to insure consistency, with little effect to dynamics and results.

Vegetation Classes

Class A 10 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

SYOR	Lower
BASA3	Lower
ARTEM	Upper
HECO26	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	25 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Grass/forb/shrub/seedling - usually post-fire. Both replacement fire and surface fire occur in this class (mean FRI of 200yrs for both). The dominant successional path is to class C (mid-open) after 60yrs, although the model allows for an alternate successional pathway to class B (mid-closed) 1/100 times.

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Class B 20 %

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO/PI	Upper
JUOS	Upper
ARTEM	Mid-Upper
SYOR	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	41 %	70 %
Height	Tree 0m	Tree 5m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mid-development, dense (>40% cover) pinyon-juniper woodland; understory is sparse. Replacement fire occurs every 400yrs on average. Three disturbances cause a transition to class C (mid-open): mixed severity fire (mean FRI of 150yrs), insects/disease (mean return interval of 100yrs), and weather-related stress (mean return interval of 150yrs). Succession to class E, late-closed, after 120yrs.

Class C 25 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO/PI	Upper
JUOS	Upper
SYOR	Lower
HECO26	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	40 %
Height	Tree 0m	Tree 5m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mid development-open (<40% cover) pinyon-juniper stand with mixed shrub/herbaceous community in understory. The mean FRI for replacement fire is 500yrs. Mixed severity fire (mean FRI of 200yrs) and insects/disease (mean return interval of 1000yrs) maintain stand structure. Primary successional pathway to class D, late-open, after 100yrs, although an alternate successional pathway to class B 2/100 times is included to represent tree invasion.

Class D 35 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO/PI	Upper
JUOS	Upper
SYOR	Upper
CELE3	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	40 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Late development-open juniper-pinyon stand with "savanna-like" appearance; mixed grass/shrub/herbaceous community. Replacement fire is infrequent (mean FRI of 500yrs). Mixed severity fire (mean FRI of 200yrs), insects/disease (mean return interval of 1000yrs), and competition (1/100 prob/yr) maintain vegetation in D, which is the primary successional endpoint. Alternate succession to class E, late-closed, occurs 1/200 times to represent tree invasion.

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Class E **10 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO/PI	Upper
JUOS	Upper
SYOR	Upper
CELE3	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	41 %	70 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dense, old-growth stands with multiple layers. Late development-closed pinyon-juniper forest. May have all-aged, multi-storied structure. Moderate mortality within stand. Occasional shrubs with few grasses and forbs and often rock or bare soil. The mean FRI of replacement fire is 500yrs. Mixed severity fire (mean FRI of 150yrs), insects/disease (mean return interval of 100yrs), and weather-related stress (mean return interval of 100yrs) thin tree cover, therefore causing a transition to class D.

Disturbances

Fire Regime Group:** **III**

Historical Fire Size (acres)

Avg 10
Min 1
Max 1000

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☐ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	435	200	500	0.0023	29
Mixed	196	150	200	0.00510	65
Surface	2500			0.0004	5
All Fires	128			0.00780	

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☑ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710170 Columbia Plateau Western Juniper Woodland and Savanna

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 4/6/2005

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Modeler 2	Louis Provencher	lprovencher@tnc.org	**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

JUOC FEID
ARAR8 ARTR2
CELE3
PUTR2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range

This woodland system is found along the northern and western margins of the Great Basin (NV), from southwestern ID, along the eastern foothills of the Cascades, south to the Modoc Plateau of northeastern CA.

Biophysical Site Description

Elevations range from under 200m along the Columbia River in central WA to over 1500m. Generally soils are medium-textured, with abundant coarse fragments and derived from volcanic parent materials. In central OR, the center of distribution, all aspects and slope positions occur. Where this system grades into relatively mesic forest or grassland habitats, these woodlands become restricted to rock outcrops or escarpments with excessively drained soils. These woodlands are generally restricted to rocky areas where fire frequency is low. Extensive woodlands are found on pumice soils in central OR.

Vegetation Description

Pinus monophylla is not present in this region, so Juniperus occidentalis is the main tree species, although Pinus ponderosa or Pinus jeffreyi may be present in some stands. Cercocarpus ledifolius may occasionally codominate. Artemisia arbuscula is the most common shrub with Artemisia tridentata present to common; others are Purshia tridentata, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ribes cereum and Tetradymia spp. Graminoids include Carex filifolia, Festuca idahoensis, Poa secunda and Pseudoroegneria spicata.

Disturbance Description

Columbia Plateau juniper savanna are distinguished by infrequent replacement fire while being surrounded by ecological systems with more frequent fire regimes (eg, ponderosa pine) that affect the size and dynamics of juniper savannas. Replacement fire drives juniper savannas-- not mixed or surface fire-- thus, this system

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is FRG IV. Increased replacement fire activity has been shown to be correlated with periods of consecutive wet years followed by low to average rainfall (Miller and Rose 1999). No such relationship was found for non-replacement fires.

The mean FRI of replacement fire varied between 200 and 500yrs and occurs in all vegetation classes. Mixed severity fire (mean FRI of 100-500yrs) increased with shrub cover, but decreased under older trees. Surface fire was infrequent (mean FRI of 200yrs) and occurred only under older trees.

Insect outbreaks and drought mortality were considered rare in ancient juniper savannas.

Adjacency or Identification Concerns

These woodlands are composed of two very different types. There are old-growth Juniperus occidentalis woodlands with trees and stands often over 1000yrs old (BPS 1017), with fairly well-spaced trees with rounded crowns. There are also large areas where juniper has expanded into sagebrush steppe and bunchgrass-dominated areas (not BpS 1017 but perhaps BpS 1125--Inter-Mountain Basins Big Sagebrush Steppe), with young, pointed-crowned trees growing closely together. Currently, these two very different types are about equally distributed across the landscape, with Juniperus occidentalis continuing to expand, either from fire suppression, grazing or climate change. Fire suppression and removal of fine fuel by grazing livestock have reduced fire frequency and allowed Juniperus occidentalis seedlings to colonize adjacent alluvial soils and expand into the shrub-steppe and grasslands. Juniperus occidentalis savanna may occur on the drier edges of the woodland where trees are intermingling with or invading the surrounding grasslands and where local edaphic or climatic conditions favor grasslands over shrublands.

Native Uncharacteristic Conditions

Scale Description

Juniper Savanna was usually distributed across the landscape in patches that range from 10s to 100s of acres in size. In areas with very broken topography and/or mesa landforms, or on pumice soils this type may have occurred in patches of several hundred acres. These stands are often surrounded by frequent fire systems, which could influence their size and fire regimes.

Scale of mixed severity and surface fires (1-2 trees) should be much less than replacement fire (whole stands).

Issues/Problems

It is difficult to distinguish between mixed severity and surface fire from the historical record. Therefore, the total estimated FRI of non-replacement fire was split 50% mixed severity fire and 50% surface fire when both were present.

Comments

BpS 1017 was adapted from the Rapid Assessment model R2PIJU (and BpS 1115-- Inter-Mountain Basins Juniper Savanna for MZs 12 and 17) developed by Steve Bunting (sbunting@uidaho.edu), Krista Waid-Gollnick (krista_waid@blm.gov) and Henry Bastian (henry_bastian@ios.doi.gov) for juniper and/or pinyon savanna. Longer FRIs for surface and mixed severity fires were used. Reviewers of R2PIJU were George Gruell (ggruell@charter.net), Jolie Pollet (jpollet@blm.gov) and Peter Weisberg (pweisberg@cabnr.unr.edu).

Quality control (Pohl, 4/25/05) resulted in adjusting the canopy closure for class A from 2-10% to 0-5% to differentiate it from class B. Canopy closure for class D was adjusted to 10-15% from 10-20% and class E was adjusted to 15-20% from 10-20% to differentiate the two. The selected Fire Regime Group was also

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changed from V to IV to reflect the <200yr overall fire return interval and the importance of replacement fire.

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

Vegetation Classes

Class A 5%

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

FEID	Upper
CRAC	Upper
ERIOG	Upper
LONE	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Initial post-fire community dominated by annual forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Evidence of past fires, charcoal and other evidence can be observed. Duration 10yrs with succession to class B, mid development-open. Replacement fire occurs every 300yrs on average. Infrequent mixed severity fire (average FRI of 200yrs) thins vegetation, but does not cause a transition to another class.

Class B 5%

Mid Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

ARAR8	Middle
FEID	Upper
CRAC	Upper
ERIOG	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	10 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dominated by perennial forbs and grasses, with low sagebrush establishment. Total cover remains low due to shallow unproductive soil. Duration 20yrs with succession to class C, unless infrequent replacement fire (FRI of 200yrs) returns the vegetation to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than 0 and <10 yrs. Mixed severity fire (average FRI of 200yrs) thins the vegetation but does not cause a transition to another class.

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Class C 15 %

Mid Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOC	Upper
ARAR8	Lower
FEID	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	1 %	10 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform.

Shrubs dominate, but trees (JUOC) are overtopping shrubs and herbaceous vegetation. Herbaceous cover is 5-10%. Shrub cover is 2-15%.

Description

Shrub dominated community with young juniper seedlings becoming established (<10% cover). Duration 70yrs with succession to class D unless replacement fire (average FRI of 200yrs) causes a transition to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed severity fire at its most frequent (mean FRI of 100yrs) with higher shrub cover (2-15%).

Class D 35 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOC	Upper
FEID	Low-Mid
ARAR8	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	20 %
Height	Tree 0m	Tree 10m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Community dominated by young to mature juniper of mixed age structure (10-20% cover). Juniper becoming competitive on site and beginning to affect understory composition. Duration 300yrs with succession to class E unless replacement fire (average FRI of 500yrs) causes a transition to class A. Mixed severity every 200yrs on average. Surface fire occurs in this class with a mean FRI of 200yrs.

Class E 40 %

Late Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOC	Upper
FEID	Low-Mid
ARAR8	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	20 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Site dominated by widely spaced old juniper. Grasses (eg, Idaho fescue) present on microsites sites with deeper soils (>20in) with restricting clay subsurface horizon. Replacement fire and mixed severity fire are rare (average FRI of 500yrs). Surface fire every 200yrs on average will scar ancient trees. Trees may live more than 600yrs.

Disturbances

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Fire Regime Group:** III

Historical Fire Size (acres)

Avg 5
Min 1
Max 10

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	370	90	1500	0.00270	26
Mixed	270	50	500	0.00370	36
Surface	255			0.00392	38
All Fires	97			0.01033	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710190 Great Basin Pinyon-Juniper Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

Modeler 1 Peter Weisberg pweisberg@cabnr.unr.edu **Reviewer** Louis Provencher lprovencher@tnc.org

Modeler 2 **Reviewer**

Modeler 3 **Reviewer**

Vegetation Type

Upland Forest and Woodland

Map Zone

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Model Zone

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

Dominant Species*

PIMO	HECO26
JUOS	BASA3
CELE3	ARTEM
SYOR	CELE3

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range

This ecological system occurs on dry mountain ranges of the Great Basin region and eastern foothills of the Sierra Nevada.

Biophysical Site Description

System typically found at lower elevations ranging from 1600-2600m. This type generally occurred on shallow rocky soils, or rock dominated sites that are protected from frequent fire (rocky ridges, steep slopes, broken topography and mesa tops). Severe climatic events occurring during the growing season, such as frosts and drought, are thought to limit the distribution of pinyon-juniper woodlands to relatively narrow altitudinal belts on mountainsides. Soils supporting this system vary in texture ranging from stony, cobbly, gravelly sandy loams to clay loam or clay.

Vegetation Description

Woodlands dominated by a mix of Pinus monophylla and Juniperus osteosperma, pure or nearly pure occurrences of Pinus monophylla, or woodlands dominated solely by Juniperus osteosperma comprise this system. Cercocarpus ledifolius is a common associate. Understory layers are variable. Associated species include shrubs such as Arctostaphylos patula, Artemisia arbuscula, Artemisia nova, Artemisia tridentata, Cercocarpus ledifolius, Cercocarpus intricatus, Coleogyne ramosissimaand bunch grasses Hesperostipa comata, Festuca idahoensis, Pseudoroegneria spicata, Leymus cinereus (=Elymus cinereus) and Poa fendleriana. Quercus gambelii and Quercus turbinella may be present in eastern woodlands of MZ17.

Since disturbance was uncommon to rare in this ecological system and the overstory conifers may live for over 1000yrs, patches were primarily composed of later seral stages (D & E; see below) that did not occur as extensive woodlands and that should be distinguished from shrubland ecological sites encroached by pinyon or juniper during the last 150yrs. It is estimated that 400yrs is required for old juniper woodland

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stands to develop (Romme et al 2002). The age structure may vary from uneven to even aged. The overstory cover is normally <25%, although it can sometimes be higher (<40%) where pinyon occurs.

Disturbance Description

Uncertainty exists about the fire frequencies of this ecological system, especially since this ecological system groups different types of pinyon-juniper communities for different slopes, exposures, and elevations. Fire occurrence may be influenced by fires spreading from shrub and grassland dominated vegetation of lower and higher altitudinal zones. Replacement fires were uncommon to rare (average FRI of 100-1000yrs) and occurred primarily during extreme fire behavior conditions. Mixed severity fire (average FRI of 100-500yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1ac). There is limited evidence for surface fires (Gruell 1994; Bauer and Weisberg, unpublished data), which likely occurred only in the more productive sites during years where understory grass (Festuca idahoensis) cover was high, providing adequate fuel. Although fire scars are only rarely found in pinyon-juniper of the Colorado Plateau and elsewhere (Baker and Shinneman 2004, Eisenhart 2004), ongoing studies in the central Great Basin are observing fire-scarred trees, suggesting that surface fires historically occurred at low frequency. Limited evidence to date suggests that while lightning ignitions in this biophysical setting may have been common, the resulting fires only rarely spread to affect more than a few trees (average FRI of 100yrs).

Prolongued weather-related stress (drought mostly) and insects and tree pathogens are coupled disturbances that thin trees to varying degrees and kills small patches every 250-500yrs on average, with greater frequency in more closed stands.

Adjacency or Identification Concerns

This system occurs at lower elevations than Colorado Plateau Pinyon-Juniper Woodland (BpS 1016) where sympatric. Inter-Mountain Basins Juniper Savanna (BpS 1115) is generally found at elevations below the physiological tolerance of Pinus monophylla.

In modern days, surrounding matrix vegetation has changed to young-mid aged woodlands that burn more intensely than the former sagebrush matrix.

Two major modern issues, climate change and invasive plant species (especially cheatgrass), lead to non-equilibrial vegetation dynamics for this ecological system, making it difficult to categorize and usefully apply natural disturbance regimes. Sites with an important cheatgrass component in the understory experience greater fire frequency, and will respond differently to fire.

Native Uncharacteristic Conditions

Scale Description

The most common disturbance in this type is very small scale, either single-tree or small groups. If the conditions are just right, then it will have replacement fires that burn stands up to 1000s of acres. This type may also have mixed-severity fires of 10-100s of acres.

Issues/Problems

There is much uncertainty in model parameters, particularly the fire regime. Quantitative data are lacking and research is on-going. The literature for this ecological system's fire history is based on the chronologies from other pines species that are better fire recorders, growing under conditions that may not represent fire environments typical of infrequent-fire pinyon and juniper communities. For example, surface fire, which leaves scars on these other pine species (but not generally on fire-sensitive pinyon or juniper), has no effect on the dynamics of the model, although surface fire maintains the open structure of classes D and E by

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thinning younger trees.

Further study is needed to better elucidate the independent and interactive effects of fire, insects, pathogens, climate, grazing and anthropogenic impacts on historical and current vegetation dynamics in the Great Basin Pinyon-Juniper Woodland type.

Comments

This model is based on the model from MZ16 for the same BpS. The model structure comes from the Rapid Assessment model for PNVG R2PIJU. However, fire return intervals were made considerably longer to fit the Great Basin context. Elements of the model for the Colorado Plateau Pinyon-Juniper Woodland and Shrubland (BpS 1016), which was developed by Bob Unnasch (bunnasch@tnc.org) for MZ16, were also incorporated. Insects/disease are incorporated in the model in both "patch mortality" and "woodland thinning" manifestations, and are intended to also represent associated drought mortality influences.

Vegetation Classes

Class A 5%

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

ELEL5	Upper
BASA3	Upper
FEID	Upper
HECO26	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	15%
Height	Herb 0m	Herb >1.1m
Tree Size Class	None	

[ ] Upper layer lifeform differs from dominant lifeform.

Description

Initial post-fire community dominated by annual grasses and forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Evidence of past fires (burnt stumps and charcoal) should be observed. Duration 10yrs with succession to class B, mid-development closed. Replacement fire occurs every 300yrs on average.

Class B 5%

Mid Development 1 Open

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 5

Indicator Species* and Canopy Position

ARTRV	Mid-Upper
ARTRW8	Mid-Upper
PIMO	Upper
JUOS	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5%	20%
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

[ ] Upper layer lifeform differs from dominant lifeform.

Description

Dominated by shrubs, perennial forbs and grasses. Tree seedlings starting to establish on favorable microsites. Total cover remains low due to shallow unproductive soil. Duration 20yrs with succession to class C unless infrequent replacement fire (FRI of 200yrs) returns the vegetation to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed severity fire (average FRI of 200yrs) thins the woody vegetation but does not change its succession age.

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Class C 20 %

Mid Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 5

Indicator Species* and Canopy Position

PIMO	Upper
JUOS	Upper
ARTEM	Middle
CELE	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	20 %
Height	Tree 0m	Tree 5m
Tree Size Class	Pole 5-9" DBH	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant lifeform is shrub. Canopy cover is10-40%. Height is 0.5-1.5m.

Description

Shrub and tree-dominated community with young juniper and pinyon seedlings becoming established. Duration 70yrs with succession to class D unless replacement fire (average FRI of 250yrs) causes a transition to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed severity fire as in class B. Mortality from insects, pathogens, and drought occurs at a rotation of approximately 500yrs and cause a transtion to class B by killing older trees.

Class D 35 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO	Upper
JUOS	Upper
CELE	Middle
ARTEM	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	40 %
Height	Tree 0m	Tree 10m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Community dominated by young to mature juniper and pine of mixed age structure. Juniper and pinyon becoming competitive on site and beginning to affect understory composition. Duration 200yrs with succession to class E unless replacement fire (average FRI of 1000yrs) causes a transition to class A. Mixed severity is less frequent than in previous states (500yrs). Surface fire (mean FRI of 500yrs) is infrequent and does not change successional dynamics. Tree pathogens and insects such as pinyon Ips become more important for woodland dynamics occurring at a rotation of 250yrs, including both patch mortality (500yr rotation) and thinning of isolated individual trees (500yr rotation).

Class E 35 %

Late Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

PIMO	Upper
JUOS	Upper
CELE	Mid-Upper
ARTEM	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	50 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Some sites dominated by widely spaced old juniper and pinyon, while elsewhere there are dense, old-growth stands with multiple layers. May have all-aged, multi-storied structure. Occasional shrubs with few grasses and forbs and often much rock. Understory depauperate and high amounts of bare ground present. Grasses present on microsites with deeper soils (>20in) with restricting clay subsurface horizon. Potential maximum overstory

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coverage is greater in those stands with pinyon as compared to those with only juniper.

Replacement fire and mixed severity fires are rare (average FRIs of 1000 and 500yrs respectively). Surface fire occurs when especially dry years follow wet years (500yr rotation) and will scar ancient trees. Tree pathogens and insects associated with drought conditions kill patches of trees (1000yr rotation), with succession to class C, and individual trees (1000yr rotation) with successoin to class D. Duration 800yrs+.

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 10
Min 1
Max 5000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	525	10	1000	0.00190	32
Mixed	370	10	1000	0.00270	45
Surface	715	5	1000	0.0014	23
All Fires	166			0.00601	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1710200** **Inter-Mountain Basins Subalpine Limber-Bristlecone Pine Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1	Julia H. Richardson	jhrichardson@fs.fed.us	**Reviewer**	Louis Provencher	lprovencher@tnc.org
Modeler 2	Cheri Howell	chowell02@fs.fed.us	**Reviewer**		
Modeler 3			**Reviewer**		

Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

PILO
PIFL2
PIAL

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

Dry wind-swept ridges and exposed upper elevations of NV, UT, southern ID and eastern CA.

Biophysical Site Description

Elevation ranges from 8000-11500ft on mid to upper slopes. The areas are typically in rain shadows, and are the dry and cold extent of tree cover. Stands occur on thin, stony soils, high windswept ridges and open slopes with minimal ground cover.

Vegetation Description

Pinus longaeva, Pinus flexilis and Pinus albicaulis can exist separately or as mixed stands. In NV, Picea Engelmannii and Pseudotsuga menziesii occur incidentally with Pinus longaeva. Sparse understories, of forbs, grass and short shrubs form an understory. Seed dispersal of limber and bristlecone pines highly dependent on seed-caching birds.

Disturbance Description

This group contains some of the oldest trees in the area, with Pinus longaeva 1000yrs old or more and Pinus flexilis ages of 500yrs+. Understories are often sparse, with little to carry fires across the surface. Fire occurrence is typically low frequency and surface fires (mean FRI of 200yrs). In the absence of wind, fires are likely limited in extent (2ac or less). Stand replacement fires (mean FRI of 500yrs) are usually wind-driven, especially in olderstands (class C). Susceptible to bark beetles (esp. Pinus flexilis), but generally drought-tolerant.

Adjacency or Identification Concerns

A new and uncharacteristic disturbance is the potential for the introduction of white pine blister rust in both of these species. Blister rust is not yet occurring in the Utah High Plateau and western Great Basin. Note:

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blister rust has been found in NV in PIAL. Surveys in 2004 in NV bristlecone found no blister rust in PILO.

Native Uncharacteristic Conditions

Scale Description

Stands vary from tens to hundreds of acres in size. Stand replacement fires of 1/10th acres to 100ac have been experienced.

Issues/Problems

Similar to model in CO & SW model, although the bristlecone species is Pinus aristata there.

Comments

This model was adopted with minor edits on species composition from the MZ16 version created by Bruce Short (bshort@fs.fed.us), Stanley Kitchen (skitchen@fs.fed.us) and Linda Chappell (lchappell@fs.fed.us).

For MZ16, BpS 1057 was included in BpS 1020 as both are ecologically similar and have very small coverage.

Vegetation Classes

Class A 20%

Early Development 1 All Structures

Indicator Species* and Canopy Position

PILO	All
PIFL2	All

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	15%
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 6

Description

Bare ground and talus with sparse ground cover of forbs, grasses and low shrubs. Occasional old survivors may be present. Infrequent stand replacement fires (mean FRI of 500yrs) will setback succession to age zero. Surface fire (mean FRI of 200yrs) and weather-related stress affect this class, but without consequences to dynamics. Succession to class B after 100yrs.

Class B 20%

Mid Development 1 Open

Indicator Species* and Canopy Position

PILO	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	15%	40%
Height	Tree 0m	Tree 10m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 6

Description

Open woodland <40% crown closure of seedlings, saplings and survivors. The only disturbances are surface and replacement fires with the same FRIs as in class A. Succession to class C after 150yrs.

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Class C 60 %

Late Development 1 Open

Indicator Species* and Canopy Position

PILO Upper
PIFL2 Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	15 %	40 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 6

Description

Open woodland <40% crown cover of mixed diameters, seedling to 40in DBH. Sparse ground cover of grasses and low shrubs. Very old trees can develop in this class. Fire frequency and severity as in previous classes.

Class D 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Class E 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 5
Min 1
Max 1000

Sources of Fire Regime Data

☑ Literature
☑ Local Data
☐ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	500			0.002	29
Mixed					
Surface	200			0.005	71
All Fires	143			0.00701	

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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**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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710330 Mediterranean California Subalpine Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 8/8/2005

Modeler 1 David Swanson dkswanson@fs.fed.us **Reviewer** one anonymous reviewer

Modeler 2 **Reviewer**

Modeler 3 **Reviewer**

Vegetation Type

Woodland

Dominant Species*

PICO
PIAL
ABLA

General Model Sources

☐ Literature
☐ Local Data
☐ Expert Estimate

Map Zone

17

Model Zone

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

Geographic Range

This woodland type occurs in the Blue Mountains, and in parts of the OR, WA and CA Cascades. It may sporadically occur throughout the Great Basin too.

Biophysical Site Description

This type occurs at elevations >7500ft in the Blue Mountains and Great Basin and >5000ft in the Cascades. In the southern Sierra Nevada, it may occur as high as 9500ft. Communities are typically on ridge crests, shoulders, or upper slopes on relatively dry, stoney soils, often on south aspects.

Vegetation Description

Lodgepole pine (Pinus contorta var. murrayana) is the dominant tree throughout the range of this type, but may be displaced by var. latifolia in the Great Basin. Other species may be locally dominant. In the Blue Mountains, P. albicaulis can be dominant, while in northern CA, P. balfouriana may dominate. Other species include P. flexilis, P. moniticola, Juniperus occidentalis var. australis, Salix spp and Vaccinium uliginosum as indicators. However, subalpine larch, Englemann spruce, or subalpine fir may also occur. The stands are usually open with canopy cover of <60%. Due to landscape position and thin soils, these types often occur as krummholz forms with wind-pruned, prostrate and/or shrublike appearance.

Disturbance Description

The fire regime in this group is highly variable and difficult to document. Lightning strikes are common on the ridges where these communities occur, but discontinuous fuel limits the spread of most fires and produce fires of highly variable severity. Infrequent severe crown fires in fir forests located downslope can spread into forests of this group and cause larger, more uniform stand-replacement fires.

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

Adjacency or Identification Concerns

This type usually occurs above subalpine fir or lodgpole pine (seral to subalpine fir) forest, and may occur among patches of alpine meadow and grasslands.

Native Uncharacteristic Conditions

Scale Description

Fires in this type can occur in very small patches associated with lightning strikes. Ignitions of this type are probably quite common but tyically do not spread beyond 10s to 100s of acres. Much larger fires can occur less frequently when extensive crown fires in subalpine fire forests spread upslope into these pine woodlands.

Issues/Problems

We are uncertain about the fire return intervals and succession rates in the group. Several literature sources indicate fire return intervals of about 30-90yrs, but the proportion of mixed fires versus stand replacement is unknown.

We lack data for stands of intermediate age (ie, 50yrs since fire), so we did not try to assign any mid-seral states. Instead we just assigned prolonged succession (100yrs) from early to late states.

Comments

This model was derived from the Rapid Assessment model R#SAWD (Subalpine Woodland). It was adopted as-is for MZ17.

Vegetation Classes

Class A 25 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model

Indicator Species* and Canopy Position

VACCI	Middle
PINUS	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	90 %
Height	Shrub 0m	Shrub >3.1m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Seedling and sapling trees may be present, but will generally be dominated by shrubs.

Description

Resprouting shrubs and herbs dominate. Tree seedlings and saplings (<10cm DBH pines and firs) are often present at low cover. Scattered old whitebark pine (>30cm DBH) are sometimes present. This stand succeeds to a late open state after about 100yrs. Replacement fires are very rare.

Class B 20 %

Late Development 2 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

Indicator Species* and Canopy Position

PINUS	Upper
ABLA	Middle
VACCI	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	51 %	90 %
Height	Tree 0m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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**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.

Pines and firs are present in the overstory with DBH >30cm. Some of the pines have ages >100yrs (often much older), while the co-dominant firs are younger, sometimes <100yrs. Understory trees (<30cm DBH) are mostly subalpine fir.

This type will maintain itself as a closed canopy until either mixed fire opens it up (MFR=60) or a replacement fire resets the forest.

Class C **55 %**

Late Development 1 Open

Indicator Species* and Canopy Position

PINUS	Upper
ABLA	Mid-Upper
VACCI	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	50 %
Height	Tree 0m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

Description

Multi-age whitebark pine occurs with the overstory containing some trees >100yrs old (often much older) and dbh >30 cm. Tree seedlings and saplings (<10cm DBH) are subalpine fir and whitebark pine, with the former predominant. Tree seedlings increase with time since fire. The understory is low shrubs and herbs.

The stand type fills in after about 100yrs in the absence of other disturbances. However, replacement fires occur very rarely. Mixed fire (MFR=60) or insect/disease can maintain it in this open state.

Class D **0 %**

[Not Used] [Not Used]

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.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

Class E **0 %**

[Not Used] [Not Used]

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.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

Disturbances

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

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	300	200	400	0.00333	21
Mixed	80	35	120	0.0125	79
Surface					
All Fires	63			0.01584	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1710510** **Southern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1 Julia H. Richardson jhrichardson@fs.fed.us **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Forest and Woodland

Map Zone
17

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

Dominant Species*
ABCO PSEUD7
PIFL2 PICO
CAGA3
CARU

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Occurs throughout the southern Rockies, north and west into UT, western WY and ID. This type is rare to non-existent in NV and may not be mappable in MZ12. It is restricted to northern locations in MZ17.

Biophysical Site Description
This type is generally located just above sagebrush ecosystems. These are mixed-conifer forests occurring on all aspects at elevations ranging from 1200-3300m (4000-11,000 ft). Rainfall averages <75cm (29in) per year, 40-60cm (16-24in) with summer "monsoons" during the growing season contributing substantial moisture in the eastern Great Basin. The composition and structure of overstory is dependent upon the temperature and moisture relationships of the site, and the successional status of the occurrence.

Vegetation Description
Abies concolor with Pseudotsuga menziesii are most frequent, Pinus ponderosa is incidental. Pinus flexilis is common in NV. Pseudotsuga menziesii forests occupy drier sites, mostly in the northeast corner of MZ17. Abies concolor-dominated forests occupy cooler sites, such as upper slopes at higher elevations, canyon sideslopes, ridgetops and north and east-facing slopes which burn somewhat infrequently. There are a number of cold-deciduous shrub and graminoid species common, including Arctostaphylos uva-ursi, Mahonia repens, Paxistima myrsinites, Symphoricarpos oreophilus, Jamesia americana, Quercus gambelii (MZ17 only) and Festuca arizonica.

Disturbance Description
Disturbance regime described here is for Douglas-fir. Fire Regime Group I. Some portions of these sites are transition zones to Fire Regime Groups II and III. Frequent surface and mixed severity fires were the common fire regime characteristics. Surface fire intervals ranged from 10-50yrs, and replacement severity fires occurred at intervals of 150-400yrs+ (Crane 1986; Barrett 1988; Bradley 1992a,b; Brown 1994;

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

Morgan et al. 1996). Mixed severity fires were assumed to have an intermediate FRI of 45-75yrs on average. Stand replacement fires were generally restricted to the closed canopy forest and the stand initiation conditions.

The Fire Regime Group I characteristics were facilitated by understory vegetation dominated by fine fuel (grasses, sedges and forbs), landscape position and adjacency to other frequent fire BpSs. Much of the forest structure was open canopy overstory that resulted in an understory dominated by healthy and vigorous plants (grasses, sedges and forbs) and generally continuous fine fuel layer. This fine fuel facilitated fire spread and thinning of the conifer or aspen seedlings (thus promoting aspen suckering).

Other disturbances included insect outbreaks (return interval of 100yrs), disease, drought, and wind and ice damage (every 1000yrs in closed stands; every 250yrs in open stands). Competition among trees was also a factor that increasingly slowed successional dynamics in more closed stands. Fire was by far the dominant disturbance agent.

Adjacency or Identification Concerns

This BpS is very similar to BpS 1052 (Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland) due to the dominance of white fir and limber pine in the Great Basin.

If aspen is present in large patches or if conifers are not coming in after ~30yrs, the BpS is probably misclassified and one of the pure Aspen types should be examined (BpS 1011 Rocky Mountain Aspen Forest and Woodland or BpS 1061 Intermountain Basins Aspen-Mixed Conifer Forest and Woodland).

BpS is often transitional between non-forested areas or between Pinus ponderosa woodlands (at lower elevations), which are uncommon in MZs 12 and 17, and spruce-fir at higher elevations.

Native Uncharacteristic Conditions

Scale Description

This BpS occurs in patches ranging from 1000s to 10000s of acres in many western locations, however in MZs 12 and 17, patch size may be much smaller (<100ac).

Issues/Problems

Douglas-fir is rare to absent in NV and the west desert of UT. The current model was clearly developed for dry Douglas-fir forests. It needs to be determined whether forests dominated by limber pine and white fir will exhibit the same fire regimes.

Comments

This model was adopted with minor edits on species composition from the MZ16 version created by Loewen (mloewen@fs.fed.us), Page (doug_page@blm.gov) and Chappel (lchappell@fs.fed.us). Further review is needed to make sure this type is appropriately described for MZs 12 and 17 - especially species occurrence.

BpS 1051 for MZ16 was based on modifications to R2PSMEdy (original modeler Lynn Bennett, lmbennett@fs.fed.us, and modified by Louis Provencher) on 2/24/05 by Pohl for LANDFIRE BpS modeling. ABCO and PIPO were added as dominant species. Hugh Safford (hughsafford@fs.fed.us) and Steve Barrett (sbarrett@mtdig.net) were reviewers of R2PSMEdy.

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

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**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.

Vegetation Classes

Class A 20 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 5

Indicator Species* and Canopy Position

CARU	Low-Mid
CAGA3	Low-Mid
PICO	Upper
PIPO	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	15 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Grass/forb/shrub/tree seedlings. Replacement fire is frequent (FRI of 25yrs). Mixed severity fire (FRI of 100yrs) does not cause an ecological setback. Vegetation will succeed to the mid-development closed (class B) condition in 35yrs.

Class B 5 %

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Indicator Species* and Canopy Position

PSEUD7	Upper
ABCO	Upper
PIFL2	Upper
PICO	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	35 %	100 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is >35%. Closed stand with trees, poles, saplings, grass and scattered shrub, 75-100% white fir and limber pine. If fire is absent for 70yrs, vegetation will succeed to E (closed, late-development). Replacement fire (average FRI of 150yrs) and infrequent weather-related stress (return interval of 250yrs) returns vegetation to class A. Mixed severity fire (FRI of 45yrs) and insect/diseases every 100yrs on average will cause a transition to an open mid-development forest (class C). Competition (probability/year=0.01) maintains the stand in its closed condition.

Class C 10 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Indicator Species* and Canopy Position

PIPO	Upper
PSEUD7	Upper
PIFL2	Upper
ABCO	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	35 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is <35%. Open trees, (poles, saplings) of Douglas-fir (if present in the area) and occassional ponderosa pine with grass and scattered shrubs. With surface fire (FRI of 10yrs), mixed severity fire (FRI of 75yrs), weak adult tree competition and insect/diseases (every 100yrs), primary succession is to D, the open late-development condition. Infrequent stand-replacing fire (FRI of 400yrs) and infreqent weather-related stress (return interval of 1000yrs) will cause transitions to A. The stand will succeed on an alternative path to a closed late-development condition after 68yrs without fire.

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Class D 60 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Indicator Species* and Canopy Position

PIPO	Upper
PSEUD7	Upper
PIFL2	Upper
ABCO	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	35 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is <35%. Open large tree/ grass and scattered shrubs; Douglas-fir with occassional ponderosa pine. Surface fire (FRI of 10yrs) and mixed severity fire (FRI of 75yrs) maintain the stand in the open condition. This open condition, however, will close after 70yrs without fire (alternative path to E). Adult tree competition (prob/yr of 0.001) and insect/diseases (100yrs return interval) also disturb this class, but do not affect the successional age. Replacement fire every 500yrs on average and weather-related stress (1000yrs return interval) will cause a transition to A.

Class E 5 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABCO	Upper
PIFL2	Upper
PIPO	Upper
PSEUD7	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	35 %	100 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is >35%. Closed large trees of Douglas-fir, white fir, limber pine and occassional lodgepole pine, scattered shrubs. Replacement fire (FRI of 150yrs) and infrequent weather/wind-related stress (return interval of 250yrs) cause a transition to class A. Mixed severity fire (FRI of 45yrs) open the structure of the stand (transition to D), whereas surface fire (FRI of 50yrs) and competition, although present, do not cause transitions to other classes. Insect and/or diseases occur every 40yrs on average. 50% of the time, insects cause a transition to class C, and 50% of the time to class D.

Disturbances

Fire Regime Group: I**

Historical Fire Size (acres)

Avg 50
Min 1
Max 100

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	90			0.01111	12
Mixed	77			0.01299	14
Surface	14	10	50	0.07143	75
All Fires	10			0.09553	

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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**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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [x] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710520 Southern Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1 Julia H. Richardson jhrichardson@fs.fed.us **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Forest and Woodland

Map Zone
17

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

Dominant Species*
ABCO
PIFL2
ABLA
PICO

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
Rocky Mountains west into the ranges of the Great Basin. BpS may be more common in eastern portion on MZ12 and in MZ17.

Biophysical Site Description
Elevations range from 1200-3300m (4000-11000ft). Occurrences of this system are found on cooler and more mesic sites than Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland (1051). Such sites include lower and middle slopes of ravines, along stream terraces, moist, concave topographic positions and north and east-facing slopes which burn somewhat infrequently.

Vegetation Description
Abies concolor is most common canopy dominant with Picea engelmannii, Pinus flexilis and Pinus longeava. Pseudotsuga menziesii will be rare and restricted to northern NV and UT. A number of cold-deciduous shrub species can occur, including Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Jamesia americana, Physocarpus malvaceus, Vaccinium membranaceum and Vaccinium myrtillus. Herbaceous species include Bromus ciliatus, Carex geyeri, Carex rossii, Carex siccata, Muhlenbergia virescens, Pseudoroegneria spicata, Erigeron eximius, Fragaria virginiana, Luzula parviflora, Osmorhiza berteroi, Packera cardamine, Thalictrum occidentale and Thalictrum fendleri.

Disturbance Description
Naturally occurring fires are of variable return intervals, and mostly light, erratic, and infrequent due to the cool, moist conditions. These ecological systems are in a Fire Regime Group III or I, but some portions of these sites are transition zones to Fire Regime Group IV. This vegetation is a transition between the frequent surface and mixed severity fires and the more stand replacement regimes common in high elevation fir and spruce ecosystems.

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Surface fire and mixed severity fire intervals were about 35-50yrs (Brown et al. 1994). Stand replacement fires occurred at intervals of 120-400yrs+ (Crane 1986; Barrett 1988; Bradley 1992a,b; Brown et al. 1994; Morgan et al. 1996). Likelihood of stand replacement fires increased with canopy closure and fuel ladders created by white fir growth, however ground fires acted as replacement fires during early stand development (class A).

Other disturbances included insect, disease, drought and wind and ice damage. Fire was by far the dominant disturbance agent.

Adjacency or Identification Concerns

This ecological system is often transitional between Fire Regime Group I and Fire Regime Groups II, IV, and V at higher elevations. Sites are dry/steep montane with a variety of aspects (often northerly) and soil conditions. In MZs 12 and 17, BpS 1051 is uncommon and should be included in BpS 1052.

This system includes mixed conifer/Populus tremuloides (aspen) stands. If aspen is present and soils show a clear organic layer, BpS 1061 Intermountain Basins Aspen-Mixed Conifer Forest and Woodland should be used.

Native Uncharacteristic Conditions

Scale Description

This BpS occurs in patches ranging from 100s to 1000s of acres.

Issues/Problems

Comments

This model was adopted with minor edits on species composition from the MZ16 version created by Mrk Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov) and Beth Corbin (ecorbin@fs.fed.us). Further review is needed to make sure this type is appropriately described for MZs 12 and 17 - especially species occurrence.

This model was originally coded as R2PSMEnr and was changed to R2PSMEms on 12/13/2004 by Lynn Bennett (lmbennett@fs.fed.us). This model was changed into BpS 1052 by Mark Loehen, Doug Page, Beth Corbin and Linda Chappell on 3/3/05. Reviewers of R2PSMEms were: Hugh Safford (hughsafford@fs.fed.us), Steve Barrett (sbarrett@mtdig.net), and Clinton K Williams (cwiliam03/@fs.fed.us).

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

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

Class A **10 %**

Early Development 1 All Structures

Indicator Species* and Canopy Position

ABCO	Upper
PICO	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	15 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 2

Description

Tree seedling-shrub-grass-forb. Succession to B after 30yrs unless replacement fire occurs (average FRI of 120yrs). Mixed severity fire (FRI of 50yrs) occurs but does not change the successional age.

Class B **30 %**

Mid Development 1 Closed

Indicator Species* and Canopy Position

ABCO	Upper
PICO	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	35 %	100 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 10

Description

Forest canopy closure is >35%. This class includes closed trees, sapling, large poles, grass and scattered shrubs. Composition is 75-100% white fir, some lodgepole pine, and spruces at higher elevations. Primary succession is to class E, the closed late development condition after 70yrs. Mixed severity fire (FRI of 47yrs) and wind/weather/stress every 200yrs on average will open the stand, thus causing a transition to class C. Insects/disease (50yrs mean return interval) cause minor mortality to this stage.

Class C **30 %**

Mid Development 1 Open

Indicator Species* and Canopy Position

ABCO	Upper
PICO	Upper
ABLA	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	35 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 8

Description

Forest canopy closure is <35%. Open pole-sapling/ grass scattered shrubs, maybe 90% white fir. This state will succeed to the closed mid-development condition (B) after 35yrs in the absence of fire (FRI of 40yrs on average). With fire, insect outbreaks (every 100yrs) and weather-related stress (every 1000yrs), the vegetation will become open late-development after 70yrs. Stand replacement fire occurs on average every 400yrs.

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Class D 20 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

ABCO	Upper
PIFL2	Upper
ABLA	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	35 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is <35%. Open large tree/ grass and scattered shrubs; potentially 90% white fir. Replacement fire occurs every 400yrs on average, whereas surface fire (FRI of 40yrs) maintains the open condition of the stand. Insects/disease every 100yrs also maintain the structure of the stand open. After 35yrs without fire, existing trees will fill out the stand and cause succession to the late closed condition (E).

Class E 10 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABCO	Upper
ABLA	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	35 %	100 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is >35%. Closed medium to large trees, scattered shrubs, 60-100% white fir. Replacement fire every 120yrs will remove the canopy, whereas mixed severity fire every 50yrs will return the stand to the open structure (D). Surface fire (FRI of 50yrs) will not affect the structure and age of trees. Occasional weather-related stress every 200yrs will open the structure of the stand and cause a transition to class D. Insect/diseases damage occurs every 50yrs (probability = .02) and most often (probability = .012) results in a transition to class D. Less frequently (probability = .008) insects/disease cause a transition to class C.

Disturbances

Fire Regime Group: I**

Historical Fire Size (acres)

Avg 100
Min 10
Max 1000

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	185	120	400	0.00541	18
Mixed	90			0.01111	37
Surface	72			0.01389	46
All Fires	33			0.03041	

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**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.

References

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710540 Southern Rocky Mountain Ponderosa Pine Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1 Julia H. Richardson jhrichardson@fs.fed.us **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Forest and Woodland

Map Zone
17

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

Dominant Species*
PIPO QUGA
ARTR2 PSSP6
SYOR
ARPA6

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
BpS is found on a few ranges in the Great Basin and Mojave Desert and southern Utah High Plateau.

Biophysical Site Description
These woodlands occur at the lower treeline/ecotone between grassland or shrubland and more mesic coniferous forests typically in warm, dry, exposed sites. Elevations range from <500m in British Columbia to 2800m in the NM mountains. Occurrences are found on all slopes and aspects, however, moderately steep to very steep slopes or ridgetops are most common. This ecological system generally occurs on igneous, metamorphic and sedimentary material derived soils, with characteristic features of good aeration and drainage, coarse textures, circumneutral to slightly acid pH, an abundance of mineral material, rockiness and periods of drought during the growing season.

Vegetation Description
Pinus ponderosa is the predominant conifer; Pinus monophylla, Pinus edulis and Juniperus spp may be present in the tree canopy. The understory is usually shrubby with Artemisia nova, Artemisia tridentata, Arctostaphylos patula, Arctostaphylos uva-ursi, Cercocarpus montanus, Cercocarpus ledifolius, Purshia stansburiana, Purshia tridentata, Quercus gambelii (eastern MZs 12 and 17), Symphoricarpos oreophilus, Prunus virginiana, Amelanchier alnifolia and Rosa spp. Common grass species include Pseudoroegneria spicata and species of Hesperostipa, Achnatherum, Festuca and Muhlenbergia. Pinus ponderosa/Arctostaphylos patula represents the extreme with a typically high percentage of rock and bare soil present.

Disturbance Description
These sites are in a Fire Regime Group I. Some portions of these sites are transition zones to Fire Regime Groups II and III. Frequent surface and mixed severity fires were the common fire regime characteristics

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

(Bradley 1992), with mixed severity being predominant (as in group III) due to the presence of shrubs with a MFRI of <35yrs. Surface fire intervals ranged from 10-50yrs, and replacement severity occurred at intervals of 150-400+yrs (Brown 2000; Crane 1986; Bradley 1992a; Bradley 1992b; Barrett 1988; Morgan et al 1996; Brown 1994). Stand replacement fires were generally restricted to the closed canopy forest and the stand initiation conditions. Topography (aspect, substrate depth, slope, position, etc.) exerted strong control over fire behavior producing spatially and temporally mixed severity regimes (personal communication, Stanley Kitchen, USFS).

Bark beettle outbreaks are highly related to stand density. Denser stands in relation to site capacity will favor outbreaks, which will decrease as trees are thinned.

Adjacency or Identification Concerns

This system intergrades with Rocky Mountain Ponderosa Pine Savanna (1117). They are distinguished by the high-frequency, surface-fire regime, less steep or rocky environmental setting, and more open grassy understory structure of the savanna system.

This ecological system is often transitional between non-forested areas or between Pinus ponderosa (at lower elevations) and Douglasfir/white fir//lodgepole pine at higher elevations. It is usually found on sites that are dry montane with a variety of slopes, aspects and soil conditions. If a large component of aspen is present, model BpS 1061 should be used.

Native Uncharacteristic Conditions

Scale Description

BpS is found throughout the Great Basin, although it is not common. Patch size is mostly 10-100ac with 1000ac less common.

Issues/Problems

Ponderosa pine woodlands and savannas should be better researched for the Great Basin. Many scattered PIPO patches in the Great Basin were completely logged during the mining era of 1850-1900 (eg, several 100ac in the Clover Mountains on the Great Basin-Mojave Desert boundary in eastern NV) and during the railroad construction era throughout the western US. It is also thought that the dominance of shrubs in understories is greater today than during pre-settlement because livestock grazing greatly reduced grasses in the southern portion of the Great Basin. Therefore, shrubby woodlands today may have been grassy savannas in the past.

Comments

This model was adopted from the MZ16 version created by Mark Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov), Beth Corbin (ecorbin@fs.fed.us), and Linda Chappell (lchappell@fs.fed.us).

This ecological system includes much of the dry Douglas/white fir and ponderosa pine ecosystems. Original model was Rapid Assessment model R2PPDFcp by Lynn Bennett (lmbennett@fs.fed.us) modified for BpS 1054. R2PPDFcp was reviewed by Stanley G. Kitchen (skitchen@fs.fed.us) and Clinton K. Williams (cwilliams03/@fs.fed.us).

This ecological system belongs both to FRG I and III (predominantly mixed severity, but with frequent fire as in FRG I).

Under dry site conditions, oak and chaparral vegetation will prevent stand closure from class C to B or from D to E.

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**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.

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

Vegetation Classes

Class A 10%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 5

Indicator Species* and Canopy Position

PIPO	Upper
QUGA	Upper
SYOR	Upper
ARPA6	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	60 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Openings with grass, shrub, and forbs created after replacement fire. May have seedlings of ponderosa pine or other species (eg, white fir). Succession to class C after 40yrs. Replacement fire every 100yrs.

Class B 9%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 5

Indicator Species* and Canopy Position

PIPO	Upper
PIMO	Mid-Upper
JUOS	Mid-Upper
ABCO	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	35 %	60 %
Height	Tree 0m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is 35% or greater. Closed pole-sapling/grass and shrubs. Shrub cover can be dense. Replacement fire occurs every 150yrs on average. Mixed severity fire (FRI of 25yrs) will open stand structure, thus causing a transition to class C. Surface fire is considered unlikely in dense stands with shrubs acting as fuel ladders. The stand will grow into a late successional closed state (class E) after 60yrs.

Class C 20%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Indicator Species* and Canopy Position

PIPO	Upper
ABCO	Upper
ARPA6	Low-Mid
PSSP6	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	35 %
Height	Tree 0m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is <35%. Open pole-sapling/grass and shrubs. Ponderosa pine dominates with white fir present. Replacement fire every 400yrs causes a transition back to class A, whereas surface fire (FRI of 25yrs) and mixed severity fire (FRI of 35yrs) maintain the open structure of the class. Without fire, the stand will transition to the closed condition (class B) after 25yrs. With fire, the stand grows into class D after 60yrs.

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**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.

Class D 60 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 9

Indicator Species* and Canopy Position

PIPO	Upper
ABCO	Upper
ARPA6	Low-Mid
PSSP6	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	35 %
Height	Tree 10.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is <35%. Open large trees/grass and shrubs. Ponderosa eventually outnumbers white fir due to insect/disease and difference in fire resistance. Rare transition to class A is caused by replacement fire every 400yrs. Surface fire (FRI of 20yrs) and mixed severity fire (FRI of 35yrs) maintain vegetation in class D indefinitely. Without fire for 50yrs, vegetation will close and transition to class E.

Class E 1 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

PIPO	Upper
PIMO	Mid-Upper
ABCO	Upper
JUOS	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	35 %	60 %
Height	Tree 25.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Forest canopy closure is 35% or greater. Closed large, trees, poles, saplings and shrubs. Replacement occurs every 150yrs on average. Mixed severity fire (FRI of 20yrs) and mountain pine beetle outbreaks (every 50yrs on average) will return vegetation to class D. This class is maintained indefinitely in the absence of disturbance.

Disturbances

Fire Regime Group: I**

Historical Fire Size (acres)

Avg 100
Min 1
Max 200

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	256	150	400	0.00391	6
Mixed	39			0.02564	39
Surface	28	10	50	0.03571	55
All Fires	15			0.06526	

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710550 Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland

☑ *This BPS is lumped with: 1056 (models are identical)*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1	Julia H. Richardson	jhrichardson@fs.fed.us	**Reviewer**
Modeler 2	Cheri Howell	chowell02@fs.fed.us	**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Forest and Woodland

Map Zone
17

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

Dominant Species*
ABLA
PIAL
PIFL2

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Subalpine forests the Great Basin (eastern CA, NV and UT).

Biophysical Site Description
Dry-mesic fir forest are the matrix forests of the subalpine zone, with elevations ranging from 2100-3355m (7000-11000ft). Sites within this system are cold year-round, and precipitation is predominantly in the form of snow, which may persist until late summer. Snowpacks are deep and late-lying, and summers are cool. Frost is possible almost all summer and may be common in restricted topographic basins and benches.

Vegetation Description
Subalpine fir forests comprise a substantial part of this subalpine forest, acompanied by Pinus albicualis and/or Pinus flexilis. The amount of Pinus in stands (and species occurance) depends on moisture limitations, some stands can be quite droughty. Populus tremuloides stands are common on early seral moist sites. Abies lasiocarpus increases in importance or replaces Picea engelmannii with increasing distance from the regions of MT and ID where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. Abies lasiocarpus can rapidly recolonize and dominate burned sites, or can succeed other species such as Pinus albicaulis, P. flexilis or Populus tremuloides. Old growth characteristics in Abies lasiocarpa forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

Disturbance Description
Fire Regime V. Primarily long-interval (eg, 150-200yr) stand replacement fires, with mixed severity fire (eg, 1000yr) occurring in open conditions. Disturbances also include insect/disease (every 100-150yrs) and windthrow events that thin younger closed stands.

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**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.

Adjacency or Identification Concerns

It is important not to confuse adjacent mountain sagebrush systems (BpS 1126 Inter-Mountain Basins Montane Sagebrush Steppe) with early development stages of this system. BpS 1156 may be imbedded in BpS 1055.

If aspen is present in large patches or if conifers are not coming in after ~30yrs, the BpS is probably misclassified and one of the Aspen types should be examined (BpS 1011 or 1061).

Native Uncharacteristic Conditions

Scale Description

Patch sizes vary but are mostly in the tens and hundreds of acres. There may be frequent small disturbances in the 10s of acres or less.

Issues/Problems

Comments

BpS 1056 and BpS 1055 for MZs 12 &17 shared the same model and were modified from BpS 1055 & 1056 for MZ16 to account for species differences (conifer dominance-ABLA). BpS 1056 for MZ16 was developed by Mark Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov), Linda Chappell (lchappell@fs.fed.us) and Beth Corbin (ecorbin@fs.fed.us).

BpS 1055 for MZ16 was based on modifications to the Rapid Assessment model R3SPFI on 2/24/05 by Pohl for LANDFIRE BpS modeling. The revised R3SFFI model was further modified on 3/3/05 in Cedar City and the late-development, open box deleted. Model and results for BpSs 1055 and 1056 are identical.

As a result of final QC for LANDFIRE National by Kori Blankenship the user-defined min and max fire return intervals forreplacement severity fire were deleted because they were not consistent with the modeled fire return interval for this fire severity type.

Vegetation Classes

Class A **35 %**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

FEID	Lower
PSSP	Lower
ABLA	Upper
PINUS	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	100 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Early succession after moderately long to long interval replacement fires. Within 40yrs, conifers will replace herbaceous vegetation and shrubs (succession to class B). Occasionally, a lack of seed source of conifer may maintain this condition (modeled as competition/maintenance). The average FRI for replacement fire is 200yrs.

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**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.

Class B 25 %

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABLA	Upper
PIAL	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Shade tolerant and mixed conifer saplings to poles (>40% canopy cover). Fir dominates, some pine is present, but showing signs of light competition stress. Canopy is dense. At 80yrs, this class succeeds to class D (late-development closed). Replacement fire will cause a transition to class A every 200yrs on average. Insects and disease may open up the canopy, causing a transition to class C (approximately 0.7% of the class per year). Dog-hair conditions in this state may maintain the mid-development closed condition.

Class C 5 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

ABLA	Upper
PIAL	Middle
PIFL2	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	45 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Primarily moderately tolerant saplings to poles (1-6.9in DBH) and <50% canopy cover of fir and pine that is intermediate or suppressed. At 80yrs, this condition succeeds to class D. Replacement fire (mean FRI of 200yrs) will cause a transition to class A. Mixed severity fires may occur on small portions of this class (approximately 0.1% per year) and maintain the mid-development open condition.

Class D 35 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABLA	Upper
PIAL	Low-Mid
PIFL2	Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree 10.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Pole and larger diameter moderately to shade tolerant conifer species (>45% canopy cover), in moderate to large size patches, all aspects. Fir dominates, pine is intermediate or suppressed/dying. This class will self-perpetuate if no disturbances cause a transition. Replacement fire will cause a transition to class A every 150yrs on average. Insects and disease will replace the stand every 100yrs on average.

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**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.

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: IV**

Historical Fire Size (acres)

Avg 100
Min 1
Max 1000

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	175			0.00571	85
Mixed	1000	1000	1000	0.001	15
Surface					
All Fires	149			0.00672	

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☑ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710560 Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland

☑ *This BPS is lumped with: 1055 (models are identical)*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1	Julia H. Richardson	jhrichardson@fs.fed.us	**Reviewer**
Modeler 2	Cheri Howell	chowell02@fs.fed.us	**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Forest and Woodland

Map Zone
17

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

Dominant Species*
ABLA
PIAL
PIFL2

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
Subalpine forests the Great Basin (eastern CA, NV and UT).

Biophysical Site Description
Elevations typically range from 8500-11000ft in the subalpine zone on gentle to moderately steep terrain (eg, 10-60% slope). These forests are found on gentle to very steep mountain slopes, high-elevation ridgetops and upper slopes, plateau like surfaces, basins, alluvial terraces, well-drained benches and inactive stream terraces. Drier sites may include lodgepole pine, and moister sites include Engelmann spruce and/or subalpine fir. Occurrences are typically found in locations with cold-air drainage or ponding, or where snowpacks linger late into the summer, such as north-facing slopes and high-elevation ravines. They can extend down in elevation below the subalpine zone in places where cold-air ponding occurs; northerly and easterly aspects predominate.

Vegetation Description
Subalpine fir forests comprise a substantial part of this type, accompanied by Pinus albicualis and/or Pinus flexilis. The amount of Pinus in stands (and species occurance) depends on moisture limitations, some stands can be quite droughty. Populus tremuloides stands are found on early seral conditions on moist sites. Abies lasiocarpus increases in importance or replaces Picea engelmannii with increasing distance from the regions of MT and ID where maritime air masses influence the climate. Fire is an important disturbance factor, but fire regimes have a long return interval and so are often stand-replacing. Abies lasiocarpus can rapidly recolonize and dominate burned sites, or can succeed other species such as Pinus albicaulis, P. flexilis or Populus tremuloides. Old growth characteristics in Abies lasiocarpa forests will include treefall and windthrow gaps in the canopy, with large downed logs, rotting woody material, tree seedling establishment on logs or on mineral soils unearthed in root balls, and snags.

*Dominant Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.
**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 V. Primarily long-interval (eg, 150-200yr) stand replacement fires, with mixed severity fire (eg, 1000yr) occurring in open conditions. Disturbances also include insect/disease (every 100-150yrs) and windthrow events than thin younger closed stands.

Adjacency or Identification Concerns

Generally higher elevation than Rocky Mountain Dry-Mesic Spruce Fir Forest and Woodland (BpS 1055), but may also be interspersed with it in more mesic microsites.

If aspen is present in large patches or if conifers are not coming in after ~30yrs, the BpS is probably misclassified and one of the Aspen types should be examined (BpSs 1011 or 1061).

Lodgepole pine does not occur in this PNVG south of 38 degrees 30 minutes (approximate).

Native Uncharacteristic Conditions

Scale Description

Patch sizes vary but are mostly in the tens and hundreds of acres. There may be frequent small disturbances in the 10s of acres or less.

Issues/Problems

As for MZ16, modelers were not convinced that enough of this BpS exists in MZs 12 and 17 to be mappable. The dry-mesic spruce-fir is more common and shares the same successional dynamics.

Comments

BpS 1056 and BpS 1055 for MZs 12 and 17 shared the same model and were modified from BpS 1055 & 1056 for mapping MZ16 to account for species differences (conifer dominance- ABLA). BpS 1056 for MZ16 was developed by Mark Loewen (mloewen@fs.fed.us), Doug Page (doug_page@blm.gov), Linda Chappell (lchappell@fs.fed.us) and Beth Corbin (ecorbin@fs.fed.us). BpS 1055 for MZ16 was based on modifications to R3SPFI on 2/24/05 by Pohl for LANDFIRE BpS modeling. The revised R3SFFI model was further modified on 3/3/05 in Cedar City and the late-development, open box deleted.

As a result of final QC for LANDFIRE National by Kori Blankenship the user-defined min and max fire return intervals for replacement severity fire were deleted because they were not consistent with the modeled fire return interval for this fire severity type.

Vegetation Classes

Class A **35%**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

FEID	Lower
PSSP	Lower
ABLA	Upper
PIAL	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0%	100%
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Early succession after moderately long to long interval replacement fires.

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

Within 40yrs, conifers will replace herbaceous vegetation and shrubs. Occasionally, a lack of seed source of conifer may maintain this condition (modeled as competition/maintenance). The average FRI for replacement fire is 200yrs.

Class B **25 %**

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABLA	Upper
PIAL	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Shade tolerant and mixed conifer saplings to poles (>40% canopy cover). Fir dominates, some pine is present, but showing signs of light competition stress, and canopy is dense.

At 80yrs, this class succeeds to E (late-development closed). Replacement fire will cause a transition to class A every 200yrs on average. Insects and disease may open up the canopy, causing a transition to class C (approximately 0.7% of the class per year). Dog-hair conditions in this state may maintain the mid-development closed condition.

Class C **5 %**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

ABLA
PIAL

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	45 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Primarily moderately tolerant saplings to poles (1-6.9in DBH) and <50% canopy cover of fir and pine that is intermediate or suppressed. .

At 80yrs, this condition succeeds to class D. Replacement fire (mean FRI of 200yrs) will cause a transition to class A. Mixed severity fires may occur on small portions of this class (approximately 0.1% per year) and maintain the mid-development open condition.

Class D **35 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABLA	Upper
PIAL	Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	45 %	100 %
Height	Tree 10.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

Pole and larger diameter moderately to shade tolerant conifer species (>50% canopy cover), in moderate to large size patches, all aspects. Fir dominates, pine is intermediate or suppressed/dying.

This class will self-perpetuate if no disturbances cause a transition. Replacement fire will cause a transition to class A every 150yrs on average. Insects and disease will replace the stand every 100yrs on average.

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 100
Min 1
Max 1000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	175			0.00571	85
Mixed	1000	1000	1000	0.001	15
Surface					
All Fires	149			0.00672	

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☑ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710570 Rocky Mountain Subalpine-Montane Limber-Bristlecone Pine Woodland

☑ *This BPS is lumped with: 1020 (models are identical)*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 2/23/2005

Modeler 1	Bruce Short	bshort@fs.fed.us	**Reviewer**
Modeler 2	Stan Kitchen	skitchen@fs.fed.us	**Reviewer**
Modeler 3	Linda Chappell	lchappell@fs.fed.us	**Reviewer**

Vegetation Type
Forest and Woodland

Map Zone
17

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

Dominant Species*
PILO
PIFL2

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
8000-11500ft on dry wind-swept ridges & exposed upper elevations of NV, UT, southern ID and eastern CA.

Biophysical Site Description
Elevation ranges from 8200-11500ft, mid to upper slopes. The areas are typically in rain shadows, and are the dry, cold extent of tree cover. Stands occur on thin, stony soils on high windswept ridges and open slopes with minimal ground cover.

Vegetation Description
This group contains some of the oldest trees in the area, with Pinus longaeva reaching 1000yrs+ and Pinus flexilis reaching ages of 500yrs+. Pinus longaeva and Pinus flexilis can exist separately or as mixed stands. There can be Picea engelmannii and limited Pseudotsuga menziesii in the stands. Sparse understories of forbs, grass and short shrubs form an understory. Seed dispersal of limber and bristlecone pines is highly dependent on seed-caching birds.

Disturbance Description
Understories are often sparse, with little to carry fires across the surface. Fire occurrence is typically low frequency and consists of surface fires (mean FRI of 200yrs). In the absence of wind, fires are likely limited in extent (2ac or less). Stand replacement fires (mean FRI of 500yrs) are usually wind-driven, especially in classes B and C. This type is susceptible to bark beetles (esp Pinus flexilis), but generally drought-tolerant.

Adjacency or Identification Concerns
BpS 161057 and 161020 models are identical, as they are ecologically similar and have very small coverage. The main difference is in the name of bristlecone species. This model will also be similar to

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**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.

systems in CO and the SW, although the bristlecone species is Pinus aristata there.

A new uncharacteristic disturbance is the introduction of white pine blister rust in both of these species. Blister rust is not occurring yet in the Utah High Plateau and western Great Basin.

Native Uncharacteristic Conditions

Scale Description

Stands vary from tens to thousands of acres in size. Stand replacement fires of 1/10th acres to 100s of acres have been experienced.

Issues/Problems

Comments

This model was taken as-is from the model for BpS 1057 from MZ16.

Vegetation Classes

Class A 20%

Early Development 1 All Structures

Indicator Species* and Canopy Position

PILO	All
PIFL2	All

Structure Data (for upper layer lifeform)

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

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Description

Bare ground and talus with sparse ground cover of forbs, grasses and low shrubs. Occasional old survivors may be present. Infrequent stand replacement fires (mean FRI of 500yrs). Surface fire (mean FRI of 200yrs) and weather-related stress affect this class, but without consequences to dynamics. Succession to class B after 100yrs.

Class B 20%

Mid Development 1 Open

Indicator Species* and Canopy Position

PILO	Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	21%	40%
Height	Tree 0m	Tree 5m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Description

Open woodland <40% crown closure of seedlings, saplings and survivors. The only disturbances are surface and replacement fires with the same FRIs as in class A. Succession to class C after 150yrs.

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Class C 60 %

Late Development 1 Open

Indicator Species* and Canopy Position

PILO Upper
PIFL2 Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	21 %	40 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 6

Description

Open woodland <40% crown cover of mixed diameters, ranging from seedling to 40in DBH. Sparse ground cover of grasses and low shrubs. Very old trees can develop in this class. Fire as in previous classes.

Class D 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Class E 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 5
Min 1
Max 1000

Sources of Fire Regime Data

☑ Literature
☑ Local Data
☐ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	500			0.002	29
Mixed					
Surface	200			0.005	71
All Fires	143			0.00701	

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

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710610 Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

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Modeler 3			**Reviewer**

Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

POTR
ABCO
ABLA
PIFL2

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range

This ecological system occurs on montane slopes and plateaus in UT, western CO, northern AZ, eastern NV, southern ID and western WY. Elevations range from 1700-2800m (5600-9200ft.).

Biophysical Site Description

Occurrences are typically on gentle to steep slopes on any aspect but are often found on clay-rich soils in intermontane valleys. Soils are derived from alluvium, colluvium and residuum from a variety of parent materials but most typically occur on sedimentary rocks.

Vegetation Description

The tree canopy is composed of a mix of deciduous and coniferous species, codominated by Populus tremuloides and conifers, including Abies concolor, Abies lasiocarpa, Picea engelmannii, Pinus flexilis and Pinus ponderosa. As the occurrences age, Populus tremuloides is slowly reduced until the conifer species become dominant. Common shrubs include Amelanchier alnifolia, Prunus virginiana, Symphoricarpos oreophilus, Juniperus communis, Paxistima myrsinites, Rosa woodsii, Spiraea betulifolia, symphoricarpos albus, or Mahonia repens. Herbaceous species include Bromus carinatus, Calamagrostis rubescens, Carex geyeri, Elymus glaucus, Poa spp and Achnatherum, Hesperostipa, Nassella and/or Piptochaetium spp (=Stipa spp), Achillea millefolium, Arnica cordifolia, Asteraceae spp, Erigeron spp, Galium boreale, Geranium viscosissimum, Lathyrus spp, Lupinus argenteus, Mertensia arizonica, Mertensia lanceolata, Maianthemum stellatum, Osmorhiza berteroi (=Osmorhiza chilensis) and Thalictrum fendleri.

Disturbance Description

This is a strongly fire adapted community, more so than BpS 1011 (Rocky Mountain Aspen Forest and Woodland), with FRIs varying for mixed severity fire with the encroachment of conifers. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal

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**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.

lightning season, yet evidence of fire scars and historical studies show that native burning was the only source of fire that occurred predominantly during the spring and fall. BpS 1061 has elements of Fire Regime Groups II, III and IV. Mean FRI for replacement fire is every 60yrs on average in all development classes, except during early development where no fire is present (as for stable aspen, BpS 1011). The FRI of mixed severity fire increases from 40yrs in stands <80yrs to 20yrs in stand >80yrs with conifer encroachment.

Under pre-settlement conditions, disease and insect mortality did not appear to have major impacts, however older aspen stands would be susceptible to outbreaks every 200yrs on average. We assumed that 20% of outbreaks resulted in heavy insect/disease stand-replacing events (average return interval 1000yrs), whereas 80% of outbreaks would thin older trees >40yrs (average return interval 250yrs). Older conifers (>100yrs) would experience insect/disease outbreaks every 300yrs on average.

Some sites are prone to snowslides, mudslides and rotational slumping. Flooding may also operate in these systems.

Adjacency or Identification Concerns

If conifers are not present in the landscape or represent <25% relative cover, the stable aspen model (BpS 1011; Rocky Mountain Aspen Forest and Woodland) should be considered, especially in western and central Nevada.

This type is more highly threatened by conifer replacement than stable aspen. Most occurrences at present represent a late-seral stage of aspen changing to a pure conifer occurrence. Nearly a hundred years of fire suppression and livestock grazing have converted much of the pure aspen occurrences to the present-day aspen-conifer forest and woodland ecological system.

Under current conditions, herbivory can significantly effect stand succession. Kay (1997, 2001a, b, c) found the impacts of burning on aspen stands were overshadowed by the impacts of herbivory. In the reference state the density of ungulates was low due to efficient Native American hunting, so the impacts of ungulates were low. Herbivory was therefore not included in the model.

Native Uncharacteristic Conditions

Scale Description

This type occurs in a landscape mosaic from moderate (10ac) to large sized patches (1000ac).

Issues/Problems

East of the Great Basin, Baker (1925) studied closely the pre-settlement period for aspen and noted fire scars on older trees. Bartos and Campbell (1998) support these findings. Results from Baker (1925) and Bartos and Campbell (1998) would apply to eastern NV and BpS 1061. We interpreted ground fires that scarred trees, probably started by Native Americans, as mixed severity fire that also promoted abundant suckering. In the presence of conifer fuel, these would be killed and aspen suckering promoted.

In previous models from the Rapid Assessment (eg, R2ASMClw), experts and modelers expressed different views about the frequency of all fires, citing FRIs longer than those noted by Baker (1925). The FRIs used here were a compromise between longer FRIs proposed by reviewers and the maximum FRI of Baker (1925).

Comments

BpS 1061 for MZs 12 and 17 is a compromise among the Rapid Assessment model R2ASMClw (aspen-mixed conifers low-mid elevation), BpS 1011 for MZs 12 and 17, and BpS 1061 for MZ16. BpS 1061 for

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

MZs 12 and 17 is approximately split into the age classes of R2ASMClw. The FRIs of replacement fire from BpS 1011 were used (60yrs). For mixed severity fire, the mean FRIs followed closely BpS 1061 for MZ16, except that 20yrs was used instead of 13yrs during periods of conifer encroachment. R2ASMClw was developed by Linda Chappell (lchappell@fs.fed.us), Bob Campbell (rbcampbell@fs.fed.us) and Cheri Howell (chowell02@fs.fed.us), and reviewed by Krista Gollnick-Wade/Sarah Heidi (Krista_Waid@blm.gov), Charles E. Kay (ckay@hass.usu.edu) and Wayne D. Shepperd (wshepperd@fs.fed.us). BpS 1061 for MZ16 was developed by Linda Chappell, Robert Campbell, Stanley Kitchen (skitchen@fs.fed.us), Beth Corbin (ecorbin@fs.fed.us) and Charles Kay.

As this type has a fairly short fire return interval compared to other aspen types, it should be noted that aspen can act as a tall shrub. Bradley, et al. (1992) state that Loope & Gruell estimated a fire frequency of 25-100yrs for a Douglas-fir forest with seral aspen in Grand Teton National Park (p39). They later state that fire frequencies of 100-300yrs appear to be appropriate for maintaining most seral aspen stands. In the Fontenelle Creek, Wyoming drainingage, the mean fire-free interval was estimated to be 40yrs. Fires in this area burned in a mosaic pattern of severities, from stand-replacement to low fires that scarred but did not kill the relatively thin-barked lodgepole pine on the site (p46).

Aspen stands tend to remain dense througout most of their life-span, hence the open stand description was not used unless it described conifer coverage during initial encroachment. While not dependent upon disturbance to regenerate, aspen was adapted to a diverse array of disturbances.

Vegetation Classes

Class A 14%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR5	Upper
SYOR2	Middle
RIBES	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Grass/forb and aspen suckers less than six feet tall. Generally, this is expected to occur 1-3yrs post-disturbance. Fire is absent and succession occurs to class B after 10yrs.

Class B 40%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR	Upper
SYOR2	Low-Mid
RIBES	Low-Mid

Structure Data (for upper layer lifeform)

	Min	Max
Cover	41 %	100 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Aspen saplings over six feet' tall dominate. Canopy cover is highly variable. Replacement fire occurs every 60yrs on average. Mixed severity fire (average FRI of 40yrs) does not change the successional age of these stands, although this fire consumes litter and woody debris and may stimulate suckering. Succession to class C after 30yrs.

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**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.

Class C 35 %

Mid Development 2 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR	Upper
SYOR2	Middle
RIBES	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	41 %	100 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Aspen trees 5-16in DBH. Canopy cover is highly variable. Conifer seedlings and saplings may be present. Replacement fire occurs every 60yrs on average. Mixed severity fire (mean FRI of 40yrs), while thining some trees, promotes suckering and maintains vegetation in this class. Insect/diseases outbreaks occur every 200yrs on average causing stand thinning (transition to class B) 80% of the time and causing stand replacement (transition to class A) 20% of the time. Conifer encroachment causes a succession to class D after 40yrs.

Class D 10 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

POTR	Upper
ABCO	Mid-Upper
ABLA	Mid-Upper
PIFL2	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	40 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Aspen dominate, making up ~80% of the overstory. Conifers which escape fire, or are the more fire resistant species, are present in the understory and will likely cause the progressive suppression of aspen. Mixed severity fire (20yr MFI) keeps this stand open, kills young conifers and maintains aspen (max FRI from Baker, 1925). Replacement fire occurs every 60yrs on average. In the absence of any fire for at least 100yrs, the stand will become closed and dominated by conifers (transition to class E).

Class E 1 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 10

Indicator Species* and Canopy Position

ABLA	Upper
ABCO	Upper
POTR	Mid-Upper
PIFL2	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	41 %	80 %
Height	Tree 5.1m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Conifers dominate at 100yrs+. Aspen over 16in DBH, uneven sizes of mixed conifer and main overstory is conifers (>50% of overstory). FRI for replacement fire is every 60yrs. Mixed severity fire (mean FRI of 20yrs) causes a transition to class D. Insect/disease outbreaks will thin older conifers (transition to class D) every 300yrs on average.

Disturbances

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

Fire Regime Group:** I

Historical Fire Size (acres)

Avg 10
Min 1
Max 100

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	68	50	300	0.01471	36
Mixed	39	10	50	0.02564	64
Surface					
All Fires	25			0.04036	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710620 Inter-Mountain Basins Curl-leaf Mountain Mahogany Woodland and Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/18/2005

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Vegetation Type

Upland Forest and Woodland

Map Zone

17

Model Zone

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

Dominant Species*

CELE3
ARTRV
PUTR2
SYMPH

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

The curlleaf mountain mahogany (Cercocarpus ledifolius var. intermontanus) community type occurs in the Sierra Nevada and Cascade Range to the Rocky Mountains from MT to northern AZ, and in Baja California and Mexico (Marshall 1995).

Biophysical Site Description

Curlleaf mountain mahogany (Cercocarpus ledifolius var. intermontanus) communities are usually found on upper slopes and ridges between 7000-10500ft elevation (NRCS, 2003), although northern stands may occur as low as 2000ft (Marshall, 1995). In western NV, curlleaf mountain mahogany may occur down to 5000ft or lower and is restricted to northwestern and especially northeastern aspects at drier, lower edge of range. Most stands occur on rocky shallow soils and outcrops, with mature stand cover between 10-55%. In the absence of fire, old stands may occur on somewhat deeper soils, with >55% cover.

Vegetation Description

Mountain big sagebrush is the most common codominant with curlleaf mountain mahogany, although chaparral species such as manzanita (Arctostaphylos patula), tobaccobrush (Ceanothus velutinus) and green ephedra (Ephedra viridis) often codominate on some sites. Curlleaf mountain mahogany is both a primary early succssesional colonizer rapidly invading bare mineral soils after disturbance and the dominant long-lived species. Where curlleaf mountain mahogany has reestablished quickly after fire, rabbitbrush (Chrysothamnus nauseosus) may co-dominate. Litter and shading by woody plants inhibits establishment of curlleaf mountain mahogany. Reproduction often appears dependent upon geographic variables (slope, aspect and elevation) more than biotic factors. Low sagebrush and black sagebrush are infrequently associated. Snowberry, Utah serviceberry and currant are present on cooler sites, with more moisture. Singleleaf pinyon, western juniper, Dougas-fir, red fir, white fir, Rocky Mountain juniper, Jeffrey pine and

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limber pine may be present, with <10% total cover. In old, closed canopy stands,understory may consist largely of prickly phlox (Leptodactylon pungens).

Disturbance Description

Fire: Curlleaf mountain mahogany does not resprout, and is easily killed by fire (Marshall 1995). Curlleaf mountain mahogany is a primary early succssesion colonizer rapidly invading bare mineral soils after disturbance. Fires are not common in early seral stages, when there is little fuel, except in chaparral. Replacement fires (mean FRI of 150-500yrs) become more common in mid-seral stands, where herbs and smaller shrubs provide ladder fuel. By late succession, two classes and fire regimes are possible depending on the history of mixed severity and surface fires. In the presence of surface fire (FRI of 50yrs) and past mixed severity fires in younger classes, the stand will adopt a savanna-like woodland structure with a grassy understory with spiny phlox and currant. Trees can become very old and will rarely show fire scars. In late, closed stands, the absence of herbs and small forbs makes replacement fires uncommon (FRI of 500yrs), requiring extreme winds and drought. In such cases, thick duff provides fuel for more intense fires. Mixed severity fires (mean FRI of 50-200yrs) are present in all classes, except the late closed one, and more frequent in the mid-development classes.

Ungulate herbivory: Heavy browsing by native medium-sized and large mammals reduces mountain mahogany productivity and reproduction (NRCS, 2003). This is an important disturbance in early and mid-seral stages, when mountain mahogany seedlings are becoming established. Browsing by small mammals has been documented (Marshall, 1995), but is relatively unimportant and was incorporated as a minor component of native herbivory mortality.

Avian-caused mortality: In western Nevada for ranges in close proximity to the Sierra Nevada, sapsuckers drilling of young curlleaf mountain mahogany has been observed to cause stand replacement mortility (personal communication, Christopher Ross, NV BLM).

Windthrow and snow creep on steep slopes are also sources of mortality.

Adjacency or Identification Concerns

Littleleaf mountain mahogany, Cercocarpus intricatus, is restricted to limestone substrates and very shallow soils in CA, NV and UT. It has similar stand structure and disturbance regime, so the curlleaf mountain mahogany model should be applicable to it.

Some existing curlleaf mountain mahogany stands may be in the big sagebrush PNVG, now uncharacteristic because of fire exclusion.

Native Uncharacteristic Conditions

Scale Description

Because these communities are restricted to rock outcrops and thin soils, stands usually occur on a small scale, and are spatially separated from each other by other communities that occur on different aspects or soil types. A few curlleaf mountain mahogany stands may be much larger than 100ac.

Issues/Problems

Data for the setback in succession caused by native grazing are lacking, but consistently observed by experts; in the model, only class A had a setback of -20 for native grazing, whereas no setback was specified for classes B and C, which do not have many seedlings.

Several fire regimes affect this community type. It is clear that being very sensitive to fire and very long-

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lived would suggest FRG V. This is true of late development classes, but younger classes can resemble more the surrounding chaparral or sagebrush communities in their fire behavior and exhibit a FRG IV. Experts had divergent opinions on this issue; some emphasized infrequent and only stand replacing fires whereas others suggested more frequent replacement fires, mixed severity fires and surface fires. The current model is a compromise reflecting more frequent fire in early development classes, surface fire in the late, open class, and infrequent fire in the late, closed class.

Comments

BpS 1062 for MZs 12 and 17 (additional modelers are Sandy Gregory, s50grego@nv.blm.gov, Julia Richardson, jhrichardson@fs.fed.us, and Cheri Howell, chowell@fs.fed.us) is based on one model modifications (and associated HRV) of BpS 1062 for MZ16 developed by Stanley Kitchen (skitchen@fs.fed.us) and Don Major (dmajor@tnc.org). Layout of VDDT model for BpS was corrected (switched class B and C). 1062 BpS 1062 for MZ16 was based on R2MTMA with moderate revisions to the original model. Current description is close to original. Original modelers were Michele Slaton (mslaton@fs.fed.us), Gary Medlyn (gmedlyn@nv.blm.gov) and Louis Provencher (lprovencher@tnc.org). Reviewers of R2MTMA were Stanley Kitchen (skitchen@fs.fed.us), Christopher Ross (c1ross@nv.blm.gov) and Peter Weisberg (pweisberg@cabnr.unr.edu).

Data from a thesis in NV and expert observations suggests some large mountain mahogany may survive less intense fires. Therefore, surface fires were added as a disturbance to late seral stages, but this is a more recent concept in curlleaf mountain mahogany ecology. Surface fires were assumed to occur on a very small scale, perhaps caused by lightning strikes.

An extensive zone of mixed mountain mahogany and pinyon pine exists in western NV and eastern CA, and perhaps elsewhere. This type was not incorporated into the model, and is probably more appropriately included in the pinyon pine model.

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

Vegetation Classes

Class A **10%**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

CELE3	Upper
ARTR2	Upper
CHRYS	Upper
SYMPH	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	55 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Curlleaf mountain mahogany rapidly invades bare mineral soils after fire. Litter and shading by woody plants inhibits establishment. Bunch grasses and disturbance-tolerant forbs and resprouting shrubs, such as snowberry, may be present. Rabbitbrush and sagebrush seedlings are present. Vegetation composition will affect fire behavior, especially if chaparral species are present. Replacement fire (average FRI of 500yrs), mixed severity (average FRI of 100yrs), and native herbivory (2 out every 100 seedlings) of seedlings all affect this class. Replacement fire and native herbivory will reset the ecological clock to zero. Mixed severity fire does not affect successional age. Succession to class C after 20yrs.

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Class B 10%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

CELE3	Upper
ARTR2	Mid-Upper
PUTR2	Mid-Upper
SYMPH	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	45 %
Height	Tree 5.1m	Tree 10m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☑ Upper layer lifeform differs from dominant lifeform.

Various shrub species typically dominate. However, under mixed severity fire disturbance various grass species may dominate.

Description

Young curlleaf mountain mahogany are common, although shrub diversity is very high. One out of every 1000 mountain mahogany are taken by herbivores but this has no effect on model dynamics. Replacement fire (mean FRI of 150yrs) causes a transition to class A. Mixed severity fire can result in either maintenance (mean FRI of 80yrs) in the class or a transition to Class D (mean FRI of 200yrs). Succession to class E after 90yrs.

Class C 15%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

CELE3	Upper
ARTR2	Low-Mid
CHRYS	Low-Mid
SYMPH	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	30 %
Height	Tree 0m	Tree 10m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Curlleaf mountain mahogany may co-dominate with mature sagebrush, bitterbrush, snowberry and rabbitbrush co-dominant. Few mountain mahogany seedlings are present. Replacement fire (mean FRI is 150yrs) will cause a transition to class A, whereas mixed severity fire (mean FRI of 50yrs) will thin this class but not cause a transition to another class. Native herbivory of seedlings and young saplings occurs at a rate of 1/100 seedlings but does not cause an ecological setback or transition. Succession to class B after 40yrs.

Class D 20%

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Indicator Species* and Canopy Position

CELE3	Upper
ARTR2	Low-Mid
PUTR2	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	30 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☑ Upper layer lifeform differs from dominant lifeform.

Various shrub species typically dominate. However, under mixed severity fire disturbance various grass species may dominate.

Description

Moderate cover of mountain mahogany. This class represents a combined Mid2-Open and Late1-Open cover and structure combination resulting from mixed severity fire in class C (note: the combined class results in a slightly inflated representation in the landscape). Further, this class describes one of two late-successional endpoints for curlleaf mountain mahogany that is maintained by surface fire (mean FRI of 50yrs). Evidence of

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**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.

infrequent fire scars on older trees and presence of open savanna-like woodlands with herbaceous-dominated understory are evidence for this condition. Other shrub species may be abundant, but decadent. In the absence of fire for 150yrs (2-3 FRIs for mixed severity and surface fires), the stand will become closed (transition to class E) and not support a herbaceous understory. Stand replacement fire every 300yrs on average will cause a transition to class A. Class D maintains itself with infrequent surface fire and trees reaching very old age.

Class E **45 %**

Late Development 1 Closed

Indicator Species* and Canopy Position

CELE3 Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	55 %
Height	Tree 10.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 8

Description

High cover of large shrub or tree-like mountain mahogany. Very few other shrubs are present, and herb cover is low. Duff may be very deep. Scattered trees may occur in this class. This class describes one of two late-successional endpoints for curlleaf mountain mahogany. Replacement fire every 500yrs on average is the only disturbance and causes a transition to class A. Class will become old-growth with trees reported to reach 1000yrs+.

Disturbances

Fire Regime Group: III**

Historical Fire Size (acres)

Avg 50
Min 1
Max 100

Sources of Fire Regime Data

☐ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	285	100	500	0.00351	24
Mixed	149	50	150	0.00671	47
Surface	238			0.00420	29
All Fires	69			0.01442	

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.

Additional Disturbances Modeled

☐ Insects/Disease
☐ Wind/Weather/Stress
☑ Native Grazing
☐ Competition
☐ Other (optional 1)
☐ Other (optional 2)

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710640 Colorado Plateau Mixed Low Sagebrush Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 2/24/2005

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Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*

ARNO4	BOGR2
ARBI3	HECO26
ACHY	PLJA
ARPU9	ERIOG

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
BpS occurs in the Colorado Plateau, Tavaputs Plateau and Uinta Basin. Also extends across northern NM into the southern Great Plains.

Biophysical Site Description
Occurs in canyons, gravelly draws, hilltops and dry flats at elevations below 1800m. Soils are often rocky, shallow and alkaline. Found on limestone ridges in northern NM and southern Great Plains. Black sagebrush (Artemisia nova) tends to grow where either a calcareous or volcanic cement layer exists in the soil profile.

Vegetation Description
Open shrublands dominated by Artemisia nova or Artemesia bigelovii sometimes with Artemesia tridentata spp. wyomingensis co-dominant. Generally have relatively low fuel loads with low growing and cushion forbs and scattered semi-arid grasses such as Achnatherum hymenoides, Aristida purpurea, Boutela gracilis, Hesperostipa comata, Pleuraphis jamesii or Poa fendleriana. Graminoid layer will often have >25% cover. Forbs often include buckwheats (Eriogonum spp), fleabanes (Erigeron spp), phloxs (Phlox spp), paintbrushes (Castilleja spp), globemallows (Sphaeralcea spp) and lupines (Lupinus spp).

Disturbance Description
Black sagebrush generally supports more fire than other dwarf sagebrushes. This type generally burns with mixed severity (average FRI of 100-140yrs) due to relatively low fuel loads and herbaceous cover. Bare ground acts as a micro-barrier to fire between low statured shrubs. Oils and resins present in the foliage and stems of sagebrush allow fire to spread. Stand-replacing fires (average FRI of 200-240yrs) can occur in this type when successive years of above average precipitation are followed by an average or dry year. Stand replacement fires dominate in the late successional class where the herbaceous component has diminished.

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

Fires may or may not be wind driven and only cover small areas. This type fits into Fire Regime Groups IV and III.

Grazing by wild ungulates occurs in this type due to the high palatability of A. nova compared to other browse. Native browsing tends to open up the canopy cover of shrubs but does not often change the successional stage.

Prolonged drought may reduce the foliar and basal covers of graminoids but not that of shrubs. Reduced foliar cover of graminoids will affect fire behavior. This effect is assumed minor and not included in the model.

Adjacency or Identification Concerns

The dwarf sagebrush type tends to occur adjacent to Wyoming big sagebrush. The dwarf sagebrush types create a mosaic within the Wyoming big sagebrush, acting as a fire break that burns only under severe conditions.

Native Uncharacteristic Conditions

Scale Description

Disturbance patch size for this type is not well known but is estimated to be 10s to 100s of acres due to the relatively small proportion of the sagebrush matrix it occupies and the limited potential for fire spread.

Issues/Problems

Comments

The model for this BpS and description were largely based on the Rapid Assessment PNVG R2SBDW developed by Sarah Heide (Sarah_Heide@blm.gov) and Gary Medlyn (gmedlyn@nv.blm.gov) for dwarf sagebrushes. Reviewers of R2SDDW were Michael Zielinski (mike_zielinski@nv.blm.gov), Gary Back (gback@srk.com) and Paul Tueller (ptt@intercomm.com).

Vegetation Classes

Class A **10 %**

Early Development 1 All Structures

Upper Layer Lifeform

- ☑ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

ACHY	Lower
BOGR2	Lower
ARNO4	Upper
ARBI3	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	50 %
Height	Herb 0m	Herb >1.1m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Scattered sagebrush recovering. Dominant vegetation is bunch grasses.

Description

Early seral community dominated by herbaceous vegetation; less than six percent sagebrush canopy cover; up to 24yrs post-disturbance. Replacement fire occurs every 250yrs on average. Succession to B after 24yrs.

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**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.

Class B 70 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARNO4	Upper
ARBI3	Upper
ACHY	Lower
BOGR2	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	10 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mid-seral community with a mixture of herbaceous and shrub vegetation; 6-10% sagebrush canopy cover present; between 20-59yrs post-disturbance. Replacement fire (FRI of 240yrs) causes a transition to A, whereas mixed severity fire (FRI of 100yrs) maintains the site in its present condition. In the absence of fire for 120yrs, the site will follow an alternative successional path to class C. Otherwise, succession and mixed severity fire keeps site in class B.

Class C 20 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARNO4	Upper
ARBI3	Upper
ACHY	Lower
BOGR2	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	25 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Late seral community with a mixture of herbaceous and shrub vegetation; >10% sagebrush canopy cover present; 75yrs+ post-disturbance. Replacement fire is every 200yrs on average (transition to A), whereas mixed severity fire happens on average every 140yrs due to a diminished herbaceous component compared to class B. Mixed severity fire causes a transition to B. Succession will keep the site in class C without fire.

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.

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

Description

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 50
Min 10
Max 100

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	238	100	240	0.00420	33
Mixed	119	75	140	0.00840	67
Surface					
All Fires	79			0.01262	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

References

Blackburn, W.H. and P.T. Tueller. 1970. Pinyon and juniper invasion in black sagebrush communities in east-central Nevada. Ecology 51(5): 841-848.

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Young, J.A. and D.E. Palmquist. 1992. Plant age/size distributions in black sagebrush (Artemisa nova): effects on community structure. Great Basin Naturalist 52(4): 313-320.

Zamora, B. and P.T. Tueller. 1973. Artemisia arbuscula, A. longiloba, and A. nova habitat types in northern Nevada. Great Basin Naturalist 33: 225-242 .

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710790 Great Basin Xeric Mixed Sagebrush Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1	Crystal Kolden	ckolden@gmail.com	**Reviewer**	Mike Zielinski	mike_zielinski@nv.blm.gov
Modeler 2	Gary Medlyn	gmedlyn@nv.blm.gov	**Reviewer**		
Modeler 3			**Reviewer**		

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
ARNO4
ACHY
ACTH7
PSSP6

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
Western UT, eastern/central/northern NV.

Biophysical Site Description
This type describes black sage and low sagebrush, mostly on convex slopes with Wyoming sagebrush and basin big sagebrush occurring in concave slopes and inset alluvial fans. Great Basin alluvial fans, piedmont, bajadas, rolling hills and mountain slopes. Can also be found on flats and plains. Other species include horsebrush, spiny hopsage and rubber rabbitbrush, although these are mostly associated with Wyoming and basin big sagebrush areas. Low/green rabbitbrush is associated with black sagebrush, as well as shadscale. Elevations range from 1500-2600m. Low sagebrush tends to grow where claypan layers exist in the soil profile and soils are often saturated during a portion of the year. Black sagebrush tends to grow where there is a root-limiting layer in the soil profile. Wyoming sagebrush and basin big sagebrush generally occur on moderately deep to deep soils that are well-drained.

Vegetation Description
This type includes communities dominated by black sagebrush (Artemisia nova), low sagebrush (Artemisia arbuscula) and Wyoming sagebrush (Artemisia tridentata spp. wyomingensis) where there is a potential for pinyon (Pinus monophylla) and/or juniper (Juniperus osteosperma) establishment. Black sagebrush is the dominant shrub in this system with Wyoming big sagebrush and basin big sagebrush occurring in minor compositions, sometimes scattered but mostly continuous. Black sagebrush generally has relatively low fuel loads with low growing and cushion forbs and scattered bunch grasses such as bluebunch wheatgrass (Pseudoroegneria spicata), needlegrasses (Achnatherum spp), Sandberg's bluegrass (Poa secunda) and Indian ricegrass (Achnatherum hymenoides). Forbs often include buckwheats (Eriogonum spp), fleabanes (Erigeron spp), phloxs (Phlox spp), paintbrushes (Castilleja spp), globemallows (Sphaeralcea spp) and

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**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.

lupines (Lupinus spp).

Disturbance Description

Black sagebrush generally supports more fire than other dwarf sagebrushes. This type generally burns with mixed severity (average FRI of 100-140yrs) due to relatively low fuel loads and herbaceous cover. Bare ground acts as a micro-barrier to fire between low statured shrubs. Stand-replacing fires (average FRI of 200-240yrs) can occur in this type when successive years of above average precipitation are followed by an average or dry year. Stand replacement fires dominate in the late successional class where the herbaceous component has diminished or where trees dominate. This type fits best into Fire Regime Group IV.

Grazing by wild ungulates occurs in this type due to it's high palatability (mostly for A. nova and A. arbuscula). Native browsing tends to open up the canopy cover of shrubs but does not often change the successional stage. Native grazing was not included in the model.

Severe drought occurs on average every 200yrs and causes two equally probably transitions: moderate thinning of the stand (maintaining conditions in the current class), or severe thinning (causing a transition to the previous development class).

Burrowing animals and ants breaking through the root restrictive zone of low and black sagebrush types create mounds of mineral soil (seedbed) that is readily colonized by big sagebrush. Burrowing creates small patches (i.e., generally less than 200 sq. ft) of big sagebrush in the low sagebrush types, which could affect fuel loads. This was not considered in the model.

Adjacency or Identification Concerns

The black and low sagebrush type tends to occur adjacent to either Wyoming big sagebrush or basin big sagebrush types. The Wyoming big sagebrush and basin big sagebrush types create a mosaic within the black and low sagebrush types. These big sagebrush types have a different fire regime that acts to carry the fire, with black and low sagebrush serving as fire breaks most of the time.

After mixed- or low-severity fires, composition is primarily islands of black sagebrush with interspaces dominated by low rabbitbrush that resprouts, and with time, increases of shadscale and herbaceous composition.

Native Uncharacteristic Conditions

Scale Description

Black sagebrush can occupy extremely large areas (>100000ac) in eastern NV and western UT. Occurrences are typically smaller towards western NV. Disturbance patch size for this type is not well known but is estimated to be 10s to 100s of acres due to the relatively small proportion of the sagebrush matrix it occupies and the limited potential for fire spread. Where these sites exist in a more herbaceous state, fire expands readily where there is continuity of fine fuel to carry it to the extent that there is wind in a low intensity burn. Fire sizes up to 800ac are possible in situations like this.

Issues/Problems

The effect of insect outbreaks (independent of drought) on mature pinyon and juniper in class D can cause a 50% reduction in class D (from 10 to 5%) if part or all of the outbreak sufficiently thins older trees (transition to class C). We assumed that 25% of outbreaks results in a transition to class C from D.

Comments

BpS 1079 was originally based on the Rapid Assessment model R2SBDW (dwarf sagebrush) developed by

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**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.

Gary Medlyn (gmedlyn@nv.blm.gov) and Sarah Heidi (sarah_heidi@blm.gov). Following expert review, choice of model was switched to R2SBDWwt (dwarf sagebrush with trees) developed by Gary Medlyn and Sarah Heidi because the NatureServe description includes pinyon and juniper encroachment and the appropriate elevation. Also, the reviewer indicated that black sagebrush is usually associated with juniper or pinyon in northcentral NV and recommended the version of the model with tree encroachment. Modifications were made to weather stress pathways and probabilities for R2SBDWwt. R2SBDW was reviewed by Paul Blackburn (paul.blackburn@usda.gov), Gary Back (gback@srk.com) and Paul Tueller (ptt@intercomm.com), whereas R2SBDWwt was reviewed by Paul Tueller.

Vegetation Classes

Class A 15%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PSSP6	Middle
POSE	Low-Mid
ACHY	Middle
ACTH7	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant lifeform is primarily herbaceous with some resprouting rabbitbrush. Canopy cover 4-10%, height 18-36cm (0.2-0.4m).

Description

Early seral community dominated by herbaceous vegetation; less than six percent sagebrush canopy cover; up to 24yrs post-disturbance. Fire-tolerant shrubs (green/low rabbitbrush) are first sprouters after stand-replacing, high-severity fire. Replacement fire (mean FRI of 250yrs) maintains vegetation in state A. Prolonged drought every 200yrs on average maintains vegetation in class A. Succession to B after 25yrs.

Class B 60%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

ARNO4	Upper
POSE	Lower
ACHY	Mid-Upper
PSSP6	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	25 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Mid-seral community with a mixture of herbaceous and shrub vegetation; 6-25% sagebrush (sagebrush/brush) canopy cover present; between 20-59yrs post-disturbance. Drought every 200yrs causes two transitions: 50% of times drought thins shrubs while maintaining vegetation in class B, whereas 50% of times drought causes a stand replacing event. Replacement fire (FRI of 250yrs) causes a transition to A, whereas mixed severity fire (FRI of 100yrs) maintains the site in its present condition. In the absence of fire for at least 120yrs, the site will follow an alternative successional path to C. Otherwise, succession and mixed severity fire keeps site in class B.

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**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.

Class C 15 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARNO4	Upper
JUOS	Upper
PSSP6	Mid-Upper
ACHY	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	5 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform.

Juniper, and maybe pinyon, overtopping shrubs. Tree cover <6%. Shrub canopy cover may reach 25%

Description

Late seral community with a mixture of herbaceous and shrub vegetation; 10-25% sagebrush canopy cover present; and dispersed conifer seedlings and saplings established at less than six percent cover. Insects attack the vegetation in this state every 60yrs on average, but does not causes a transition to another state. Severe droughts (return interval of 200yrs) causes two thinning disturbances: to class B (50% of times) and within class C. Replacement fire is every 200yrs on average, whereas mixed severity fire is less frequent than in class B (FRI of 130yrs). Succession is to class D after 75yrs.

Class D 10 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOS	Upper
PIMO	Upper
ARNO4	Middle
ACHY	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	6 %	40 %
Height	Tree 0m	Tree 10m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Late seral community with a closed canopy of conifer trees (6-40% cover). The degree of tree canopy closure differs depending on whether it is a low sagebrush (max 15%) or black sagebrush (max 40%) community. In low sagebrush communities a mixture of herbaceous and shrub vegetation with >10% sagebrush canopy cover would still be present. In black sagebrush communities the herbaceous and shrub component would be greatly reduced (<1%). When Ips beetle outbreaks occur the pinyon component is reduced (return interval of 60 yrs): 75% of times thinning is not intense enough to cause a transition whereas in 25% of cases a transition to class C will occur. The only fire is replacement (FRI of 150yrs) and driven by a greater amount of woody fuel than in previous states. Prolongued droughts have the same effect as before. Sucession from class D to D without fire.

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

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

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 50
Min 1
Max 2000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	227	100	250	0.00441	37
Mixed	133	75	140	0.00752	63
Surface					
All Fires	84			0.01193	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

References

Blackburn, W.H. and P.T. Tueller. 1970. Pinyon and juniper invasion in black sagebrush communities in east-central Nevada. Ecology 51(5): 841-848.

NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

Ratzlaff, T.D. and J.E. Anderson. 1995. Vegetal recovery following wildfire in seeded and unseeded sagebrush steppe. Journal of Range Managenent 48: 386-391.

USDA-NRCS 2003. Ecological site descriptions for Nevada. Technical Guide Section IIE. MLRAs 28B, 28A, 29, 25, 24, 23. Available online: http://esis.sc.egov.usda.gov/Welcome/pgESDWelcome.aspx.

Young, J.A. and D.E. Palmquist. 1992. Plant age/size distributions in black sagebrush (Artemisa nova): effects on community structure. Great Basin Naturalist 52(4): 313-320.

Zamora, B. and P.T. Tueller. 1973. Artemisia arbuscula, A. longiloba, and A. nova habitat types in northern Nevada. Great Basin Naturalist 33: 225-242.

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710800 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** 3/17/2005

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Modeler 2	Gary Medlyn	gmedlyn@nv.blm.gov	**Reviewer**
Modeler 3	Crystal Kolden	ckolden@gmail.com	**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
ARTRW ATCO
CHVI8 ELELE
ACHY
HECO26

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This ecological system is found in eastern CA, central NV and UT and is distinct from sagebrush steppe (Inter-Mountain Basins Big Sagebrush Steppe) found on the Columbia Plateau and in WY.

Biophysical Site Description
This widespread system is common to the Basin and Range province. In elevation it ranges from 3000-7000ft (above 4000ft at lower latitudes), and occurs on well-drained soils on foothills, terraces, slopes and plateaus. It is found on soil depths >18in and up to 60in+. Elevationally it is found between low elevation salt desert shrub and mountain big sagebrush zones where pinyon and juniper can establish. Occurs from 4-14in precipitation zones, however, Wyoming big sagebrush requires 8-12in of effective moisture within this broader range. Thus, other sites characteristics (eg, aspect, drainage) should be considered in identifying this ecotype. At the precipitation extremes, this system generally occurs as small patches and stringers.

Vegetation Description
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. Rubber rabbitbrush is co-dominant.

Perennial forb cover is usually <10% with perennial grass cover reaching 20-25% on the more productive sites. Bluebunch wheatgrass may be a dominant species following replacement fires and as a co-dominant after 20yrs, but only in precipitation zones >10in. Bottlebrush squirreltail and Indian ricegrass are common on more xeric sites. Percent cover and species richness of understory are determined by site limitations. Pinyon (generally Pinus monophyla) and juniper (generally Juniper osteosperma) are present, occasionally reaching 90% canopy cover in areas that have escaped fire. Wyoming big sagebrush semi-desert is critical

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**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.

habitat for the greater sage grouse and many sagebrush obligates.

For MZs 12 and 17: In more xeric zones in central NV, basin big sagebrush is dominant with rabbitbrush co-dominant and shadscale sub-dominant. On the sodic sites, greasewood may also co-dominate, with spiny hopsage (Grayia spinosa). Shrub cover in these regions is reduced compared to more mesic sites, with the herbaceous understory consisting of Indian rice grass, bottlebrush squirreltail and Great Basin wildrye (Elymus elymoides).

Disturbance Description

This ecological system is characterized by replacement fires where shrub canopy exceeds 25% cover (ie, class C) or where grass cover is >15% and shrub cover is >20% (ie, class B). Mixed severity fires account for 20% of fire activity (mean FRI of 500yrs) where shrub cover ranges from 10-20% (ie, class B). Surface fires occur where shrub cover is <10% (ie, class A) and is generally uncommon (FRI of 200yrs). Where pinyon or juniper has encroached after 100yrs without fire, mean FRI of fire replacement increases from 100 to 125yrs. In MZs 12 and 17, reduced shrub cover associated with more xeric sites pushes FRI to longer periods.

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

Weather stress: 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 300yrflood events). In years with high winter precipitation, flooding (ie, soil saturation for extended periods) results in mortality and die-back.

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

Adjacency or Identification Concerns

Identification concerns include instaces of low-statured Wyoming big sagebrush due to reduced effective rooting zone. Low-statured Wyoming big sagebrush can be confused with black sagebrush (BpS 1079) from a distance or satellite.

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 cheatgass 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 comumunity 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.

Post-settlement issues center around the high amount of big sagebrush with minimal to no understory, and whether these decadent stands are related to fire suppression or natural physiological/ecological progression.

Native Uncharacteristic Conditions

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

Scale Description

BpS can occupy vast areas (>100000ac). Historic disturbance (fire) likely ranged from small (<10ac) to large (>10000ac) depending on conditions, time since last ignition and fuel loading. The average patch size is assumed to be 250ac.

Issues/Problems

This ecological system represents the merging of basin big sagebrush (R2SBBB) and all Wyoming big sagebrush ecological systems from the Rapid Assessment: R2SBWY and R2SBWYwt. The NatureServe description of Intermountain Basins Big Sagebrush Shrubland (BPS 1080) includes both Artemesia tridentata spp. tridentata AND Artemesia tridentata spp. wyomingensis. Evaluation of plot-level data was of limited use as no distinction was made between big sagebrush types. 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.

Comments

This ecological system is closely based on 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 (e.g., lower elevation), the Historic Range of Natural Variability for classes A, B, and C, respectively, is 10%, 55%, and 35% (results of R2SBWY).

NOTE regarding depleted sagebrush: Late seral stage was not modeled as it was identified that sagebrush depletion rate is much slower than the rate of juniper invasion. Further, sagebrush systems are unable to exclude grass/forb so they can maintain fire, which can move the system back to earlier classes.

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.

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

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Class A 15 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

ACHY	Upper
HECOC8	Upper
CHVI8	Upper
ARTRW8	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	10 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Early development is dominanted by grasses and forbs with scattered shrubs representing <10% upper canopy cover.

Description

Post-replacement disturbance; grass dominated with scattered shrubs. Fuel loading discontinuous. Surface fire occurs every 200yrs on average but has no effect on succession. Succession to class B after 20yrs.

Class B 50 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTRW8	Upper
ACHY	Lower
CHVI8	Mid-Upper
HECO26	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	25 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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 (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

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTRW	Upper
CHVI8	Mid-Upper
ELEL5	Lower
HECO26	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	26 %	35 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ 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.

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Class D 5%

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUNIP	Upper
PIMO	Upper
ARTRW8	Mid-Upper
HECO26	

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	15%
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☑ Upper layer lifeform differs from dominant lifeform.

Shrubs may still represent the dominant lifeform with pinyon and juniper saplings common (1-15% upper canopy cover).

Description

Pinyon-juniper encroachment where disturbance has not occurred for at least 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 125yrs 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.

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	16%	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%) where disturbance does not occur for at least 50yrs in Class D. Shrub cover <10% and graminoids scattered. Replacement fire occurs every 125yrs on average. Prolonged drought thins trees, causing a transition to class B. In the absence of disturbance class E maintains itself.

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

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.

Additional Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**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.

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710810 Inter-Mountain Basins Mixed Salt Desert Scrub

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

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Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
ATCO
PIDE4
KRLA2
ELEL5

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Great Basin; OR, ID, UT, NV, CA and Colorado Plateau. This ecological system occupies sites west of the Wasatch Mountains, east of the Sierras, south of the Idaho batholith and north of the Mojave Desert.

Biophysical Site Description
This type occurs from lower slopes to valley bottoms ranging in elevation from 3800-6500ft. Soils are often alkaline or calcareous. Soil permeability ranges from high to low, with more impermeable soils occurring in valley bottoms. Water ponds on alkaline bottoms. Texture is variable becoming finer toward valley bottoms. Many soils are derived from alluvium. Average annual precipitation ranges from 3-10in, however, this system is in 5-8in of effective moisture within this broader range. Thus, other sites characteristics (eg aspect, drainage and soil type) should be considered in identifying this ecotype. At the precipitation extremes, this system generally occurs as small patches and stringers. Summers are hot and dry with many days reaching 100 degrees F. Spring is the only dependable growing season with moisture both from winter and spring precipitation. Cool springs can delay the onset of plant growth and drought can curtail the length of active spring growth. Freezing temperatures are common from November through April.

This group generally lies above playas, lakes and greasewood communities. Both to the north and up slope it is bordered by low elevation big sagebrush groups, commonly ARTRWY, ARAR8 and ARNO4 communities. To the south this group is bordered by Mojave Desert transition communities.

Vegetation Description
This ecological system includes low (<3ft) and medium-sized shrubs found widely scattered (often 20-30ft apart) to high density (3-5 plants per sq m) shrubs interspersed with low to mid-height bunch grasses.

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Common shrubs are shadscale, winterfat, budsage, Nevada ephedra, horsebrush, low rabbitbrush, broom snakeweed and spiny hopsage. Shrub dominance is highly dependant on the site. Some of these shrubs will be present. Common bunch grass species are Indian ricegrass, needle-and-thread, purple three-awnand bottlebrush squirreltail and where monsoonal influences are present you will find common rhizomatous/sod forming grasses such as galleta grass, sand dropseed and blue grama. Globe mallows are the most common and widespread forbs. The understory grasses and forbs are salt-tolerant, not particularly drought tolerant and are variably abundant. The relative abundance of species may vary in a patchwork pattern across the landscape in relation to subtle differences in soils (eg, sand sheets or other surface textural differences) and reflect variation in disturbance history. Total cover rarely exceeds 25% and annual precipiation is closely linked to prior 12 months precipitation. Stand replacing disturbances (insects, extended wet periods and drought) shift dominance between shrub and grass species. Following drought coupled with insect infestations, the system will tend more toward Class C (bud sagebrush).

Disturbance Description

Disturbance was unpredictable. But flooding, drought and insects may all occur in these systems. Fire was very rare. For the model, extended wet periods occurred every 55yrs (30-80yrs), and drought periods occurred every 55yrs (30-80yrs).

Documented Mormon cricket/grasshopper outbreaks since settlement have corresponded with drought; outbreaks cause shifts in composition amongst dominant species, but do not typically cause shifts to different seral stages. Therefore insect disturbance was not modeled. During outbreaks Mormon crickets prefer open, low plant communities. Herbaceous communities and the herbaceous component of mixed communities were more susceptible to cricket grazing.

Fire was rare and limited to more mesic sites (and moist periods) with high grass productivity. Mixed severity fire with mean FRI of 1000yrs (for the model).

Extended wet periods tended to favor perennial grass development, while extended drought tended to favor shrub development. Shrubs, however, were always dominant.

Native American manipulation of salt desert shrub plant communities was minimal. Grass seed may have been one of the more important salt desert shrub crops. It is unlikely that native Americans manipulated the vegetation to encourage grass seed.

Adjacency or Identification Concerns

This ecological system contains the typical Great Basin salt desert shrub communities. Salt desert shrub communities are varied and the current model and description capture the most typical. Salt desert shrub is also common in the Wyoming big sagebrush community and there is some species overlap.

A wide range of salt desert shrubs can occur in this group. Two important types that were not included in the list of BpSs are winterfat (KRLA2) and Atriplex gardneri (Gardner's or sickle saltbush) (ATGA). Winterfat forms vast, homogeneous, and low-statured communities on silty soils resembling gray golf courses. Winterfat is critical to wildlife and livestock because it is more palatable than alfalfa and typically the only forage available during the winter. Gardner's saltbush resembles shadscale (thus BpS 1081) but form extensive and distinctive communities endemic to the Great Basin.

A drier site of mixed salt desert would include fourwing salthbush, which is usually not found within the shadscale community. The same model would apply with perhaps longer recovery times.

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**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.

NOTE for MZs 12 and 17:
Where the BpS 1081 community is adjacent to a black sage or Wyoming big sage that has burned, these communities are often replaced by shadscale community at lower elevation. Further, these sites generally don't have budsage and winterfat, however, the temporal nature of this condition is unknown. In rare occurrences shrub dominance can also shift.

Indian ricegrass can dominate sites with sandy surface textures, however, the temporal nature of this condition is unknown.

Upland salt desert shrub communities are easily invaded and, in the short term at least, replaced by cheatgrass. Other nonnative problematic annuals include halogeton, Russian thistle and several mustards. Through central UT and east central NV this group is susceptible to invasion by squarerose knapweed. More mesic areas can be invaded by tall whitetop and hoary cress. All three are noxious weeds in Great Basin states.

Native Uncharacteristic Conditions

Scale Description

BpS 1081 forms vast communities easily >100000ac in valley bottoms. Disturbance scale was variable during pre-setlement. Droughts and extended wet periods could be region wide, or more local. A series of high water years or drought could affect whole basins.

Most fires were rare and <1ac, but may exceed hundreds of acres with a good grass crop.

Issues/Problems

Comments

BpS 1081 for MZs 12 and 17 was modified from BpS 1081 for MZ16. 1) Pinyon-juniper steppe was removed as potential adjacent type in vegetation description. 2) The model was clearly defined following the dynamics of shadscale and bud sagebrush where mortality of shadscale in class B causes a transition to bud sagebrush dominant class C for a short period before abundant shadscale seed allow the return to class B. 3) In this revised model it is not possible to have an alternate succession from class A to C.

BpS 1081 for MZ16 was initially based on R2SDSH. Greasewood box was removed from R2SDSH by Jolie Pollet, Annie Brown and Stanley Kitchen to build BpS 1081 for MZ16. The model was greatly simplified at this time. Original descriptions by Bill Dragt were kept. Reviewers of R2SDSH were Stanley Kitchen (skitchen@fs.fed.us), Mike Zielinski (mike_zielinski@nv.blm.gov) and Jolie Pollet (jpollet@blm.gov).

Vegetation Classes

Class A **5%**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ACHY	Upper
ATCO	Upper
KRLA	Lower
ELEL5	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0%	5%
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

Dominated by scattered and young shrubs (shadscale). After five years, vegetation moves to Class B as the primary successional pathway. Extended wet period (every 55yrs) will have a stand replacing effect, with an ecological setback of five years.

Class B **50 %**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

KRLA	Lower
ATCO	Upper
ELEL5	Lower
PIDE4	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	20 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dominated by shadscale. Extended wet periods (every 55yrs on average) will cause a stand replacing transition to Class A. During extended drought periods (every 55yrs), vegetation will shift to Class C (bud sagebrush dominant). Replacement fire is rare (mean FRI of 1000yrs).

Class C **45 %**

Mid Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

PIDE4	Upper
KRLA	Upper
ELEL5	Middle
ATCO	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	20 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Budsage canopy cover is dominant with young shadscale establishing from seed. After 50yrs, vegetation moves back to Class B through succession. Drought (mean return interval of 35yrs) will maintain vegetation in Class C. Fire would not carry in this class.

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

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

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: V**

Historical Fire Size (acres)

Avg 1
Min 1
Max 1

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	2000			0.0005	96
Mixed					
Surface					
All Fires	1992			0.00052	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710820 Mojave Mid-Elevation Mixed Desert Scrub

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 2/24/2005

Modeler 1	Louis Provencher	lprovencher@tnc.org	**Reviewer**
Modeler 2			**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
CORA
ACSP12
BOER4
AMDU2

General Model Sources
☑ Literature
☐ Local Data
☐ Expert Estimate

Geographic Range

Mojave Mid-Elevation Desert Scrub (blackbrush is dominant) occurs in the southern Great Basin region, in the Mojave desert from CA, through NV to UT and AZ. Within the Mojave-Colorado plateau ecotone, blackbrush is found on dry slopes and benches above the river canyons of southern UT and northern AZ. It is also found midslope on mountain ranges throughout this area.

Biophysical Site Description

This ecological system represents the extensive desert scrub in the transition zone above Larrea tridentata-Ambrosia dumosa desert scrub and below the lower montane woodlands (700-1800m elevations) that occurs in the eastern and central Mojave Desert. It is also common on lower piedmont slopes in the transition zone into the southern Great Basin. Blackbrush occurs therefore on mesic and thermic soils, that are shallow to a root restrictive layer, on low hills and mountains and broad alluvial fans. Elevation ranges from 2200-4500ft.

Vegetation Description

The vegetation in this ecological systems is quite variable. Codominants and diagnostic species include Coleogyne ramosissima (blackbrush) , Eriogonum fasciculatum, Ephedra nevadensis, Grayia spinosa, Menodora spinescens, Opuntia acanthocarpa, Pleuraphis rigida, Salazaria mexicana, Viguiera parishii, Yucca brevifolia or Yucca schidigera. The dominant shrub of the Mojave Mid-Elevation Desert Scrub is blackbrush (Coleogyne ramosissima). Blackbrush is considered to be one of the most flammable native plant assemblages in the Mojave Desert, although this desert does not have a history of fire. There are many ecological site descriptions in the Mojave Desert and the bioregional transition between the Mojave Desert and Great Basin or Colorado Plateau that describe the various sites by vegetation composition and soils published by the NRCS. In general terms, blackbrush dominates the site with 80-90% of total cover. Although 185 species of vascular plants have been found growing within blackbrush, they are never abundant in the Mojave Desert, except at upper and lower-elevational ecotones. Desert grasses, including

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**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.

Achnatherum hymenoides, Achnatherum speciosum, Muhlenbergia porteri, Pleuraphis jamesii, Pleuraphis rigida or Poa secunda, may form an herbaceous layer. Scattered Juniperus osteosperma or desert scrub species may also be present. Beatley (1976) stated that "so nearly complete is the dominance of this shrub species that in areas that are not ecotonal there are only a few associated shrubs species, and these occur usually as scattered plants in an otherwise pure stands of Coleogyne."

Disturbance Description

Low amounts of fine fuel in interspaces probably limited fire spread to only extreme fire conditions, during which high winds, low relative humidity and low fuel moisture led to high intensity stand-replacing crown fires. Historical fire return intervals appear to have been on the order of centuries allowing late seral blackbrush stands to re-establish.

Adjacency or Identification Concerns

On the upper elevation, adjacent ecological systems include black sagebrush and Wyoming big sagebrush communities and at lower elevations creosotebush and bursage communities in the Mojave Desert. Within the upper and lower limits exist adjacent problem areas of blackbrush that are characterized by burned patches with early seral charcteristics that have been degraded by overgrazing and prescribed burning in the mid-1900s. There is increased cover of early seral shrubs such as Chrysothamnus spp, Gutierrezia spp and Eriogonum fasciculatum, early seral herbacious perennials such as Sphaeralcea ambigua and Astragalus spp, and alien annual plants such as Bromus rubens, Bromus tedtorum and erodium cictarum. Burned stands can also have a large perennial grass component. Other areas are annual grasslands dominated by Bromus rubens and Bromus tectorum from repeated burning.

Native Uncharacteristic Conditions

Scale Description

Although the BpS can be extensive (>100000ac) in the Mojave Desert, it is likely smaller where it reaches into the Great Basin (1000ac). The typical scale of common disturbance extent ranges from 100-1000ac. Exceptions do occur in excess of 1000s of acres.

Issues/Problems

We don't have much data on this community.

Comments

This model and description was developed by Gary Medlyn (gmedlyn@nv.blm.gov) from the blackbrush PNVG R2BLBR for the Great Basin Rapid Assessment. The main body of literature on blackbrush is from the eastern Mojave Desert. Therefore, R2BLBR was initially based on Mojave Desert dynamics, which was emphasized for MZs 12 and 17. Reviewers of R2BLBR were Patti Novak-Echenique (patti.novak@nv.usda.gov), Jolie Pollet (jpollet@blm.gov) and James Bowns (Bowns_JE@suu.edu).

Vegetation Classes

Class A **10 %**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

GUSA2	Upper
MESP2	Upper
EPNE	Upper
TETRA3	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	35 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

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

Description

Historically, fire was relatively uncommon in this vegetation. The average FRI for replacement fire was 333yrs, which would reset the ecological clock to zero. When burned, the fire tolerant/crown-sprouting shrubs such as spiny menodora, horsebrush and snakeweed will dominate the site. At higher elevations of mesic blackbrush, a big sagebrush-desert bitterbrush community typically replaces blackbrush for a protracted period. This class can express itself for over a hundred years with varying amounts of blackbrush gradually establishing after decades and eventually succeeding to Class B. A few examples of this that have been observed in the field are believed to be over 60yrs+ old. The ground cover varies by elevation and moisture regime with mesic sites being generally 0-35% with some sites only capable of 10% cover. The thermic sites are generally, 10-15% ground cover with exceptions going as high as 35%.

Class B **90%**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

CORA	Upper
EPNE	Upper
YUSC2	Upper
LATR2	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	45 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

This community class seems to be stable and occurs after a threshold is crossed. Composition is 70-80% blackbrush dominated. Other species are perennial grasses of desert needlegrass, Indian ricegrass, galleta grass, fluff grass and threeawn. Lesser shrub composition includes: Nevada ephedra, turbineila oak, desert bitterbrush, fourwing saltbush and Anderson's wolfberry in mesic sites and Nevada ephedra, creosotebush, Mojave buckwheat, snakeweed, prickly pear, white bursage and spiny menodora in thermic sites. There are other shrubs also. The FRI for replacement fire is 1000yrs, which causes a rare transition to class A.

Class C **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 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

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

Class E **0 %**

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: V**

Historical Fire Size (acres)

Avg 10
Min 1
Max 100

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	833	100	1700	0.00120	98
Mixed					
Surface					
All Fires	832			0.00122	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710860 Rocky Mountain Lower Montane-Foothill Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

Modeler 1	Sandy Gregory	s50grego@nv.blm.gov	**Reviewer**	Louis Provencher	lprovencher@tnc.org
Modeler 2	Bryan Bracken	Bryan_Bracken@blm.gov	**Reviewer**		
Modeler 3			**Reviewer**		

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
SYMPH
AMELA
PRUNU
HOLOD

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
This ecological system is found in the foothills, canyon slopes and lower mountains of the Rocky Mountains and on outcrops and canyon slopes in the western Great Plains. It ranges from southern NM extending north into WY, and west into the Intermountain region.

Biophysical Site Description
These shrublands occur between 1500-2900m elevations and are usually associated with exposed sites, rocky substrates and dry conditions, which limit tree growth. It is common where Quercus gambelii is absent such as the northern Colorado Front Range and in drier foothills and prairie hills.

Vegetation Description
Scattered trees or inclusions of grassland patches or steppe may be present, but the vegetation is typically dominated by a variety of shrubs including Amelanchier utahensis, Cercocarpus montanus, Purshia tridentata, Rhus trilobata, Ribes cereum or Symphoricarpos oreophilus. In UT, true mountain mahogany (Cercocarpus montanus) is a resprouting shrub that sometimes dominates this ecological system, whereas Ribes, Acer, mountain ash (Sorbus scopulina) and Chrysothamnus are less common. Artemisia tridentata var. vaseyana and Holodiscus are more common shrubs on dry sites in UT and the Great Basin. Grasses are represented as species of Muhlenbergia, Hesperostipa and Pseudoroegneria spicata. Fire plays an important role in this system as the dominant shrubs usually have a severe die-back, although some plants will stump sprout. Cercocarpus montanus requires a disturbance such as fire to reproduce, either by seed sprout or root crown sprouting. Fire exclusion may have allowed an invasion of trees into some of these shrublands, but in many cases sites are too xeric for tree growth. When trees are present, they include pinyon pine, juniper and limber pine; white fir and lodgepole pine may be found on more mesic sites.

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**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: This ecological system could be in Fire Regime Group III or IV. This is a fire-dependent system, and is strongly influenced by the fire regime of the surrounding shrublands. Dominant species are resprouters (FEIS references, 2004). Average FRIs for replacement fire vary between 100-200yrs with longer intervals for older stands. The average mixed severity FRI varies between 25yrs for younger stands to 100yrs for older stands with greater tree encroachment.

Avalanche/rockslide: Sites on steep slopes experience rockslides and avalanches that favor resprouting shrubs.

Weather/stress: Severe weather event, such as frost, can cause replacement type mortality every 200yrs on average.

Adjacency or Identification Concerns

Native Uncharacteristic Conditions

Scale Description

Usually, this community occurs on a small scale on mesic sites near or within the mountain big sagebrush zone. However, it may occur on mesic sites outside this zone.

Issues/Problems

In the Great Basin (west desert of UT and NV) mountain shrublands, the potential for tree invasion by pinyon, juniper, white fir, limber pine and, incidentally, lodgepole pine is greater than in the Rocky Mountains (MZ16 and east). This system is generally drier than Rocky Mountain Gambel Oak-Mixed Montane Shrubland (BpS 1107) in the eastern part of MZ17, but may include mesic montane shrublands where Quercus gambelii does not occur.

This type occurs in association or complex with mountain big sagebrush, although mountain shrublands are differentiated here by greater diversity.

Dwarf aspen, willows and alder may be present on moist sites. If those species are dominant, an aspen or riparian model would be more appropriate.

Comments

BpS 1086 for MZs 12 and 17 is essentially the same as the model for MZ16, but with two modifications to class D. 1) Mixed severity thins encroaching trees and causes a transition to class C. 2) Weather-related mortality to shrubs favors conifer encroachment. BpS 1086 for MZ16 was developed by Beth Corbin (ecorbin@fs.fed.us) and Stanley Kitchen (skitchen@fs.fed.us). BpS 1086 for MZ16 was based on original PNVG model and description R2MSHBwt - Mountain Shrubland with trees developed by Michele Slaton (mslaton@fs.fed.us), Joanne Baggs (jbaggs@fs.fed.us) and Cheri Howell (chowell@fs.fed.us) for the western and eastern Great Basin. Reviewers of R2MSHBwt were Stanley Kitchen (skitchen@fs.fed.us), Crystal Golden (kolden@unr.edu) and Clinton Williams (cwilliams03@fs.fed.us).

Vegetation Classes

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

Class A **5 %**

Early Development 1 All Structures

Indicator Species* and Canopy Position

SYMPH	Upper
AMELA	Upper
PRUNU	Upper
HOLOD	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	40 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 6

Description

Grasses and forbs are abundant, as are resprouting shrubs. Shrub seedlings are also present. Replacement fire every 100yrs and severe weather related mortality (mean return interval of 200yrs) will reset the ecological clock to zero. Succession from classes A to B after five years.

Class B **20 %**

Mid Development 1 Closed

Indicator Species* and Canopy Position

SYMPH	Upper
AMELA	Upper
HOLOD	Upper
PRUNU	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	30 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 6

Description

Shrubs are dominant, and grasses and forbs may be present, especially in gaps between shrubs. Many shrubs are small and immature. Both replacement fire every 100yrs and severe weather related mortality every 200yrs will cause a transition to class A. Mixed severity fire every 25yrs will maintain vegetation in class B. Succession to C after 15yrs.

Class C **70 %**

Late Development 1 Closed

Indicator Species* and Canopy Position

SYMPH	Upper
AMELA	Upper
PRUNU	Upper
HOLOD	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	60 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 6

Description

Shrubs are dominant, with little decadence. Grasses and forbs may be present. Small tree seedlings may be present. Shrubs are larger and many are reproducing. Fire and severe weather events return interval are as in class B. Class C is the succcessional endpoint. However, vegetation will transition to class D in the absence of fire for 60yrs (three FRIs).

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

Class D 5 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

JUNIP	Upper
PIFL2	Upper
ARTR2	Middle
HOLOD	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	15 %
Height	Tree 0m	Tree 25m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Description

Dominant lifeform medium shrubs (Symphoricarpos, Amelanchier, Prunus and Holodiscus), as in class C, but being overtopped by trees. Min canopy 25%, maximum canopy 50%; minimum height short shrub, maximum height medium shrub.

Shrubs are dominant, with more decadence. Trees are over-topping the shrub canopy. Vegetation is considered open because trees do not form a close canopy. FRIs are longer in this class. Replacement fire is every 200yrs on average. Mixed severity fire (mean FRI of 100yrs) thins trees and returns vegetation to class C. Severe weather every 200yrs on average thins shrubs and favors trees, thus maintaining vegetation in class D, which is the endpoint for succession without stand replacement fire.

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: I**

Historical Fire Size (acres)

Avg 100
Min 10
Max 500

Sources of Fire Regime Data

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	103	100	200	0.00971	21
Mixed	27	25	100	0.03704	79
Surface					
All Fires	21			0.04676	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1710870** **Sonora-Mojave Creosotebush-White Bursage Desert Scrub**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1 Gary Medlyn gmedlyn@nv.blm.gov **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
AMDU2 NVEG
LATR2
EPNE
ATRIP

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This area exists in isolated valleys within the transition zone between the Mojave Desert and cold desert. It is true Mojave Desert and found as fingers within MZs 12 and 17. An example is the Parahnagat Valley.

Biophysical Site Description
Creosotebush scrub is wide ranging across the warm deserts and is most common in the Mojave Desert. Creosotebush scrub is typically found below the blackbrush zone on well-drained alluvial flats and slopes and above the saltbush zone. Elevation zones 600-4200ft. Creosote shrublands occur on several soil types from shallow to deep. Desert pavement is common. Soils are well drained, available water capacity is very low and runoff is moderate to rapid.

Vegetation Description
Creosotebush (Larrea tridentata) dominates shrublands. Plant community associates change from east to west Mojave Desert. Creosotebush codominates in desert shrub communities with saltbush (Atriplex spp), Ambrosia dumosa, white bursage and bladder sage (Salazaria mexican). Joshua trees can be part of this community type. Grass species include galleta grass (Hilaria spp), bush muhly, desert needlegrass, Indian ricegrass and threeawn.

Creosotebush scrub is characterized by low cover (5-30%) of woody shrubs of various heights. With the exception of Joshua tree, creosotebush has the highest cover and is the most wide-ranging plant species in the Mojave Desert.

Disturbance Description
Cresosotebush scrub is not fire tolerant because of its drought-tolerant features such as thin bark, slow growth, shallow root system and small leaves. Some species resprout after fire depending on fire severity,

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

but native plants are slow to recover or re-establish after fire.

We do not know the pre-settlement fire conditions in warm desert plant communities. However, it is thought that fires in creosotebush scrub were absent to rare events in pre-settlement desert habitats, because fine fuels from winter annual plants were probaby sparse, only occuring in large amounts during the spring following exceptionally wet winters.

Adjacency or Identification Concerns

The adjacency/identification issue is not as much of a concern as in other systems because creosote communities dominate the Mojave landscape.

Fine fuel from alien annual grasses such as red brome or cheatgrass, currently represent the most important fuelbed component in creosotebush scrub. In years of good moisture, alien annual grasses can comprise 66-97% of the total annual biomass in this system.

Historic year round livestock grazing has contributed to the deterioration of this system.

Native Uncharacteristic Conditions

Scale Description

Patch sizes, which can be very large (>100000ac), vary according to landform, aspect and precipitation. The site occurs on erosional fan remnants and fan piedmonts. Slopes range from 0-15%, but are generally 2-8%.

Issues/Problems

Little information is available regarding fire frequency and fire severity in pre-settlement fire conditions in warm desert plant communities. It is thought that fire was rare to absent.

Comments

BpS 1087 is based on the Rapid Assessment model R2CRBU developed by Sandy Gregory (s50grego@nv.blm.gov). R2CRBU was reviewed by Patti Novak-Echenique (patti.novak@nv.usda.gov), Tim Duck (tim_duck@blm.gov) and Stanley D. Smith (ssmith@ccmail.nevada.edu). Suggested reviewers for BpS 1087: Doug Merkler, doug.merkler@usda.gov; Patti Novak-Echenique (patti.novak@nv.usda.gov).

Vegetation Classes

Class A **15%**

Early Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PPGG	Lower
AMDU2	Low-Mid
LATR2	Upper
ARIST	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0%	10%
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant cover is herbaceous, 5-10% canopy cover.

Description

Creosotebush scrub is characterized by low cover 5-10%. Little disturbance was considered in Class A, except for replacement fire every 300yrs on average. Historical condition where invasive annual grasses are absent, the fire return interval is virtually non-existent except for areas near the base of mountains experiencing locally higher rainfall and fine fuel buildup is from native annuals. After 100yrs, class A transitions to B.

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**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.

Class B 85%

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

LATR2
AMDU2

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	30 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Greater than 15% shrub cover and 20-40% grass and forb cover; associated with more productive soils. Less fine fuel is associated with this community, therefore the FRIs for replacement fire and mixed severity fire is 650yrs (min-max: 300-1000yrs). Wind/weather stress also affected this community on average every 80yrs, but did not cause a transition to class A.

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

Fire Regime Group:** V

Historical Fire Size (acres)

Avg 20
Min 1
Max 100

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	588	300	1000	0.00170	56
Mixed	769	300	1000	0.00130	43
Surface					
All Fires	333			0.00301	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1710930 Southern Colorado Plateau Sand Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date**

Modeler 1 Mike Babler mbabler@tnc.org **Reviewer**
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*

EPVI	POIN3
EPCU	ACHY
EPTO	BOGR2
ARFI2	HECO26

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This system occurs in sandy plains and mesas on the south-central Colorado Plateau in northeastern AZ extending into southern and central UT. It may also occur on portions of the Colorado Plateau in NM and CO.

Biophysical Site Description
This BpS occurs on windswept mesas, broad basins and plains at low to moderate elevations(1300-1800m). It occurs on stabilized sandsheet and shallow to moderately deep sandy soils. May be on small hummocks or small coppice dunes.

Vegetation Description
A semi-arid open shrublands, dominated by short shrubs (10-30% cover). Includes a sparse graminoid layer. Ephedra viridis (Green ephedra) is often dominant and regenerates from seed and by sprouting from the roots and woody crown. Seed production is erratic under natural conditions, with an abundant seed crop occurring very infrequently. Green ephedra has also been identified as a resprouting species following disturbance. Coleogyne ramosissima (blackbrush) seldom occurs in this BpS.

Disturbance Description
Fire Regime Group IV or III, though wind may be the dominant disturbance. Fire is likely not a major factor due to limited fuel in the BpS. Green ephedra has been found in plant communities with a wide range of fire return intervals, and has been found in ecosystems following large, stand replacing fires as well as small, patchy, erratic fires.

Fire regimes in similar plant associations include: Saltbush-Greasewood, Atriplex confertifolia-Sarcobatus vermiculatus with MFIs of <35 to <100yr; Blackbrush, Coleogyne ramosissima with MFIs of <35 to <100yr; and Creosotebush, Larrea tridentata with MFIs of <35 to <100yr.

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

Adjacency or Identification Concerns

Coleogyne ramoisissima (blackbrush) is not present in this BpS. If blackbrush is present, one of the following BpSs would be more appropriate: 1078-Colorado Plateau Blackbrush-Mormon Tea Shrubland; or 1082-Mojave Mid-Elevation Desert Scrub.

Higher vegetation cover and less prominent geomorphic features distinguish this system from Inter-Mountain Basins Active and Stabilized Dune (CES302.775).

Native Uncharacteristic Conditions

Scale Description

Patches may be large.

Issues/Problems

Information on this BpS, including fire information, is lacking. The impacts of long term domestic animal grazing in this BpS are difficult to determine. A two-box model may be appropriate.

Comments

This model is identical to the model for the same BpS in MZs 23 and 24.

Vegetation Classes

Class A 20%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 5

Indicator Species* and Canopy Position

EPVI	Upper
EPCU	
ARFI2	

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	10%
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Blowout and disturbed sites with very low cover, primarily consisting of Ephedra viridis.

Class B 79%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 5

Indicator Species* and Canopy Position

EPVI	Upper
EPCU	
ARFI2	

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10%	25%
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Canopy cover is 10-30% and dominated by Ephedra viridis. Grass and graminoids presence is highly influenced by seasonal moisture. Ephedra viridis and E. cutleri may develop a matty growth form.

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**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.

Class C 1 %

Mid Development 1 Closed

Indicator Species* and Canopy Position

EPVI Upper
EPCU
ARFI

Structure Data (for upper layer lifeform)

	Min	Max
Cover	25 %	30 %
Height	Shrub 0.6m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 5

Description

Canopy cover limits potential grasses and graminoid plant growth. Ephedra viridis and E. cutleri assume matty growth form.

Class D 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Class E 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg 0
Min 0
Max 0

Sources of Fire Regime Data

☑ Literature
☐ Local Data
☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	200			0.005	55
Mixed	250			0.004	44
Surface					
All Fires	111			0.00901	

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

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711020 Colorado Plateau Pinyon-Juniper Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 2/23/2005

Modeler 1	Bob Unnasch	bunnasch@tnc.org	**Reviewer**
Modeler 2			**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
PIED
JUOS
ARTR2

General Model Sources
☑ Literature
☐ Local Data
☐ Expert Estimate

Geographic Range
This ecological system is characteristic of the rocky mesa tops and slopes on the Colorado Plateau and western slope of CO.

Biophysical Site Description
Substrates are shallow/rocky and shaley soils at lower elevations (1200-2000m). These stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands.

Vegetation Description
The vegetation is dominated by dwarfed (usually <3m tall) Pinus edulis and/or Juniperus osteosperma trees forming extensive tall shrublands in the region along low-elevation margins of pinyon-juniper woodlands. Other shrubs, if present, may include Artemisia nova, Artemisia tridentata ssp. wyomingensis, Chrysothamnus viscidiflorus or Coleogyne ramosissima. Herbaceous layers are sparse to moderately dense and typically composed of xeric graminoids.

Disturbance Description
Fire regime was primarily determined by fire occurrence in the surrounding matrix vegetation. Lightning-ignited fires were common but typically did not affect more than a few individual trees. Replacement fires were uncommon to rare (average FRI of 100-500yrs) and occurred primarily during extreme fire behavior conditions. Mixed severity fire (average FRI of 100-500yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1ac). Surface fires could occur in stands where understory grass cover is high and provides adequate fuel. Surface fires were primarily responsible for producing fire scars on juniper or pinyon trees (average FRI of 100yrs).

Adjacency or Identification Concerns
Sites are drier than Colorado Plateau Pinyon-Juniper Woodland (1016).

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

These stunted tree shrublands may extend further upslope along the low-elevation margins of taller pinyon-juniper woodlands.

Native Uncharacteristic Conditions

Scale Description

Juniper/pinyon-juniper shrubland was usually distributed across the landscape in patches that range from 10-100s of acres in size. In areas with very broken topography and/or mesa landforms this type may have occurred in patches of several hundred acres. In UT and NV, pinyon and juniper landscape patches tended to be 10-100s of acres in size.

Issues/Problems

Information was scarce on this ecological system. It appears that this model is a hybrid between the Colorado Plateau Pinyon-Juniper Woodland (1016) and Inter-Mountain Basins Juniper Savanna (1115). Due to the shallow/rocky soils of mesa tops, the Inter-Mountain Basins Juniper Savanna model for MZ16 (161115) is very similar.

Comments

This is essentially the same model as the Rapid Assessment PNVG R2PIJU developed by Steve Bunting (sbunting@uidaho.edu), Krista Waid-Gollnick (krista_waid@blm.gov) and Henry Bastian (henry_bastian@ios.doi.gov) for juniper and/or pinyon savanna. Reviewers of R2PIJU were George Gruell (ggruell@charter.net), Jolie Pollet (jpollet@blm.gov) and Peter Weisberg (pweisberg@cabnr.unr.edu). It is also very similar to the Inter-Mountain Basins Juniper Savanna model for MZ16 (161115).

Cover breaks changed by Pohl on 3/30/2005 to facilitate LANDFIRE mapping and differentiate structural classes. D was changed from 11-30% to 21-30%; E was changed from 21-40% to 31-40%.

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

Vegetation Classes

Class A 5%

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

BOGR2	Upper
forb	Upper
CRYP	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	2%	10%
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Initial post-fire community dominated by annual forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Duration 10yrs with succession to class B, mid-development closed. Replacement fire occurs every 100yrs on average. Infrequent mixed severity fire (average FRI of 300yrs) thins vegetation.

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

Class B 5 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTEM	Upper
CHVI8	Upper
BOGR2	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5 %	10 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dominated by shrubs, perennial forbs and grasses. Total cover remains low due to shallow, unproductive soil. Duration 20yrs with succession to class C unless infrequent replacement fire (FRI of 100yrs) returns the vegetation to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than zero and <10. Mixed severity fire (average FRI of 100yrs) thins the woody vegetation, but does not cause a transition to another class.

Class C 10 %

Mid Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTEM	Upper
CHVI8	Upper
JUOS	Upper
PIED	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	20 %
Height	Tree 0m	Tree 5m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform.

Tree seedlings emerging from a shrub dominated vegetation.

Description

Shrub dominated community with young juniper and pinyon seedlings becoming established. Duration 70yrs with succession to class D unless replacement fire (average FRI of 200yrs) causes a transition to class A. It is important to note that replacement fire at this stage does not eliminate perennial grasses, thus, in reality, succession age in class A after this type of fire would be older than zero and <10. Mixed severity fire as in class B.

Class D 35 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOS	Upper
PIED	Upper
ARTEM	Middle
BOGR2	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	21 %	30 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Community dominated by young and stunted juniper and pinyon of mixed age structure. Juniper and pinyon becoming competitive on site and beginning to affect understory composition. Duration 300yrs with succession to E unless replacement fire (average FRI of 500yrs) causes a transition to A. Mixed severity fire is less frequent than in previous states (200yrs), whereas surface fire every 100yrs on average becomes more important at this age in succession.

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

Class E **45 %**

Late Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOC/JU Upper
PIED/PI Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	31 %	40 %
Height	Tree 0m	Tree 5m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Site dominated by widely spaced old and stunted juniper and pinyon. Understory depauperate and high amounts of bare ground and rock present. Grasses present on microsites sites with deeper soils (>20in) with restricting clay subsurface horizon. Potential maximum overstory coverage is greater in those stands with pinyon as compared to those with only juniper. Replacement fire and mixed severity fires are rare (average FRIs of 500yrs). Surface fire every 100yrs on average will scar ancient stunted trees. Duration 600yrs+.

Disturbances

Fire Regime Group:** **III**

Historical Fire Size (acres)

Avg 10
Min 1
Max 100

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	345	100	1000	0.0029	19
Mixed	217	100	1000	0.00461	30
Surface	125			0.008	52
All Fires	64			0.01551	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711030 Great Basin Semi-Desert Chaparral

☑ *This BPS is lumped with: 1104 (models are identical)*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1	Louis Provencher	lprovencher@tnc.org	**Reviewer**
Modeler 2	Bryan Bracken	Bryan_Bracken@blm.gov	**Reviewer**
Modeler 3	Jack Sheffey	Jack_Sheffey@blm.gov	**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*

ARPA6	CEIN7
ARPU5	ERFA2
CEGR	GAFL2
CEMOG	QUTU2

General Model Sources
☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
Western, southern and central Great Basin of eastern CA, NV and UT. There are limited occurrences extending as far west as the inner Coast Ranges in central CA.

Biophysical Site Description
This system includes chaparral on sideslopes transitioning from low-elevation desert landscapes up into pinyon-juniper and ponderosa pine woodlands of the western and central Great Basin.

Vegetation Description
Although these ecological systems are typically dense and impenetrable shrublands, open spaces either bare or supporting patchy grass and forbs can be observed. Characteristic species may include Arctostaphylos patula, Arctostaphylos pungens, Ceanothus greggii, Cercocarpus montanus var. glaber, Cercocarpus intricatus, Eriogonum fasciculatum, Garrya flavescens, Quercus turbinella, Purshia stansburiana and Rhus trilobata. Cercocarpus ledifolius is generally absent.

Disturbance Description
Typical fire regime in these systems varies with the amount of organic accumulation. The only significant disturbance to the system is stand-replacing fire occurring every 50yrs on average. Shrubs resprout rapidly after fire, often making the vegetation impenetrable.

Adjacency or Identification Concerns
At higher elevations, chaparral vegetation may blend into ponderosa pine woodlands and pinyon-juniper woodlands. Stand replacement fires will periodically remove these trees.

Compared to other Great Basin systems deserving splitting (eg, BPS 1080, 1081, 1125 and 1126), chaparral

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**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.

systems for MZs 12 and 17 (1104 Mogollon Semi-Desert Chaparral, 1107 Rocky Mountain Gambel Oak-Mixed Montane Shrublands, and 1108 Sonora-Mojave Semi-Desert Chaparral) are described too finely to be distinguished and share nearly identical fire dynamics.

Native Uncharacteristic Conditions

Scale Description

Vegetation found in small patches of 10ac to whole mountain slopes of 10000ac.

Issues/Problems

Comments

BpS 1103 for MZs 12 and 17 is essentially the model and description for MZ16 proposed by James Bowns and translated into VDDT by Louis Provencher on 3/2/05.

Great Basin chaparral experiences very few disturbances other than replacement fire.

Vegetation Classes

Class A 15%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ARPA6	Upper
ARPU5	Upper
CEGR	Upper
CEMOG	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	100%
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

After fire, shrubs resprout strongly from roots or from the base of plants. Shrubs can cause stands to become impenetrable. Stand replacement fire occurs every 50yrs on average. After 10yrs, succession to class B.

Class B 85%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ARPA6	Upper
ARPU5	Upper
CEGR	Upper
CEMOG	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10%	100%
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dense shrubs with grasses present in the few openings. Shrub composition same as in class A. The only disturbance is stand replacing fire every 50yrs on average. Canopy cover will generally be >50%.

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

Class C 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class D 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class E 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: IV**

Historical Fire Size (acres)

Avg 500
Min 5
Max 5000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	48	10	90	0.02083	100
Mixed					
Surface					
All Fires	48			0.02085	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

References

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711040 Mogollon Chaparral

☑ *This BPS is lumped with: 1103 (models are identical)*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1	Louis Provencher	lprovencher@tnc.org	**Reviewer**
Modeler 2	Bryan Bracken	Bryan_Bracken@blm.gov	**Reviewer**
Modeler 3	Jack Sheffey	Jack_Sheffey@blm.gov	**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
CAHO3 QUTU2
ARPU5 PUST
CEGR
CEMO2

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This ecological system occurs across central AZ (Mogollon Rim), western NM, southern UT and eastern NV (MZ17). It often dominates along the mid-elevation transition from the Mojave, Sonoran and northern Chihuahuan deserts

Biophysical Site Description
Found in mountains from 1000-2200m. It occurs on foothills, mountain slopes and canyons in drier habitats below the encinal (southwestern oak woodlands) and Pinus ponderosa woodlands. Stands are often associated with more xeric and coarse-textured substrates such as limestone, basalt or alluvium, especially in transition areas with more mesic woodlands.

Vegetation Description
The moderate to dense shrub canopy includes species such as Quercus turbinella, Quercus toumeyi, Cercocarpus montanus, Canotia holacantha, Ceanothus greggii, Forestiera pubescens (=Forestiera neomexicana), Garrya wrightii, Juniperus deppeana, Purshia stansburiana, Rhus ovata, Rhus trilobata and Arctostaphylos pungens and Arctostaphylos pringlei at higher elevations. Most chaparral species are fire-adapted, resprouting vigorously after burning or producing fire-resistant seeds. Stands occurring within montane woodlands are seral and a result of recent fires.

Disturbance Description
Typical fire regime in these systems varies with the amount of organic accumulation. The only significant disturbance to the system is stand-replacing fire occurring every 50yrs on average. Shrubs resprout rapidly after fire, often making the vegetation impenetrable.

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

Adjacency or Identification Concerns

At higher elevations, chaparral vegetation may blend into ponderosa pine woodlands and oak woodlands (encinal). Stand replacement fires will periodically remove these trees.

Compared to other Great Basin systems deserving splitting (eg, BPS 1080, 1081, 1125, and 1126), chaparral systems for MZs 12 and 17 (1104 Mogollon Semi-Desert Chaparral, 1107 Rocky Mountain Gambel Oak-Mixed Montane Shrublands, and 1108 Sonora-Mojave Semi-Desert Chaparral) are described too finely to be distinguished and share nearly identical fire dynamics.

Native Uncharacteristic Conditions

Scale Description

Vegetation found in small patches of 10ac to whole mountain slopes of 10000ac.

Issues/Problems

Uncertainty exists about the size of this system in MZ17. The BpS is assumed absent from MZ12.

Comments

This BpS for MZ17 is essentially BpS 1103 with minor modifications to the descriptions. The components of BpS 1103 for MZ16 were proposed by James Bowns and translated into VDDT by Louis Provencher on 3/2/05.

Vegetation Classes

Class A 15%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

QUTU2	Upper
ARPU5	Upper
CEGR	Upper
CEMO2	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

After fire, shrubs resprout strongly from roots or from the base of plants. Shrubs can cause stands to become impenetrable. Stand replacement fire occurs every 50yrs on average. After 10yrs, succession to class B.

Class B 85%

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

QUTU2	Upper
ARPU5	Upper
CEGR	Upper
CEMO2	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	100 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dense shrubs with grasses present in the few openings. Shrub composition same as in class A. The only disturbance is stand replacing fire every 50yrs on average. Canopy cover will generally be >50%.

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

Class C 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class D 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class E 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: IV**

Historical Fire Size (acres)

Avg 500
Min 5
Max 5000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	48	10	90	0.02083	100
Mixed					
Surface					
All Fires	48			0.02085	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

References

Barbour, M.G., and J. Major, editors. 1977. Terrestrial vegetation of California. John Wiley and Sons, New York. 1002 pp.

Brown, J. K. and J. K. Smith, eds. 2000 Willdand fire in ecosystems: effects of fire on flora. Gen. Tech. Rep RMRS-GTR-42-vol.2. Odgen, UT; USDA Forest Service, Rocky Mountain Research Station. 257 pp.

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NatureServe. 2007. International Ecological Classification Standard: Terrestrial Ecological Classifications. NatureServe Central Databases. Arlington, VA. Data current as of 10 February 2007.

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711070 Rocky Mountain Gambel Oak-Mixed Montane Shrubland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1	Bryan Bracken	Bryan_Bracken@blm.gov	**Reviewer**	Louis Provencher	lprovencher@tnc.org
Modeler 2	Sandy Gregory	s50grego@nv.blm.gov	**Reviewer**		
Modeler 3	Jack Sheffey	Jack_Sheffey@blm.gov	**Reviewer**		

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*
QUGA SYOR2
ARTR2
PRVI
PURSH

General Model Sources
- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Geographic Range
This ecological system occurs in the mountains, plateaus and foothills in the southern Rocky Mountains and Colorado Plateau including the Uinta and Wasatch ranges and the Mogollon Rim. In NV, this BpS is found only rarely in the southeastern portion of the state.

Biophysical Site Description
These shrublands are most commonly found along dry foothills, lower mountain slopes and at the edge of the western Great Plains from approximately 2000-2900m in elevation, and are often situated above pinyon-juniper woodlands. Substrates are variable and include soil types ranging from calcareous, heavy, fine-grained loams to sandy loams, gravelly loams, clay loams, deep alluvial sand or coarse gravel.

Vegetation Description
The vegetation is typically dominated by Quercus gambelii alone or codominant with Amelanchier alnifolia, Amelanchier utahensis, Artemisia tridentata, Cercocarpus montanus, Prunus virginiana, Purshia stansburiana, Purshia tridentata, Robinia neomexicana, Symphoricarpos oreophilus or Symphoricarpos rotundifolius. There may be inclusions of other mesic montane shrublands with Quercus gambelii absent or as a relatively minor component. This ecological system intergrades with the lower montane-foothills shrubland system and shares many of the same site characteristics. Density and cover of Quercus gambelii and Amelanchier spp often increase after fire.

Disturbance Description
Fire is more often mixed, with less frequent replacement severity. Mixed fire at 100yr return interval modeled in class A; and classes B and C experiences mean FRI of 150yr for replacement and 50yr for mixed severity fire. Insect outbreaks occassionally affect this BpS (modeled at 300yr return in classes B & C, but

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

outbreaks do not change class). Frost-kill was modeled as 150yr return interval, causing a transition to early seral conditions. Fire often follows frost-kill disturbances.

Adjacency or Identification Concerns

May be very difficult to distinguish this from Great Basin Semi-Desert Chaparral (BpS 1103). May be adjacent to other oak species.

Native Uncharacteristic Conditions

Scale Description

This type occurs in relatively large patches across the landscape. Disturbance patch size within the type is generally moderate (a few to hundred acres).

Issues/Problems

Little information on fire history for this type.

Highly susceptible to cheatgrass invasion.

Comments

BpS 1107 for MZ17 is based on BpS 1107b (patchy Gambel Oak) from MZ16 developed by Beth Corbin (ecorbin@fs.fed.us) and Stanley Kitchen (skitchens@fs,fed,us). BpS 1007b for MZ16 was reviewed by Doug Page (doug_page@blm.gov), Mark Loewen (mloewen@fs.fed.us) and Linda Wadleigh (lwadleigh@fs.fed.us). Suggested reviewers for BpS 1107 for MZs 12 and 17: Rick Orr(Nevada BLM - Caliente F.S.) (Rick_Orr@nv.blm.gov), Doug Merckler (DougMerkler@usda.gov) and Michelle Flaton (mflaton@usda.gov).

Vegetation Classes

Class A 5%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

QUGA	Upper
ARTR2	Mid-Upper
PRVI	Low-Mid
PURSH	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	80 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Grass/forb and young Gambel oak sprouts less than two meters tall. This stage is generally 0-9yrs in age. Within clones, little herbaceous understory due to oak density. Between clones, there is fairly high cover of grasses and herbs, and less than five percent cover of sagebrush and other shrubs. Succession to class B after five years.

Class B 35%

Mid Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

QUGA	Upper
ARTR2	Mid-Upper
PRVI	Low-Mid
PURSH	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	60 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

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

Description

Mid-seral stage is generally 10-24yrs old, with Gambel oak stems less than 2-3in diameter, and generally less than eight feet tall. High oak cover (generally >80%) within clone. Overall landscape canopy cover will generally be 40-60%. Very sparse herbaceous cover within clones, but interspaces between clones grass/herb/sagebrush cover may be 5-20%. Succession to class B after 15yrs.

Class C **60 %**

Late Development 1 All Structures

Indicator Species* and Canopy Position

QUGA	Upper
ARTR2	Mid-Upper
PRVI	Low-Mid
PURSH	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	61 %	80 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

☐ Herbaceous
☑ Shrub
☐ Tree

Fuel Model 4

Description

Late seral stage is >25yrs in age, generally in closed stands. Oak stems are generally greater than 2-3in diameter and usually over eight feet tall. Oak cover within the clones is slightly lower than in the mid-seral, due to self-thinning of stems. Herbaceous understory cover is low (although may be somewhat more than in the mid-seral stage). Interspaces between clones is sagebrush (and other low shrubs) with 20-30% cover, along with grass/herbs.

Class D **0 %**

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Class E **0 %**

[Not Used] [Not Used]

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.

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model

Description

Disturbances

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Fire Regime Group:** III

Historical Fire Size (acres)

Avg 150
Min 5
Max 1000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	151			0.00662	25
Mixed	51			0.01961	75
Surface					
All Fires	38			0.02624	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**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.

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711080 Sonora-Mojave Semi-Desert Chaparral

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1	Sandy Gregory	s50grego@nv.blm.gov	**Reviewer**
Modeler 2	Bryan Bracken	Bryan_Bracken@blm.gov	**Reviewer**
Modeler 3	Jack Sheffey	Jack_Sheffey@blm.gov	**Reviewer**

Vegetation Type
Upland Shrubland

Map Zone
17

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

Dominant Species*

QUJO3	ARPU5
QUCO7	ARGL4
QUBE5	CEMOG
ARPA6	GAFL2

General Model Sources
☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range
This ecological system is composed of evergreen shrublands on sideslopes transitioning from low-elevation desert landscapes up into woodlands of the western Mojave and Sonoran deserts. It extends from northeast Kern County, CA, into Baja Norte.

Biophysical Site Description
This system includes chaparral on sideslopes transitioning from low-elevation desert landscapes up into pinyon-juniper and ponderosa pine woodlands of the western and central Great Basin, between 4000 and 7000ft.

Vegetation Description
Associated species include Quercus john-tuckeri, Quercus cornelius-mulleri, Quercus berberidifolia, Arctostaphylos patula, Arctostaphylos pungens, Arctostaphylos glauca, Rhus ovata, Juniperus californica, Cercocarpus montanus var. glaber (=Cercocarpus betuloides), Ceanothus greggii, Garrya flavescens and Nolina parryi.

Disturbance Description
Typical fire regime in these systems varies with the amount of organic accumulation. The only significant disturbance to the system is stand-replacing fire occurring every 50-100yrs on average. Shrubs resprout rapidly after fire, often making the vegetation impenetrable.

Adjacency or Identification Concerns
BpS 1108 will be diffcult to distinguish from BpS 1103 (Great Basin Semi-Desert Chaparral) and BpS 1104 (Mogollon Semi-Desert Chaparral).

Native Uncharacteristic Conditions

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

Scale Description

Vegetation found in small patches of 10ac to whole mountain slopes of 5000ac.

Issues/Problems

None of the experts consulted were familiar with this chaparral.

Issues with selection of proper MFRI, tested both 50 and 75 (retained) years.

Comments

Model for BpS 1108 was based on the model of BpS 1103 (Great Basin Semi-Desert Chaparral). Mean FRI for replacement fire was increased to 75yrs from 50yrs.

Vegetation Classes

Class A 65%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ARPA6	Upper
ARPU5	Upper
QUJO3	Upper
CEMOG	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

After fire, shrubs resprout strongly from roots or from the base of plants. Shrubs can cause stands to become impenetrable. Stand replacement fire occurs every 75yrs on average. After 50yrs, succession to class B.

Class B 35%

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 4

Indicator Species* and Canopy Position

ARPA6	Upper
ARPU5	Upper
QUJO3	Upper
CEMOG	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	100 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dense shrubs with grasses present in the few openings. Shrub composition same as in class A. Canopy cover will generally exceed 50%. The only disturbance is stand replacing fire every 75yrs on average.

Class C 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

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

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 500
Min 5
Max 5000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	50	10	90	0.02	100
Mixed					
Surface					
All Fires	50			0.02002	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**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.

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711150 Inter-Mountain Basins Juniper Savanna

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1	Peter Weisberg	pweisberg@cabnr.unr.edu	**Reviewer**
Modeler 2	Crystal Kolden	ckolden@gmail.com	**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type
Upland Savanna and Shrub-Steppe

Map Zone
17

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

Dominant Species*
JUOS ELEL5
ARNO4 PLJA
HECO26
ACHY

General Model Sources
- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Geographic Range
In NV and western UT.

Biophysical Site Description
This ecological system is typically found at lower elevations ranging from 1500-2300m. Occurrences are found on lower mountain slopes, hills, plateaus, basins and flats. Juniper savanna ecotype generally occurs in local, geologically confined, badland environments and is limited in its distribution. Occurs at the lower altitudinal limits for tree species, below the pinyon-juniper woodland type but at or above sagebrush semi-desert and salt desert shrubland in locations where soil moisture is limiting.

Vegetation Description
The vegetation is typically open savanna, although there may be inclusions of more dense juniper woodlands. This savanna is typically dominated by Juniperus osteosperma trees with sparse cover of black sagebrush and perennial bunch grasses and forbs, with Elymus elymoides, Achnatherum hymenoides (=Oryzopsis hymenoides), Hesperostipa comata and Pleuraphis jamesii (more southern locations) being most common. Pinyon trees are typically not present because sites are outside the ecological or geographic range of Pinus edulis and Pinus monophylla.

Disturbance Description
Uncertainty exists about the fire frequencies of this ecological system. It is likely that fires were very infrequent in this ecotype with inherently low productivity. Fire occurrence was primarily determined by fire occurrence in the surrounding matrix vegetation. Lightning-ignited fires typically did not affect more than a few individual trees. Replacement fires were rare (average FRI of greater than 300-1000yrs) and occurred primarily during extreme fire behavior conditions, particulary when preceded by wetter years associated with high herbaceous production. Fire regime primarily determined by adjacent communities, as fire rarely

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**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.

originated within the community. Mixed severity fire (average FRI of 200-500yrs) was characterized as a mosaic of replacement and surface fires distributed through the patch at a fine scale (<0.1ac). Surface fire could occur in stands where understory grass cover was high and provided adequate fuel. Surface fire was primarily responsible for producing fire scars on juniper trees in older stands (average FRI of 500yrs).

Adjacency or Identification Concerns

This system is generally found at lower elevations and more xeric sites than Great Basin Pinyon-Juniper Woodland (BpS 1019) or Colorado Plateau Pinyon-Juniper Woodland (BpS 1016).

In modern days, surrounding matrix vegetation has changed to young-mid aged woodlands that encroached the former sagebrush matrix during the last century of fire exclusion or livestock grazing. The woodlands burn more intensely than the former sagebrush matrix. Many lay-people confuse these younger pinyon and juniper woodlands with true woodland sites dependent on naturally fire-protected features.

Native Uncharacteristic Conditions

Scale Description

Juniper steppe was usually distributed across the landscape in patches that range from 10s-100s of acres in size. In areas with very broken topography and/or mesa landforms this type may have occurred in patches of several hundred acres.

Issues/Problems

Uncertainty exists about the fire frequencies of this ecological system because juniper does not generally survive fire and most fire study for pinyon and/or juniper are from other regions with fire scars recorded on conifers that experience more frequent fire.

Comments

This is essentially the same model as the Rapid Assessment model R2PIJU developed by Steve Bunting (sbunting@uidaho.edu), Krista Waid-Gollnick (krista_waid@blm.gov) and Henry Bastian (henry_bastian@ios.doi.gov) for juniper and/or pinyon savanna. Mean FRIs are somewhat longer due to the more arid Great Basin context. Reviewers of R2PIJU were George Gruell (ggruell@charter.net), Jolie Pollet (jpollet@blm.gov) and Peter Weisberg (pweisberg@cabnr.unr.edu).

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

Vegetation Classes

Class A **2%**

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Description

Indicator Species* and Canopy Position

HECO26	Upper
ELEL5	Upper
ACHY	Upper
CRYP	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0%	10%
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

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

Initial post-fire community dominated by annual forbs. Later stages of this class contain greater amounts of perennial grasses and forbs. Evidence of past fires, charcoal, and other evidence can be observed. Duration 20yrs with succession to B, mid-development open. Replacement fire occurs every 300yrs on average. Infrequent mixed severity fire (average FRI of 200yrs) thins vegetation but has no effect on succession age.

Class B **2%**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

HECO26	Mid-Upper
ARNO4	Upper
ELEL5	Mid-Upper
ACHY	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	5%	10%
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Dominated by perennial forbs and grasses, with early shrub establishment. Total cover remains low due to shallow unproductive soil. Duration 20yrs with succession to C unless infrequent replacement fire (FRI of 300yrs) returns the vegetation to A. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed severity fire (average FRI of 200yrs) thins the woody vegetation but does not change its succession age.

Class C **6%**

Mid Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARNO4	Middle
ELEL5	Low-Mid
JUOS	Upper
ACHY	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10%	20%
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform.

Juniper seedlings emerging from vegetation dominated by shrubs. Juniper cover may be 5-20%; less than 5 m tall.

Description

Shrub dominated community (10-25% cover) with young juniper seedlings becoming established. Duration 60yrs with succession to D unless replacement fire (average FRI of 300yrs) causes a transition to A. It is important to note that replacement fire at this stage does not eliminate perennial grasses. Mixed severity fire as in B.

Class D **25%**

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOS	Upper
ARNO4	Middle
ELEL5	Low-Mid
ACHY	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0%	15%
Height	Tree 0m	Tree 5m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

Community dominated by young to mature juniper of mixed age structure. Juniper becoming competitive on site and beginning to affect understory composition. Duration 300yrs with succession to E unless replacement fire (average FRI of 1000yrs) causes a transition to A. Mixed severity and surface fire are less frequent than in previous states (500yrs).

Class E **65 %**

Late Development 2 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

JUOS	Upper
ARNO4	Middle
ELEL5	Lower
ACHY	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	15 %	30 %
Height	Tree 0m	Tree 5m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Site dominated by widely spaced old juniper. Grasses (eg,Hesperostipa comata) present on microsites with deeper soils (>20in) with restricting clay subsurface horizon. Shrubs are present. Replacement fire is rare (average FRI of 1000yrs). Mixed and surface fire every 1000yrs on average will scar ancient trees. Duration 600rs+.

Disturbances

Fire Regime Group:** **III**

Historical Fire Size (acres)

Avg 5
Min 1
Max 100

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	833	100	1000	0.00120	22
Mixed	417	100	1000	0.0024	44
Surface	555			0.00180	33
All Fires	185			0.00540	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711230 Columbia Plateau Steppe and Grassland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

Modeler 1	Cheri Howell	chowell02@fs.fed.us	**Reviewer**	Mike Zielinski	mike_zielinski@nv.blm.gov
Modeler 2			**Reviewer**	Terri Barton	terri_barton@nv.blm.gov
Modeler 3			**Reviewer**		

Vegetation Type
Upland Savanna and Shrub-Steppe

Map Zone
17

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

Dominant Species*
LETR5
MURI
ARCAV2
ELTR7

General Model Sources
- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Geographic Range
ID, NV and OR. This system occurs throughout much of the Columbia Plateau.

Biophysical Site Description
Elevations range from 5000-5500ft. This type is mostly found with basalt or rhyolite substrate. Soils range from relatively very deep, medium to fine textured, imperfectly drained and non-saline often with a microphytic crust. BpS is often associated with large depressions that accumulate soil mositures. Temperature regime is usually frigid. Slopes are generally less than two percent.

Vegetation Description
These are grasslands within the sagebrush shrub-steppe ecological system. This grassland is dominated by rhizomatous perennial grasses and forbs (>75% cover) sometimes with a sparse (<10% cover) shrub layer. Associated graminoids include creeping wildrye, mat muly and slender wheatgrass. Common forbs are poverty weed and dandelion. Grasslands are used abundantly by greater sage grouse, antelope and other native herbivores.

Disturbance Description
Wet cycles (mean 55yrs) or fire eliminated shrubs from the community. Fire frequency is presumed to be about 50yrs maintaining this system as a grassland. Fire intervals were probably coupled to those of the surrounding sagebrush steppe.

Native herbivory is very likely in this system. During pre-settlement times, antelope and bison (if bison reached the southern Columbia Plateau) were likely herbivores.

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Adjacency or Identification Concerns

Similar system on drier sites would be dominated by mountain silver sagebrush (>25% shrub cover).

Sites are suitable for conversion via dryland pasture grass seeding.

Fine-testured soils are prone to compaction with heavy off-highway vehicle and grazing use.

With ground disturbance sites are prone to increase in tap-rooted and annual, weedy forbs, increase in shrubs and increase in less desirable forbs (poverty weeds).

Native Uncharacteristic Conditions

Scale Description

Stands vary from ten acres to 300ac in size on the southern Columbia Plateau of MZs 12 and 17. Grasslands are often associated with large depression areas within the sagebrush matrix.

Issues/Problems

Comments

Original model and description of BpS 1123 was developed for a higher elevation grassland that may not be present on the Columbia Plateau. Reviewers recommend substantial changes to the original model and description by using NRCS ecological site descriptions for depression grasslands on the Columbia Plateau. Class C was removed from 3-box model, duration of class A was extended, wet cycles where introduced as a disturbance removing shrubs, and the MFRI was extended from 20yrs to 50yrs. It is believed that elevation of the water table for a long period is more critical for shrub removal than fire.

Final quality control of this type (Pohl, 6/29/2005) resulted in slight changes to the model. Fire was described as having a 50yr MFI, but occurred with a frequency of 20yrs in class B in the VDDT model. Additionally, a rule violation (replacement fire in class A had no relative age) was adjusted. This resulted in no change to the class percentages, but a slight change in the overall fire frequency (from 38yrs to 50yrs), and agreed with model description.

Vegetation Classes

Class A 80 %

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

LETR5	Upper
MURI	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	50 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Grassland dominated by rhizomatous grasses, generally with 30-50% cover. Succession to class B after 55yrs. Replacement fire occurs every 50yrs on average.

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Class B 20%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

ARCAV2	Upper
LETR5	Upper
MURI	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	31 %	50 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Description

Dominant cover is herbaceous with heights ranging from herbaceous short to herbaceous medium and herbaceous canopy cover ranging from 0-50%.

Grasslands with shrub component (30-50% cover of shrubs, mostly mountain silver sagebrush). Wet cycles remove shrubs every 55yrs on average. Replacement fire occurs every 50yrs on average.

Class C 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 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 10
Min 1
Max 300

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	50	20	100	0.02	100
Mixed					
Surface					
All Fires	50			0.02002	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [x] Wind/Weather/Stress
- [x] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711240 Columbia Plateau Low Sagebrush Steppe

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1	Crystal Kolden	ckolden@gmail.com	**Reviewer**	Mike Zielinski	mike_zielinski@nv.blm.gov
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Modeler 3			**Reviewer**		

Vegetation Type

Upland Savanna and Shrub-Steppe

Map Zone

17

Model Zone

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

Dominant Species*

ARAR8 FEID
ARARL CHVI8
ACTH7
PSSP6

General Model Sources

☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

Eastern OR, northern, central and western NV (at higher elevations) and southern ID. BpS will occur in large patches in eastern and central NV where similar substrates are found on higher elevation mountain tops and mesas.

Biophysical Site Description

This type describes low sagebrush on shallow soils where a clay pan produces seasonally perched water. Occurs on lowlands, erosional fan remnants, pediments of volcanic,granititic or quartzite base material, rock pedimant remnants, sideslopes and summits of mountains, and foothills. Subsoils swell on wetting and crack on drying, depth to a fine-textured subsoil ranges from 5-10in, and tend to have a high percentage of course fragments (gravels, cobbles, rocks or stones). Where soils are influenced by aeolian calcareous dust additions originating from local playas or another source, black sage can occur. Low sage tends to grow where claypan layers exist in the soil profile and soils are often saturated during a portion of the year. Elevations range from 1000m at higher latitudes to 3000m in lower latitudes. Where concave areas or drainages occur, Wyoming or basin big sagebrush (at lower elevations) and mountain big sagebrush (at higher elevations) will dominate. Precipitiation is in this sites ranges from 10-16in per year.

Vegetation Description

This type includes communities dominated by low sagebrush (Artemisia arbuscula), low gray sagebrush (Artemisia arbuscula ssp. arbuscula) and in some cases early sagebrush (Artemisia arbuscula ssp. longiloba) replaces low sagebrush. Although these types do not usually grow in combination, they do share similar fire regimes. Other shrubs growing on site may include antelope bitterbrush (Purshia tridentata) and/or Douglas rabbitbrush (Chrysothamnus viscidiflorous). Dwarf sagebrushes generally have relatively low fuel loads with low growing and cushion forbs and scattered bunch grasses such as bluebunch

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wheatgrass (Pseudoroegneria spicata), needlegrasses (Achnatherum spp), Sandberg's bluegrass (Poa secunda), Idaho fescue (Festuca idahoensis), Prairie junegrass (Koeleria macrantha), Thurber's needlegrass (Achnatherum thurberanium) and Indian ricegrass (Achnatherum hymenoides). The presence of Idaho fescue does not occur in more southerly and easterly dwarf-sage sites. Forbs often include buckwheats (Eriogonum spp), fleabanes (Erigeron spp), phloxs (Phlox spp), paintbrushes (Castilleja spp), goldenweeds (Haplopapus spp) and lupines (Lupinus spp).

Disturbance Description

Low sagebrush generally supports less fire than black sagebrush. This type generally burns more frequently with mixed severity (average FRI of 75-125yrs) because of the dominance of fine fuel on the site. Less bare ground than black sagebrush sites, allowing for more frequent mixed severity fire and less stand-replacing. Stand-replacing fires (average FRI of 230-250yrs) can occur in this type when successive years of above average precipitation are followed by a dry winter, dry spring and high winds are present with dry lightning (Miller and Rose 1999). Stand-driven replacing fires are primarily wind-driven and only cover small areas. This type fits best into Fire Regime Group III.

Grazing by wild ungulates occurs in this type due to its high palatability (mostly for A. nova and A. arbuscula) compared to other browse. Native browsing tends to open up the canopy cover of shrubs but does not often change the successional stage.

Low and early sagebrush types can be pockmarked by burrowing animals, especially ants, breaking through the root restrictive zone and creating a seedbed that is readily colonized by sagebrush. Burrowing creates small patches (ie, generally less than 200 sq. ft) of big sagebrush in the low sagebrush types, which could affect fuel loads. This was not considered in the model.

Adjacency or Identification Concerns

The low sagebrush type tends to occur over broad areas, with pockets of black sagebrush where there is a calcareous substrate, and Wyoming or mountain big sagebrush (in northern latitudes) in drainages or small concave pockets of deeper soils. In NV, where low sagebrush occurs at higher elevations, in rocky, open stands, pockets of curlleaf mountain mahogany with an understory of mountain sagebrush occur along the drainages.

Cheatgrass (Bromus tectorum) is likely to invade this site after disturbance.

Native Uncharacteristic Conditions

Scale Description

Low sagebrush communities can occur in small to 10000ac areas on mountains ranges. Disturbance patch size for this type is not well known but is estimated to be 10s-100s of acres due to the relatively small proportion of the sagebrush matrix it occupies and the limited potential for fire spread.

Issues/Problems

Comments

BpS 1124 was based on the Rapid Assessment model R2SBDW developed by Gary Medlyn (gmedlyn@nv.blm.gov) and Sarah Heidi (sarah_heidi@blm.gov). Reviewers of R2SDDW were Mike Zielinski (mike_zielinski@nv.blm.gov), Gary Back (gback@srk.com) and Paul Tueller (ptt@intercomm.com). Modifications were made to BpS 1124 after reviews: 1) longer mean FRI for mixed severity fire in mid-development; 2) shorter mean FRI in late development; 3) longer mean FRI for replacement fire in late development; and 5) removal of short term drought effects throughout.

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**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.

Suggested reviewers for BpS 1124 MZs 12 and 17: Mike Zielinski (mike_zielinski@nv.blm.gov) and Ed Horn (ed_horn@or.blm.gov).

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

Vegetation Classes

Class A 10%

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PSSP6	Middle
CHVI8	Upper
FEID	Middle
ACTH7	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	6 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant lifeform is herbaceous (15-25% cover), however rabbitbrush will be the upper layer lifeform at less than six percent cover.

Description

Early seral community dominated by herbaceous vegetation; less than six percent sagebrush canopy cover; up to 24yrs post-disturbance. Replacement fire occurs every 250yrs on average. Succession to B after 24yrs.

Class B 70%

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARAR8	Upper
CHVI8	Middle
PSSP6	Middle
ACTH7	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	15 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant lifeform is herbaceous with cover 15-25%. Height 0.2-0.4m.

Description

Mid-seral community with a mixture of herbaceous and shrub vegetation; 6-15% sagebrush canopy cover present; between 20-59yrs post-disturbance. Drought every 3-4yrs reduces the herbaceous cover. Replacement fire (FRI of 250yrs) causes a transition to A, whereas mixed severity fire (FRI of 150yrs) maintains the site in its present condition. In the absence of fire for 120yrs, the site will follow an alternative successional path to C. Otherwise, succession and mixed severity fire keeps site in class B.

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Class C 20 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARAR8	Upper
FEID	Middle
ARARL	Upper
PSSP6	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	16 %	30 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Herbaceous component is co-subdominant with shrub cover. Canopy cover 10-15%. Height 0.2-0.4m.

Description

Late seral community with a mixture of herbaceous and shrub vegetation; >10% sagebrush canopy cover present; 75yrs+ post-disturbance. In class C, replacement fire is every 250yrs on average (transition to A), whereas mixed severity fire happens on average every 100yrs. Mixed severity fire causes a transition to B. Succession will keep the site in class C without fire.

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

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

Historical Fire Size (acres)

Avg 90
Min 1
Max 2000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	250	250	250	0.004	36
Mixed	143			0.00699	64
Surface					
All Fires	91			0.01100	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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

Biophysical Setting: 1711250 Inter-Mountain Basins Big Sagebrush Steppe

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 2/23/2005

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Modeler 3			**Reviewer**

Vegetation Type
Upland Savanna and Shrub-Steppe

Map Zone
17

Model Zone

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

Dominant Species*
ARTRW
PSSP6
STTH2
POSE

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
This widespread matrix-forming ecological system occurs throughout much of the Columbia Plateau and northern Great Basin and WY and is found at slightly higher elevations farther south.

Biophysical Site Description
Sagebrush steppe is found in continental, semi-arid climate with highly variable annual precipitation >7-12in (~180-300mm) (McArthur 2000) that may also include 14in precipitation zone. 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 <40in (~1m). NRCS Range Sites: Loamy 8-10in and 10-12in precipitation zones, and shallow loam 10-14in precipitation zones.

Vegetation Description
This shrub-steppe is dominated by perennial grasses and forbs (>25% cover) with Artemisia tridentata ssp. tridentata, Artemisia tridentata ssp. wyomingensis and/or Purshia tridentata dominating or codominating the open to moderately dense (10-40% cover) shrub layer. In southern ID and northern UT, Artemisia tridentata ssp. wyomingensis dominates large landscape. Atriplex confertifolia, Chrysothamnus viscidiflorus, Ericameria nauseosa or Tetradymia spp may be common especially in disturbed stands. Associated graminoids include Achnatherum hymenoides, Elymus lanceolatus ssp. lanceolatus, Festuca idahoensis, Festuca campestris, Koeleria macrantha, Poa secunda and Pseudoroegneria spicata. Common forbs are Phlox hoodii, Arenaria spp and Astragalus spp. Areas with deeper soils more commonly support Artemisia tridentata ssp. tridentata but have largely been converted for other land uses.

The sagebrush steppe landscape is a mosaic of shrub-dominated and herbaceous-dominated phases (West 2000). 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 (FEIS).

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Wyoming big sagebrush communities are critical habitat for greater sage grouse and other sagebrush obligate species.

Disturbance Description

Historically, fire was the principal disturbance within this vegetation type; other disturbances included insects (eg, moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75yrs), periods of drought and wet cycles and shifts in climate (return interval of 100yrs). Intervals between natural wildfires varied between 25yrs (northern Yellowstone National Park [Houston 1973], cited in West 2000) and 100yrs+ (West 2000). West (1983) and Miller and Eddelman (2000) cite mean FRI <100yrs for replacement fire. FEIS cites fire return interval ranges between 10-70yrs with mean of 40yrs for Wyoming sagebrush steppe. Studies cited in FEIS 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 75-94yrs) due to the continuity of fine fuel typical of steppe ecosystems. Mixed severity (25-75% of area inside burn perimeter topkilled) played a minor role during mid-development. Assuming a MFI of 75yrs (from the total fire probability), the mean FRI of mixed severity fire was 20% of fires, thus a mean FRI of 375yrs, during mid-development. Re-establishment following fire is from seed germination and establishment. Establishment is dependent upon soil seedbank and/or proximity of seed sources, fire size and continuity and climatic conditions.

Adjacency or Identification Concerns

The NatureServe description of BpS 1125 includes different species of sagebrush and steppe ecosystems that are structurally and ecologically different such as Artemisia tridentata ssp. tridentata and Artemisia tridentata ssp. wyomingensis. We highly recommend that, at least, Artemisia tridentata ssp. tridentata, which is a taller shrub found in drainages and deeper soils, be separated from the other shrubs. Ultimately, the two sagebrush species should be modeled separately. Artemisia tripartita ssp. tripartita is not part of this system in NV because it is generally associated with frigid soils (thus more typically mountain big sagebrush) under snow pockets. Bitterbrush is not found in a large area of northcentral NV on the more alkaline soils of Pleistocene Lake Lahontan.

Wyoming big sagebrush is known to hybridize with other subspecies of the big sagebrush complex; ie, 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.

Invasion of cheatgrass has transformed this ecological system into large areas of uncharacteristic annual grasslands and shrublands with understories where anuual grasses replaced perennial grasses.

Native Uncharacteristic Conditions

Scale Description

Sagebrush steppe covers vast landscapes >10000ac with inclusions of low sagebrush and basin big sagebrush. 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

West (2000) cites wide range in FRI (25-100yrs). West (1983) and Miller and Eddelman (2000) recommend a FRI of <100yrs for replacement fire. FEIS gives 10-70yr range (40yr 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 100yrs (confirmed by Stephen Bunting

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and Dave Pyke). Given uncertainties and opinions of reviewers, a MFI of 75yrs was chosen. Without this shorter MFI and differences in fire behavior, there would be no difference between Wyoming sagebrush steppe from the Snake River plains and Wyoming big sagebrush semi-desert from central NV, UT and eastern CA. Because replacement fire is by far dominant over mixed severity fire, a FRG IV was selected to the recommendation of reviewers.

Comments

BpS 1125 for MZs 12 and 17 was obtained by slightly modifiying the description of BpS 1125 for MZ16 developed by Don Major (dmajor@tnc.org). BpS 1125 for MZ16 is completely based on R2SBWYse developed by Eric Limbach (eric_limbach@blm.gov) for Wyoming big sagebrush steppe and reviewed by Krista Waid-Gollnick/Sarah Heidi (krista_waid@blm.gov, Stanley Kitchen (skitchen@fs.fed.edu), Michael Zielinski (mike_zielinski@nv.blm.gov), Jolie Pollet (jpollet@blm.gov) and Gary Back (gback@srk.com).

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

Vegetation Classes

Class A 20%

Early Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PSSP6	Upper
STTH2	Upper
POSE	Upper
ARTRW8	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0%	5%
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Vegetation is primarily herbaceous with a few scattered shrubs accounting for < 5% cover.

Description

Perennial grasses and forbs dominate where woody shrub canopy has been top killed/removed by wildfire. Shrub cover less than six percent. (~0-19yrs). Replacement fire every 120yrs on average resets succesion back to zero. Succession to class B after 20yrs.

Class B 50%

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PSSP6	Lower
STTH2	Lower
ARTRW8	Upper
POSE	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5%	25%
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

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Class C 30 %

Late Development 1 Closed

Indicator Species* and Canopy Position

ARTRW	Upper
PSSP6	Lower
STTH2	Lower
POSE	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	25 %	35 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Description

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

Class D 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

Class E 0 %

[Not Used] [Not Used]

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.

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

Disturbances

Fire Regime Group: IV**

Historical Fire Size (acres)

Avg 250
Min 10
Max 10000

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals

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

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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**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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711260 Inter-Mountain Basins Montane Sagebrush Steppe

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

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Modeler 3		**Reviewer**	

Vegetation Type
Upland Savanna and Shrub-Steppe

Map Zone
17

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

Dominant Species*
ARTRV
PUTR2
SYOR2

General Model Sources
☑ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

Montane and subalpine elevations across the western US from 1000m in eastern OR and WA to over 3000m in the Southern Rockies, and within the mountains of NV, western UT, southeast WY and southern ID.

Biophysical Site Description

This ecological system occurs in many of the western states, usually at middle elevations (1000-2500m). Within the Great Basin mapping zone, elevation ranges from 1370m in ID to 3200m in the White Mountains of CA (Winward and Tisdale 1977, Blaisdell et al. 1982, Cronquist et al. 1994, Miller and Eddleman 2000). However, elevations are predominantly between 1525 and 2750m in the mountains of NV and western UT. The climate regime is cool, semi-arid to subhumid, with yearly precipitation ranging from 25-90cm/year (Mueggler and Stewart 1980, Tart 1996). Much of this precipitation falls as snow. Temperatures are continental with large annual and diurnal variation. In general this system shows an affinity for mild topography, fine soils and some source of subsurface moisture. Soils generally are moderately deep to deep, well-drained and of loam, sandy loam, clay loam or gravelly loam textural classes; soils often have a substantial volume of coarse fragments and are derived from a variety of parent materials. This system primarily occurs on deep-soiled to stony flats, ridges, nearly flat ridgetops and mountain slopes. Soils are typically deep and have well developed dark organic surface horizons (Hironaka et al. 1983, Tart 1996). However, at the high ends of its precipitation and elevation ranges mountain big sagebrush occurs on shallow and/or rocky soils. All aspects are represented, but the higher elevation occurrences may be restricted to south or west-facing slopes.

At lower elevations, mountain big sagebrush occurs on upper fan piedmonts, where it typically intermixes

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with Wyoming big sagebrush on north facing slopes. On mountain sideslopes at this elevation, it occurs on north-facing slopes. Where pinyon and juniper are present, it is usually on south-facing slopes with pinyon and juniper generally increasing on north-facing slopes within the sagebrush community. At mid-level elevations, mountain sagebrush begins to move into more southerly slopes intermingling with black sagebrush and low sagebrush and with mountain mahogany occurring on north-facing slopes. With continued elevation gain, curlleaf mountain mahogany generally crowds it out. Mountain big sagebrush then occupies drier sites at higher elevations.

Vegetation Description

Vegetation types within this ecological system are usually <1.5m tall and dominated by Artemisia tridentata ssp. vaseyana, Artemisia cana ssp. viscidula or Artemisia tridentata ssp. spiciformis. A variety of other shrubs can be found in some occurrences, but these are seldom dominant. They include Artemisia rigida, Artemisia arbuscula, Ericameria nauseosa, Chrysothamnus viscidiflorus, Ephedra viscidiflorus, Symphoricarpos oreophilus, Purshia tridentata, Peraphyllum ramosissimum, Ribes cereum and Amelanchier alnifolia. The canopy cover is usually between 20-80%. The herbaceous layer is usually well represented, but bare ground may be common in particularly arid or disturbed occurrences. Graminoids that can be abundant include Festuca idahoensis, Festuca thurberi, Festuca ovina, Elymus elymoides, Deschampsia caespitosa, Danthonia intermedia, Danthonia parryi, Stipa spp, Pascopyrum smithii, Bromus carinatus, Elymus trachycaulus, Koeleria macrantha, Pseudoroegneria spicata, Bromus anomalus, Achnatherum therburianum, Poa fendleriana or Poa secunda. Forbs are often numerous and an important indicator of health. Forb species may include Castilleja, Potentilla, Erigeron, Phlox, Astragalus, Geum, Lupinus, Eriogonum, Balsamorhiza sagittata, Achillea millefolium, Antennaria rosea, Eriogonum umbellatum, Fragaria virginiana, Artemisia ludoviciana, Hymenoxys hoopesii (=Helenium hoopesii), etc. Mueggler and Stewart (1980), Hironaka et al. (1983) and Tart (1996) described several of these types. This ecological system is critical summer habitat for greater sage grouse. Moreover, resprouting bitterbrush in mountain big sagebrush types is potentially important to wildlife in early stand development.

Disturbance Description

Mean fire return intervals in and recovery times of mountain big sagebrush are subjects of lively debate in recent years (Welch and Criddle 2003). Mountain big sagebrush communities were historically subject to stand replacing fires with a mean return interval ranging from 40yrs+ at the Wyoming big sagebrush ecotone, and up to 80yrs 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. Therefore, replacement fire with a mean FRI of 40-80yrs was adopted here. 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 (Anderson and Inouye 2001, 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 (50-100yrs) 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 (eg, snowberry, bitterbrush) and size and severity of the burn. Mountain big sagebrush typically reaches 5% canopy cover in 8-14yrs. This may take as little as four years under favorable conditions and longer than 25yrs in unfavorable situations (Pedersen et al. 2003, Miller unpublished data). Mountain big sagebrush typically reaches 25% canopy cover in about 25yrs, but this may take as few as nine years or longer than 40yrs (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).

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Adjacency or Identification Concerns

In MZ16, BpS 1126 was separated into two very distinct montane sagebrush steppe not distinguished by NatureServe: Inter-Mountain Basins Montane Sagebrush Steppe dominated by mountain big sagebrush (1126big) and Inter-Mountain Basins Montane Sagebrush Steppe dominated by low sagebrush (1226low). Both systems cover large high-elevation areas in the Intermountain West. Mountain big sagebrush is a tall shrubs with a mean FRI from 10-70yrs, whereas high-elevation low sagebrush is a dwarf shrub with a mean FRI of 200yrs+. For MZs 12 and 17, mountain big sagebrush communities fall into this model (BpS 1126), while mountain low sagebrush communtities fall into BpS 1124.

The NatureServe description does not distinguish between mountain big sagebrush that can be invaded by conifers at mid to high elevations (ie, within the tolerance of pinyon and juniper) and mountain sagebrush steppe that is too high elevation for pinyon to encroach. The ability for pinyon to invade has a large effect on predicted HRV and management.

This type may be adjacent to forests dominated by aspen, Douglas-fir, limber pine and bristlecone pine. It also occurs adjacent to pinyon-juniper woodlands. The ecological system, where adjacent to conifers, is readily invaded by conifers (Douglas-fir, sub-alpine fir, whitebark pine, limber pine, pinyon-pine and juniper spp) in the absence of historic fire regimes (Miller and Rose 1999). This type probably served as an ignition source for adjacent aspen stands. Mountain big sagebrush is commonly found adjacent to or intermingled with low sagebrush and mountain shrublands.

Uncharacteristic conditions in this type include herbaceous canopy cover <40% and dominance of the herbaceous layer by mulesears (Wyethia amplexcaulis) on clayey soils.

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.

Native Uncharacteristic Conditions

Scale Description

This type occupies areas ranging in size from 10s-10000s of acres. Disturbance patch size can also range from from 10s-1000s of acres. The distribution of past burns was assumed to consist of many small patches in the landscape.

Issues/Problems

This was initially 1126_a (Mountain Big Sagebrush) model from MZ16, which was itself based on Rapid Assessment models R2SBMT and R2SBMTwc where the reviewers and modelers had very differents 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 20yrs, 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 10-70yrs. 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). For MZs 12 and 17, modelers place this system in Fire Regime Group IV.

If conifers are not adjacent to this system, such as in the Tuscarora range, Santa Rose range and similar regions, use a three-box model with the following percentages per box: 20% A, 45% B, 35% C.

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**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.

Comments

BpS 1126 for MZs 12 and 17 was based on BpS 1126_a (Mountain Big Sagebrush) from LF MZ16. BpS 1126_a is essentially PNVG R2SBMTwc (mountain big sagebrush with potential for conifer invasion) developed by Don Major (dmajor@tnc.org), Alan R. Sands (asands@tnc.org), David Tart (dtart@fs.fed.us) and Steven Bunting (sbunting@uidaho.edu). R2SBMTwc was itself based on R2SBMT developed by David Tart. R2SBMtwc was revised by Louis Provencher (lprovencher@tnc.org) following critical reviews by Stanley Kitchen (skitchen@fs.fed.us), Michele Slaton (mslaton@fs.fed.us), Peter Weisberg (pweisberg@cabnr.unr.edu), Mike Zielinski (mike_zielinski@nv.blm.gov) and Gary Back (gback@srk.com).

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.

Vegetation Classes

Class A 20 %

Early Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

PSSP6	Upper
FEID	Upper
SYOR2	Lower
ARTRV	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	5 %
Height	Shrub 0m	Shrub 0.5m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Dominant vegetation is herbaceous with scattered shrubs. Herbaceous cover is 0-80%.

Description

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

Class B 50 %

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 1

Indicator Species* and Canopy Position

ARTRV	Upper
PUTR2	Upper
CONIFE	Lower
SYMPH	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	6 %	25 %
Height	Shrub 0m	Shrub >3.1m
Tree Size Class	Seedling <4.5ft	

☑ Upper layer lifeform differs from dominant lifeform.

Herbaceous cover is the dominant lifeform with canopy >50%. Shrub cover is 6-25% and the upper lifeform.

Description

Shrub cover 6-25%. Mountain big sagebrush cover up to 20%. Herbaceous cover is typically >50%. Initiation of conifer seedling establishment. Replacemenfire mean FRI is 40yrs. Succession to class C after 38yrs.

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Class C 15 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTRV	Upper
PUTR2	Upper
SYMPH	Low-Mid
CONIFE	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	26 %	45 %
Height	Shrub 0m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

Class D 10 %

Late Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 2

Indicator Species* and Canopy Position

CONIFE	Upper
ARTRV	Mid-Upper
PUTR2	Mid-Upper
SYMPH	Low-Mid

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	10 %	25 %
Height	Tree 0m	Tree 10m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☑ Upper layer lifeform differs from dominant lifeform.

Shrub cover generally decreasing but remains between 26-40% Conifers cover 10-25%.

Description

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

Class E 5 %

Late Development 2 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 6

Indicator Species* and Canopy Position

CONIFE	Upper
ARTRV	Mid-Upper
PUTR2	Mid-Upper
SYMPH	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	26 %	80 %
Height	Tree 0m	Tree 10m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Conifers are the dominant lifeform (juniper, pinyon-juniper, ponderosa pine, limber pine or white fir). Conifer cover ranges from 26-80% (pinyon-juniper 36-80% (Miller and Tausch 2000), juniper 26-40% (Miller and Rose 1999), white fir 26-80%). Shrub cover 0-20%. Herbaceous cover <20%. The mean 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 75yrs on average.

Disturbances

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**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.

Fire Regime Group:** IV

Historical Fire Size (acres)

Avg 100
Min 10
Max 10000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	49	15	100	0.02041	100
Mixed					
Surface					
All Fires	49			0.02043	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711270 Inter-Mountain Basins Semi-Desert Shrub-Steppe

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/18/2005

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Modeler 3			**Reviewer**		

Vegetation Type

Upland Savanna and Shrub-Steppe

Map Zone

17

Model Zone

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

Dominant Species*

GRSP
TETRA3
ARTRW
ATCO

General Model Sources

☐ Literature
☐ Local Data
☑ Expert Estimate

Geographic Range

This ecological system occurs throughout the intermountain western U.S.

Biophysical Site Description

Found at elevations ranging from 4000-5000ft. The climate where this system occurs is generally hot in summers and cold in winters with low annual precipitation, ranging from 5-10in and high inter-annual variation. Much of the precipitation falls as snow, and growing-season drought is characteristic. Temperatures are continental with large annual and diurnal variation. Sites are generally alluvial fans and flats with moderate to deep soils. Substrates are generally calcareous derived from alluvium, medium to coarse-textured alluvial soils. Soils may be alkaline and typically moderately saline (West 1983).

This group generally lies above salt desert shrub and below sagebrush types. Both to the north and up slope it is bordered by low elevation big sagebrush groups, commonly ARTRWY, ARAR8 and ARNO4 communities. To the south this group is bordered by Mojave Desert transition communities.

Vegetation Description

The plant associations in this system are characterized by a somewhat sparse to moderately dense (10-70% cover) shrub layer of Grayia spinosa, Artemesia tridentata, Ephedra nevadensis, Ephedra viridis, Chrysothamnus viscidiflorus, Sarcobatus vermiculatus or Atriplex canescens. Shrub Tetradymia canescens may be occasionally present. The herbaceous layer is dominated by bunch grasses which occupy patches in the shrub matrix. The most widespread species is Heterostipa comata and Achnatherum hyminoides. Other locally dominant or important species include Leymus cinereus, Pascopyrum smithii, Pleuraphis jamesii, Elymus lanceolatus, Elymus elymoides, Koeleria macrantha, Hesperostipa comata and Poa secunda. Forbs

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are generally of low importance and are highly variable across the range, but may be diverse in some occurrences. Species that often occur are Astragalus, Oenothera, Eriogonum and Balsamorhiza. Mosses and lichens may be important ground cover.

Disturbance Description

Disturbance is unpredictable in these systems. However, drought, insects and fire may all occur here. Drought periods occurred approximately every 75yrs.

Documented Mormon cricket/grasshopper outbreaks since settlement have corresponded with drought; outbreaks cause shifts in composition amongst dominant species, but do not typically cause shifts to different seral stages. Therefore insect disturbance was not modeled. During outbreaks Mormon crickets prefer open, low plant communities. Herbaceous communities and the herbaceous component of mixed communities were more susceptible to cricket grazing.

Fire was infrequent and somewhat dependent on fire importation from the upper sagebrush zone. Replacement fire was the primary fire with mean FRI (200-300yrs) increasing with shrub development intermixed with grass.

Adjacency or Identification Concerns

This BpS is transitional between salt desert shrub (1081) and Inter-Mountain Basins Big Sagebrush Shrublands (1080) and is truly considered a higher elevation type of salt desert shrublands. Intermingling of both ecological systems on different lifeforms and aspects on alluvial fans creates this BpS.

This ecological system contains the typical Great Basin salt desert shrub communities. Salt desert shrub is also common in the Wyoming big sagebrush community and there is some species overlap. A wide range of salt desert shrubs can occur in this group.

Indian ricegrass can dominate sites with sand sheets, or surfaces, however, the temporal nature of this condition is unknown.

Upland shrub communities are easily invaded and, in the short term at least, replaced by cheatgrass. Other nonnative problematic annuals include halogeton, Russian thistle and several mustards. Through central UT and east central NV this group is susceptible to invasion by squarrose knapweed. More mesic areas can be invaded by tall whitetop and hoary cress. All three are noxious weeds in Great Basin states.

Native Uncharacteristic Conditions

Scale Description

Grayia spinosa communities occupy a narrow elevation band that can be extensive in many valleys (>10000ac). Disturbance scale was variable during pre-setlement. Droughts and extended wet periods could be region wide, or more local. A series of high water years or drought could affect whole basins.

Most fires were rare and less than one acre, but may have exceeded hundreds of acres with a good grass crop.

Issues/Problems

Comments

Originally, BpS 1127 for MZs 12 and 17 was based on the model results for BpS 1081 (salt desert shrub) developed by Gary Medlyn (gmedlyn@nv.blm.gov) and Don Major (dmajor@tnc.org) because 1127 and

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1081 are both salt desert shrub systems. Reviewers recommended significant changes to the description and model to adapt this model to the spiny hopsage ecological site description. Spiny hopsage, a salt desert species, does not respond to drought and extended wet periods as does shadscale (BpS 1081). Moreover, spiny hopsage communities support a higher cover of Indian ricegrass than shadscale (little grass cover) and contain Wyoming and basin big sagebrushes. Therefore, class C was removed from the model, MFRIs shortened, and the explicit effect of wet extended periods removed from the model. Descriptions for 1127 are from NatureServe and modified according to the NRCS ecological site descriptions for spiny hopsage. Annie Brown (annie_brown@blm.gov), Jolie Pollet (jpollet@blm.gov) and Stanley Kitchen (skitchen@fs.fed.us) developed 1081 for MZ16, which was based on PNVG R2SDSH from the Great Basin Rapid Assessment. Greasewood box was removed from R2SDSH by Jolie Pollet, Annie Brown and Stanley Kitchen to build this model. Model was greatly simplified at that time. Original descriptions by Bill Dragt were kept. Reviewers of R2SDSH were Stanley Kitchen (skitchen@fs.fed.us), Mike Zielinski (mike_zielinski@nv.blm.gov) and Jolie Pollet (jpollet@blm.gov).

Vegetation Classes

Class A 30 %

Early Development 1 All Structures

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

ACHY	Mid-Upper
HECO26	Upper
GRSP	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	10 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Dominated by continuous Indian ricegrass with widely scattered shrubs and relatively younger shrubs than in Class B . Over 20yrs, vegetation moves to Class B. Replacement fire occurs every 200yrs on average, and will set back succession to year zero. Climate (every 75yrs) will also have a stand replacing effect.

Class B 70 %

Mid Development 1 Open

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Indicator Species* and Canopy Position

GRSP	Upper
ARTR2	Upper
ACHY	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	11 %	30 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Discontinous grass patches, and higher shrub canopy cover than in Class A. Spiny hopsage dominates. Climate (every 75yrs) will shift vegetation back to Class A. Replacement fire is infrequent (mean FRI of 200yrs).

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Class C 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class D 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class E 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group: V**

Historical Fire Size (acres)

Avg 10
Min 1
Max 1000

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	227	100	500	0.00441	100
Mixed					
Surface					
All Fires	227			0.00443	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**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.

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711350 Inter-Mountain Basins Semi-Desert Grassland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/30/2005

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Modeler 2	Louis Provencher	lprovencher@tnc.org	**Reviewer**
Modeler 3			**Reviewer**

Vegetation Type

Upland Grasslands and Herbaceous

Map Zone

17

Model Zone

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

Dominant Species*

ACHY GRSP
HECO26 ATCA2
LECI4
ARTR2

General Model Sources

☑ Literature
☐ Local Data
☐ Expert Estimate

Geographic Range

Occurs throughout the Intermountain western US on sandsheets or stabilized dunes.

Biophysical Site Description

Ecological systems found at approximately 4200-5000ft of elevation in the Great Basin. These grasslands occur in lowland and upland areas and may occupy sandsheets, stabilized dunes, swales, playas, mesatops, plateau parks, alluvial flats and plains, but sites are typically xeric. Substrates are often excessively to well-drained sandy or loamy-textured soils derived from sedimentary parent materials but are quite variable and may include fine-textured soils derived from igneous and metamorphic rocks. These grasslands typically occur on aradic sites. When they occur near foothill grasslands they will be at lower elevations. These grasslands occur on a variety of aspects and slopes. Sites may range from flat to moderately steep. Annual precipitation is usually from 6-10in in the Great Basin.

Vegetation Description

Grasslands within this system are typically characterized by a sparse to moderately dense herbaceous layer dominated by medium-tall and short bunch grasses. The dominant perennial bunch grasses and shrubs within this system are all very drought-resistant plants. These grasslands are typically dominated or codominated by Achnatherum hymenoides or Hesperostipa comata and may include scattered shrubs and dwarf-shrubs of species of Artemisia tridentata, Atriplex canescens, Ephedra or Krascheninnikovia lanata.

Disturbance Description

This system is maintained by frequent fires and sometimes associated with specific soils, often well-drained clay soils. Fire most often occurred in these sites, when adjacent shrublands (BpS 1080, 1125) burned. Therefore, the disturbance dynamics of this system are identical to those of BpS 1125: hence, it was

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**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.

assumed that dominant fires were stand replacement (mean FRIs of 75-94yrs) due to the continuity of fine fuel. Mixed severity fire played a minor role during late-development. Assuming a MFI of 75yrs (from the total fire probability), the mean FRI of mixed severity fire was 20% of fires, thus a mean FRI of 375yrs, during mid-development. Re-establishment following fire is from resprouting grasses with shrubs re-establishing from seed over time. Other disturbances included insects (eg, moths and grasshoppers that eat leaves, moth larval grubs that eat roots; return interval of 75yrs), periods of drought and wet cycles and shifts in climate (return interval of 100yrs).

Native American's likely used these sites for camping and vegetation collection (seeds of Indian ricegrass).

Adjacency or Identification Concerns

NatureServe description for BpS 1135 includes Muhlenbergia-dominated grasslands which flood temporarily. Muhlenbergia grasslands and flooding are not part of these sandy systems in NV.

Found adjacent to BpS 1125 and 1080, sagebrush steppe and semi-desert. Fires in sagebrush types spread to BpS 1135.

Many of these sites were impacted by introduced grazing animals post-Europeon settlement and have been converted to shrub dominated systems.

Cheatgrass is present in these ecological systems but do not dominate due to the high sand content.

Native Uncharacteristic Conditions

Scale Description

Semi-desert grassland can be large (>10000ac) when associated with extensive sandsheet systems. Historic disturbance (fire) likely ranged from small (<10 acres) to large (>10000ac) depending on conditions, time since last ignition and fuel loading. Assumed the average patch size of fire is 250ac.

Issues/Problems

The scale of historic fire is unknown and numbers provided are a guess. Native burning was presumably important to encourage seed production, but data are lacking.

Comments

BpS 1135 for MZs 12 and 17 is completely different from BpS 1135 for MZ16. BpS 1135 uses the model and disturbance regime of BpS 1125 (and 1080 without trees) for MZs 12 and 17 because the two systems are highly coupled, however BpS 1135 lacks class C because it is a grassland with shrub encroachment.

Vegetation Classes

Class A **20 %**

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Description

Indicator Species* and Canopy Position

ARTR2	Upper
HECO26	Upper
ACHY	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	40 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

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

Perennial grasses and forbs dominate (generally 25-40% cover) where woody shrub canopy has been top killed/removed by wildfire. Shrub cover is less than five percent. Replacement fire occurs every 120yrs on average. Succession to class B after 20yrs.

Class B **80%**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 2

Indicator Species* and Canopy Position

ARTR2	Upper
HECO26	Low-Mid
ACHY	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	25 %
Height	Shrub 0m	Shrub 1.0m
Tree Size Class	None	

☑ Upper layer lifeform differs from dominant lifeform.

Herbaceous layer is >25% cover whereas shrub cover is <25%.

Description

Shrubs compose the upper layer lifeform (5-25% cover) with diverse perennial grass and forb understory dominant. MFI is 75yrs with 80% replacement fire (mean FRI of 94yrs) and 20% mixed severity fire (mean FRI of 375yrs). Mixed severity fire, insect/disease (return interval of 75yrs) and weather related stress (return interval of 100yrs) maintains vegetation in class B.

Class C **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 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.

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

Description

Disturbances

Fire Regime Group:** IV

Historical Fire Size (acres)

Avg 250
Min 10
Max 10000

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	98	30	120	0.01020	82
Mixed	454	120	500	0.00220	18
Surface					
All Fires	81			0.01242	

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.

Additional Disturbances Modeled

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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**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.

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711450 Rocky Mountain Subalpine-Montane Mesic Meadow

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

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Modeler 3 **Reviewer**

Vegetation Type
Upland Grasslands and Herbaceous

Map Zone
17

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

Dominant Species*
LIGUS LUPIN
SENEC OSMOR
PENST THALI
HACKE ERIGE

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Found in the Rocky Mountains and Great Basin on high elevation ranges.

Biophysical Site Description
This Rocky Mountain ecological system is restricted to sites in the subalpine zone where finely textured soils, snow deposition or wind-swept dry conditions limit tree establishment. Typically above 3000m (9800ft) in elevation in the southern part of its range and above 1500m (5000ft) in the north. The soils are typically cryic and seasonally moist to saturated in the spring, but will dry out later in the growing season. These upland communities occur on gentle to moderate-gradient slopes. The sites are not as wet as those found in Rocky Mountain Alpine-Montane Wet Meadow (CES306.812).

Vegetation Description
BpS (1145) is commonly termed Tall Forbs. Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include Agastache urticifolia, Chamerion angustifolium, Erigeron spp, Senecio spp, Helianthella spp, Mertensia spp, Penstemon spp, Campanula spp, Hackelia spp, Lupinus spp, Solidago spp, Ligusticum spp, Osmorhiza spp, Thalictrum spp, Valeriana spp, Balsamorhiza sagittata, Wyethia spp, Bromus carinatus, Danthonia intermedia, Deschampsia caespitosa, Koeleria macrantha, Elymus tachycaulus, Phleum alpinum and Dasiphora fruticosa. Burrowing mammals can increase forb diversity.

Disturbance Description
Fires are primarily replacement and occur about every 40yrs. Fire Regime groups could be IV (chosen) or II. Mixed severity fire (mean FRI of 75yrs) occurs in late development meadows and removes shrubs. The ignition source in this type is probably associated with native burning in the fall and spring, but fire can spread from adjacent shrub or tree dominated sites, such as mountain big sagebrush, ponderosa pine or

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aspen.

Adjacency or Identification Concerns

In MZs 12 and 17 this could be confused with low forb/alpine shrub communities. Often adjacent to aspen/tall forb comunities and mountain or subalpine big sagebrush/tall forb communities. In degraded sites this community may convert to silver sagebrush/tall forb.

With heavy grazing these sites can convert to undesirable forbs and grasses such as Circium spp (thistle, any species), Galium spp (bedstraw), Rudbeckia occidentalis (coneflower), Helenium hoopesii (Orange sneezeweed), Polygonum spp. (knotweed), Rumex spp (sorrel or dock), Taraxacom officinale (dandelion), Veratrum californicum (false hellebore), Wyethia amplexicaulis (mulesears), Potentilla gracilis (cinquefoil), Geum marcophyllum (avens), Arnica chamissonis (arnica), Collomia linearis (tiny trumpet), Madia glomerata (mountain tarweed), Descurainia spp (tansymustard), Nemophila brevifolia (basin blue eyes), Poa pratensis (Kentucky bluegrass), Agrostis exarata (bentgrass), Dactylis glomerata (orchardgrass), Bromus inermis (smooth brome), Bromus tectorum (cheatgrass), Poa bulbosa (bulbous bluegrass) and Vulpia octoflora (six-week fescue).

Roads and trails can impact these sites.

Native Uncharacteristic Conditions

Scale Description

This type ranges in size from <10-300ac.

Issues/Problems

There is not much information about this type. We estimated the fire frequency of 40yrs based on adjacent aspen, herbaceous and sagebrush communities. Also, because fire was assumed to occur in the fall and spring when the summer's green and wet biomass would be dead and cured, replacement fire has little effect on tall forbs themselves and probably result in exposing more bare ground. Fires would affect encroaching shrubs.

Comments

There is not much information about this type. We estimated the fire frequency of 40yrs based on adjacent aspen, herbaceous and sagebrush communities. Also, because fire was assumed to occur in the fall and spring when the summer's green and wet biomass would be dead and cured, replacement fire has little effect on tall forbs themselves and probably result in exposing more bare ground. Fires would affect encroaching shrubs.

Vegetation Classes

Class A **5 %**

Early Development 1 Open

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Description

Indicator Species* and Canopy Position

ASTER	Upper
APIAC	Upper
BORAG	Upper
SCROP	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	60 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

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**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.

Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include Agastache urticifolia, Chamerion angustifolium, Erigeron spp, Senecio spp, Helianthella spp, Mertensia spp, Penstemon spp, Campanula spp, Hackelia spp, Lupinus spp, Solidago spp, Ligusticum spp, Osmorhiza spp, Thalictrum spp, Valeriana spp, Balsamorhiza sagittata, Wyethia spp, Bromus carinatus, Danthonia intermedia, Deschampsia caespitosa, Koeleria macrantha, Elymus tachycaulus, Phleum alpinum and Dasiphora fruticosa. Succession to class B after three years. Replacement fire (mean FRI of 40yrs) presumably occurred during the fall and spring.

Class B **45 %**

Mid Development 1 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

ASTER	Upper
APIAC	Upper
BORAG	Upper
SCROP	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	61 %	100 %
Height	Herb 0m	Herb >1.1m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include Agastache urticifolia, Chamerion angustifolium, Erigeron spp, Senecio spp, Helianthella spp, Mertensia spp, Penstemon spp, Campanula spp, Hackelia spp, Lupinus spp, Solidago spp, Ligusticum spp, Osmorhiza spp, Thalictrum spp, Valeriana spp, Balsamorhiza sagittata, Wyethia spp, Bromus carinatus, Danthonia intermedia, Deschampsia caespitosa, Koeleria macrantha, Elymus tachycaulus, Phleum alpinum and Dasiphora fruticosa. There is some increase in shrub component, but will occupy less than five percent cover. Succession to C after 20yrs. Replacement fire removes shrubs (mean FRI of 40yrs).

Class C **50 %**

Late Development 1 Open

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

ASTER	Middle
APIAC	Middle
BORAG	Middle
SCROP	Middle

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	10 %
Height	Shrub 0m	Shrub >3.1m
Tree Size Class	Seedling <4.5ft	

- [x] Upper layer lifeform differs from dominant lifeform.

Up to 10% of cover in late seral may be woody species from adjacent plant communities such as Populus tremuloides (acting as a shrub), Artemisia cana, Artemisia tridentata, Rosa woodsii, Ribes spp and Amelanchier spp.

Description

Vegetation is typically forb-rich, with forbs contributing more to overall herbaceous cover than graminoids. Important taxa include Agastache urticifolia, Chamerion angustifolium, Erigeron spp, Senecio spp, Helianthella spp, Mertensia spp, Penstemon spp, Campanula spp, Hackelia spp, Lupinus spp, Solidago spp, Ligusticum spp, Osmorhiza spp, Thalictrum spp., Valeriana spp, Balsamorhiza sagittata, Wyethia spp, Bromus carinatus, Danthonia intermedia, Deschampsia caespitosa, Koeleria macrantha, Elymus tachycaulus, Phleum alpinum and Dasiphora fruticosa. Five to 10% of cover in this class may be woody species from adjacent plant communities such as Populus tremuloides, Artemisia cana, Artemisia tridentata, Rosa woodsii, Ribes spp and Amelanchier spp. Mixed severity fire (mean FRI of 75yrs) removes shrubs from overstory (causing a transition to class B). Replacement fire (mean FRI of 40yrs) sets site back to class A.

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

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: II**

Historical Fire Size (acres)

Avg 50
Min 1
Max 300

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	40			0.025	80
Mixed	161			0.00621	20
Surface					
All Fires	32			0.03122	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☐ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711460 Southern Rocky Mountain Montane-Subalpine Grassland

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

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Modeler 3			**Reviewer**

Vegetation Type

Upland Grasslands and Herbaceous

Map Zone

17

Model Zone

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

Dominant Species*

DANTH	LECI4
FEID	LEKI2
PSSP6	KOMA
ELTRT	POFE

General Model Sources

☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range

Mid to high elevations in the Great Basin

Biophysical Site Description

This Great Basin ecological system typically occurs between 2200-3000m (7200-9800ft) on flat to rolling plains and parks or on lower side slopes that are dry, but it may extend up to 3350m (11000ft) on warm aspects. Soils somewhat resemble prairie soils in that the A-horizon is dark brown, relatively high in organic matter, neutral to slightly acidic and usually well-drained. Unlike prairie soils, these soils are generally cold and while loamy on the surface, grade to higher in coarse fragments at depth.

Vegetation Description

This BpS usually consists of a mosaic of two or three plant communities with one of the following dominant bunch grasses: Danthonia intermedia, Danthonia unispicata, Danthonia californica, Festuca idahoensis, Festuca rubra, Elymus trachycaulus, Leymus cinereus, Koeleria macrantha, Leucopoa kingiii, Poa fendleriana, Poa wheeleri, Pseudoroegneria spicata or various sedges (CAREX spp) in moist (concave) sites. The subdominants include Achnatherum lettermanii, Achnatherum nelsonii, Bromus carinatus, Deschampsia danthonoiodes, Poa cusickii and Poa secunda. These large-patch grasslands are intermixed with matrix stands of spruce-fir, lodgepole pine, ponderosa pine and aspen forest.

Disturbance Description

Predicted historic stand replacement fire regime of approximately 20ysr based upon the MZ16 model.

Adjacency or Identification Concerns

Montane grasslands are very similar and intergrade with their subalpine counterparts, but are separated here to represent those species that do not occur at higher altitudes.

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

With long-term fire suppression, these sites are prone to shrub encroachment.

Fine-grained soils are prone to compaction with heavy grazing use during early season when soils are moist.

Native Uncharacteristic Conditions

Scale Description

Type occurs in large patches of 10-100ac. In the Great Basin, occurences >100ac are uncommon.

Issues/Problems

Literature and concept for this system is based on Rocky Mountain systems. A few examples of montane-subalpine grasslands exist in the Great Basin (eg, Great Basin National Park and Mount Grant in western NV), but these are uncommon and small because montane big sagebrush or low sagebrush would usually dominate or surround these sites.

Comments

BpS 1146 for MZs 12 and 17 was based on the description and model from MZ16 with edits in species composition, geographic range and scale. Within the Great Basin dominant graminiod species vary by location and substrate. BpS 1146 for MZ16 was based on R3MGRA created by Wayne A. Robbie (wrobbie@fs.fed.us) and adopted by Louis Provencher (lprovencher@tnc.org) for MZ16.

Vegetation Classes

Class A 20%

Early Development 1 All Structures

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

FEID	Upper
PSSP6	Upper
DANTH	Upper
ELTRT	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	34 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	None	

[ ] Upper layer lifeform differs from dominant lifeform.

Description

Low cover and frequency of Idaho fescue (FEID), bluebunch bluegrass (PSSP6), Leymus cinereus (LECI4), slender wheatgrass (ELTRT), oatgrass (DAIN/DACA3/DAUN), Sandberg's bluegrass (POSE), spike fescue (LEKI2), muttongrass (POFE) and mountain brome (BRCA5); annual hairgrass (DEDA) and various sedges (CAREX spp) in moist (concave) sites. Replacement fire (Mean FRI of 20yrs) setbacks succession to age zero. Succession to class B after five years.

Class B 35%

Mid Development 1 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

FEID	Upper
PSSP6	Upper
DANTH	Upper
ELTRT	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	35 %	65 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	None	

[ ] Upper layer lifeform differs from dominant lifeform.

Description

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

Idaho fescue (FEID), bluebunch bluegrass (PSSP6), Leymus cinereus (LECI4), slender wheatgrass (ELTRT), oatgrass (DAIN/DACA3/DAUN), Sandberg's bluegrass (POSE), spike fescue (LEKI2), muttongrass (POFE) and mountain brome (BRCA5); annual hairgrass (DEDA) and various sedges (CAREX spp) in moist (concave) sites. Replacement fire occurs every 10yrs on average. Succession to class C after five years.

Class C **45 %**

Late Development 1 Closed

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 1

Indicator Species* and Canopy Position

FEID	Upper
PSSP6	Upper
DANTH	Upper
ELTRT	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	66 %	100 %
Height	Herb 0m	Herb 1.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Idaho fescue (FEID), bluebunch bluegrass (PSSP6), Leymus cinereus (LECI4), slender wheatgrass (ELTRT), oatgrass (DAIN/DACA3/DAUN), Sandberg's bluegrass (POSE), spike fescue (LEKI2), muttongrass (POFE) and mountain brome (BRCA5); annual hairgrass (DEDA) and various sedges (CAREX spp) in moist (concave) sites. Replacement fire (mean FRI of 60yrs) is less frequent than in other classes. Surface fire (mean FRI of 10yrs) causes a transition to B. Competition maintains vegetation structure (0.01 prob/yr).

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

Fire Regime Group:** I

Historical Fire Size (acres)

Avg 50
Min 10
Max 100

Sources of Fire Regime Data

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

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	20	10	100	0.05	51
Mixed					
Surface	21			0.04762	49
All Fires	10			0.09763	

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.

Additional Disturbances Modeled

- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [x] Competition
- [ ] Other (optional 1)
- [ ] Other (optional 2)

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

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711530 Inter-Mountain Basins Greasewood Flat

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/17/2005

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Vegetation Type
Wetlands and Riparian

Map Zone
17

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

Dominant Species*
SAVE4
DISTI
LECI4
ATCO

General Model Sources
- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

Geographic Range
Occurs throughout much of the western US in intermountain basins. Common in NV and UT.

Biophysical Site Description
This site occurs on aluvial flats or lake plains usually adjacent to playas. Sites typically have saline soils, shallow water table and flood intermittently, but remain dry for most growing seasons. The water table remains high enough to maintain vegetation, despite salt accumulations. Slope gradients of <2 percent are most typical. Elevations are between 3800-5800ft. Average annual precipitation is 5-8in; mean temperature is 45-50 degrees F; average growing season is 100-120 days. The surface layer will normally crust inhibiting water infiltration and seedling emergence.

Vegetation Description
This system sometimes occurs as a mosaic of multiple communities, with open to moderately-dense shrublands dominated or co-dominated by Sarcobatus vermiculatus (greasewood). Atriplex confertifolia (shadscale) may be present or co-dominant. Occurences are often surrounded by mixed salt desert scrub. Herbaceous layer, if present, is usually dominated by graminoids. There may be inclusions of Sporobolus airoides (alkali sacaton)and Distichilis spicata (saltgrass). Vegetation on this site is normally restricted to coppice mound areas that are surrounded by playa-like depressions or nearly level, usually barren, inner spaces. Potential vegetative composition is about 15% grasses, five percent forbes and 80% shrubs. As ecological condition declines herbaceous understory is reduced or eliminated and the site becomes a community of halophytic shrubs dominated by greasewood.

Disturbance Description
Historically, fire was extremely infrequent. This type may be killed by standing water that lasts greater than

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**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.

40 days based on observation of inundations of Lake Bonneville flats in 1983 (pers. observ., Gary Medlyn, Ely BLM) (mean return interval of 150yrs). Vigorous resprouter following low to moderate severity fires, although severe fires may result in some mortality. Some re-seeding may occur from nearby remnant plants.

Adjacency or Identification Concerns

Halogeton is likely to invade this site.

Native Uncharacteristic Conditions

Scale Description

Scale ranges from tens to 100000s of acres.

Issues/Problems

Comments

Reviewers recommended extended the MFRI from 200 to 1000yrs and adding extended flooding to 150yrs return interval. Duration of class A was extended to five from two years.

Vegetation Classes

Class A 5%

Early Development 1 All Structures

Upper Layer Lifeform

- [x] Herbaceous
- [ ] Shrub
- [ ] Tree

Fuel Model 2

Indicator Species* and Canopy Position

ELEl4	Upper
LECI4	Lower
SPAI	Lower
SAVE4	Middle

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	15 %
Height	Herb 0m	Herb 0.5m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Some grasses and greasewood sprouts are present. Some representation of other sprouting species may also be present (eg, rabbitbrush). Grass species varies geographically, but include the following for UT and NV: inland saltgrass, bottlebrush squirreltail, and alkali sacaton. Succession to class B after five years.

Class B 95%

Mid Development 1 Closed

Upper Layer Lifeform

- [ ] Herbaceous
- [x] Shrub
- [ ] Tree

Fuel Model 2

Indicator Species* and Canopy Position

SAVE4	Upper
DISTI	Lower
SPAI	Middle
LECI4	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	15 %	25 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

- [ ] Upper layer lifeform differs from dominant lifeform.

Description

Greasewood shrubs are mature. Rabbitbrush may be found in association with greasewood. May occur with various sagebrush species and salt desert shrub vegetation (shadscale, saltbushes and budsage). Greasewood communities stay in this class indefinitely. Replacement fire is rare (mean FRI of 1000yrs). Prolongued flooding events (>40 days) will cause a transition to class A (return interval of 150yrs).

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Class C 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class D 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Class E 0 %

[Not Used] [Not Used]

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

Fuel Model

Description

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.

Disturbances

Fire Regime Group:** V

Historical Fire Size (acres)

Avg 1
Min 1
Max 1

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	1000	500	2000	0.001	98
Mixed					
Surface					
All Fires	998			0.00102	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other (optional 1)
- ☐ Other (optional 2)

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**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.

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711540 Inter-Mountain Basins Montane Riparian Systems

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/16/2005

Modeler 1 Don Major dmajor@tnc.org **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Wetlands and Riparian

Map Zone
17

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

Dominant Species*
POPUL
SALIX
ALNUS
BETUL

General Model Sources
☐ Literature
☐ Local Data
☐ Expert Estimate

Geographic Range
Great Basin, eastern slopes of the Sierra Nevada of CA, Columbia Plateau and western edge of northern Rockies.

Biophysical Site Description
This ecological system is found within a broad elevation range from about 1220-2135m+ (4000-7000ft). These forests and woodlands require flooding and some gravels for reestablishment. They are found in low-elevation canyons and draws, on floodplains, or in steep-sided canyons, or narrow V-shaped valleys with rocky substrates. Sites are subject to temporary flooding during spring runoff. Underlying gravels may keep the water table just below ground surface, and are favored substrates for cottonwood. Large bottomlands may have large occurrences, but most have been cut over or cleared for agriculture. Rafted ice and logs in freshets may cause considerable damage to tree boles. Beavers crop younger cottonwood and willows, and frequently dam side channels occurring in these stands. In steep-sided canyons, streams typically have perennial flow on mid to high gradients. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition

Vegetation Description
This ecological system occurs as a mosaic of multiple communities that are tree dominated with a diverse shrub component. In the Great Basin and eastern Sierra Nevada, dominant trees may include Abies concolor, Alnus incana, Betula occidentalis, Populus angustifolia, Populus balsamifera ssp. trichocarpa, Populus fremontii, Salix laevigata and Salix gooddingii. Dominant shrubs include Artemisia cana, Cornus sericea, Salix exigua, Salix lasiolepis, Salix lemmonii or Salix lutea. Herbaceous layers are often dominated by species of Carex and Juncus, and perennial grasses and mesic forbs such Deschampsia caespitosa, Elymus trachycaulus, Glyceria striata, Iris missouriensis, Maianthemum stellatum or Thalictrum fendleri. In

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

the Columbia Plateau section, important and diagnostic trees include Populus balsamifera ssp. trichocarpa, Alnus rhombifolia, Populus tremuloides, Celtis laevigata var. reticulata, Betula occidentalis or Pinus ponderosa. Important shrubs include Crataegus douglasii, Philadelphus lewisii, Cornus sericea, Salix lucida ssp. lasiandra, Salix eriocephala, Rosa nutkana, Rosa woodsii, Amelanchier alnifolia, Prunus virginiana and Symphoricarpos albus.

Disturbance Description

These are disturbance-driven systems that require flooding, scour and deposition for germination and maintenance. This system is dependent on a natural hydologic regime, especially annual to episodic flooding with flooding of increasing magnitude causing more stand replacement events. Beaver (Castor canadensis) crop younger cottonwoods (Populus spp) and willows (Salix spp), and frequently influence the hydrologic regime through construction of dams, etc. Beaver will move from areas where tree availability is depleted. Fire disturbances occur, but are infrequent catastrophic events (100yrs).

Adjacency or Identification Concerns

Livestock grazing is a major influence in the alteration of structure, composition and function of the community. Livestock can result in the nearly complete removal of willow and cottonwood regeneration, and bank slumping in places where water is accessible.

Exotic trees of Elaeagnus angustifolia and Tamarix spp are common in some stands. Introduced forage species such as Agrostis stolonifera, Poa pratensis, Phleum pratense and the weedy annual Bromus tectorum are often present in disturbed stands.

Native Uncharacteristic Conditions

Scale Description

This system can exist as small to large linear features in the lansdscape (eg, lower Truckee, Carson, Walker and Humboldt Rivers). In larger, low-elevation riverine systems, this system may exist as mid to large patches.

Issues/Problems

Comments

This model attempts to combine the Columbia Basin Foothill and Lower Montane Riparian woodland and shrubland (CES304.768) and Great Basin Foothill and Lower Montane Riparian woodland and shrubland (CES304.045). This model is similar to BpS 1159 with only slight modifications to vegetation species composition because BpS 1154 and 1159 overlap in elevations and describe the lower part of meandering river systems of the Great Basin.

Vegetation Classes

Class A **20 %**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
SALIX	Upper
ALNUS	Upper
CAREX	Lower

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	10 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

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

Immediate post-disturbance resposes are dependent on pre-burn vegetation composition. Typically shrub dominated, but grass may co-dominate. Silt, gravel, cobble and woody debris may be common. Composition highly variable. Generally, this class is expected to occur 1-5yrs post-disturbance. Modeled disturbances include weather-related stress expressed as 10yr annual flooding events and beaver (Castor canadensis) clear-cutting (Option1 disturbance) (mean return interval = 5 yrs). Succession to class B after five years.

Class B **50 %**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
ALNUS	Upper
SALIX	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	100 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Highly dependent on the hydrologic regime. Vegetation composition includes tall shrubs and small trees (cottonwood, aspen and conifers). Modeled disturbances include 1) weather-related stress expressed as five year annual flooding events, which maintains vegetation in class B, 2) 100yr flooding events (weather-related stress) causing stand replacement, and 3) beaver (Castor canadensis) clear-cutting (Option1). Beaver clearcutting occurs every 20yrs on average with a total probability partitioned 50/50 causing, respectively, a transition back to Class A (mean return interval =40yrs) and class B (mean return interval =40yrs). Succession to class C after 45yrs.

Class C **30 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
ALNUS	Mid-Upper
SALIX	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	51 %	100 %
Height	Tree 0m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

This class represents mature, large cottonwood, conifer, etc. woodlands. Beaver (Castor canadensis) activity thins (Option1) trees causing an infrequent transition to class B (prob/yr=1/1000). 1000-yr flooding events (weather-related stress) cause a transition to class A, whereas 200yr flood events cause a transition to class B. Replacement fire occurs very 100yrs on average.

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

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

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:** **V**

Historical Fire Size (acres)

Avg 100
Min 1
Max 1000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☐ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	370			0.00270	99
Mixed					
Surface					
All Fires	370			0.00272	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other (optional 1) Beaver
- ☐ Other (optional 2)

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

LANDFIRE Biophysical Setting Model

Biophysical Setting: 1711590 Rocky Mountain Montane Riparian Systems

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/15/2005

Modeler 1 Don Major dmajor@tnc.org **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Wetlands and Riparian

Map Zone
17

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

Dominant Species*
POPUL ABLA
SALIX PICEA
ACER
CAREX

General Model Sources
☑ Literature
☐ Local Data
☐ Expert Estimate

Geographic Range
This system is found throughout the Rocky Mountains and Colorado Plateau regions.

Biophysical Site Description
This system occurs within a broad elevation range from approximately 900-2800m within the flood zone of rivers, on islands, sand or cobble bars, and immediate streambanks. Typically this system exists in large, wide occurrances on mid-channel islands in larger rivers or narrow linear bands on small, rocky canyon tributaries and well drained benches and hillslopes below seeps/springs. May also include backwater channels, floodplain swales and irrigation ditches. Surface water is generally high for variable periods. Soils are typically alluvial deposits of sand, clays, silts and cobbles that are highly stratified with depth due to flood scour and deposition.

Vegetation Description
This ecological system occurs as a mosaic of multiple communities that are tree dominated with a diverse shrub component. Dominant trees may include Acer negundo, Populus angustifolia, Populus balsamifera, Populus deltoides, Populus fremontii, Pseudotsuga menziesii, Picea pungens, Salix amygdaloides or Juniperus scopulorum. Dominant shrubs include Acer glabrum, Alnus incana, Betula occidentalis, Cornus sericea, Crataegus rivularis, Forestiera pubescens, Prunus virginiana, Rhus trilobata, Salix monticola, Salix drummondiana, Salix exigua, Salix irrorata, Salix lucinda, Shepherdia argentia or Symphoricarpos spp. Generally the adjacent upland vegetation surrounding this riparian system is different and ranges from grasslands to forests.

Disturbance Description
This system is dependent on a natural hydologic regime, especially annual to episodic flooding. Flood events of increasing magnitude will cause maintenance to stand replacing disturbances. Beaver (Castor canadensis) crop younger cottonwoods (Populus spp) and willows (Salix spp), and frequently influence the

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hydrologic regime through construction of dams. Beavers show considerable movement along rivers as available trees are felled. Fire disturbances occur, but are infrequent catastrophic events (>100yrs).

Adjacency or Identification Concerns

Exotic trees of Elaeagnus angustifolia and Tamarix spp are common in some stands.

Livestock grazing is a major influence in the alteration of structure, composition and function of the community.

Native Uncharacteristic Conditions

Scale Description

These systems can exist as small to large linear features in the lansdscape. In larger, low elevation riverine systems, this system may exist as mid-large patches.

Issues/Problems

Comments

Hydrological processes (eg, flooding) are the determining factors in these systems. This BpS encompasses the mid and lower-elevation riparian systems within the eastern Great Basin. Higher elevation riparian systems arre covered in BpS 1160. The VDDT model for this system was taken from BpS 1160 and modified to highlight the dominance of the hydrologic regime.

Suggested reviewer: Dave Weixelman (Tahoe NF), dweixelman@fs.fed.us

As a result of final QC for LANDFIRE National by Kori Blankenship the min height in class A was changed from “Herb Short <0.5m” to “Shrub 0.0m” because according to LANDFIRE National rules height should only be designated for the upper-layer lifeform.

As a result of final QC for LANDFIRE National by Kori Blankenship the user-defined min and max fire return intervals for replacement severity fire were deleted because they were not consistent with the modeled fire return interval for this fire severity type.

Vegetation Classes

Class A 20 %

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
SALIX	Upper
ALNUS	Upper
CAREX	Lower

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	10 %
Height	Shrub 0m	Shrub 3.0m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Immediate post-disturbance responses are dependent on pre-burn vegetation composition. This class is typically shrub dominated, but grass may co-dominate; species composition is highly variable. Silt, gravel, cobble and woody debris may be common.

Generally, this class is expected to occur 1-5yrs post-disturbance. Modeled disturbances include weather-related stress expressed as 10yr annual flooding event and beaver (Castor canadensis) clear-cutting (Option1

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disturbance) (mean return interval = 5yrs). Succession to class B after five years.

Class B **50 %**

Mid Development 1 Open

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
SALIX	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	11 %	100 %
Height	Shrub 1.1m	Shrub >3.1m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Highly dependent on the hydrologic regime. Vegetation composition includes tall shrubs and small trees (cottonwood, aspen and conifers). Modeled disturbances include 1) weather-related stress expressed as five year annual flooding events, which maintains vegetation in class B, 2) 100yr flooding events (weather-related stress) causing stand replacement, and 3) beaver (Castor canadensis) clear-cutting (Option1). Beaver clearcutting occurs every 20yrs on average with a total probability partitioned 50/50 causing, respectively, a transition back to Class A (mean return interval=40yrs) and class B (mean return interval=40yrs). Succession to class C after 45yrs.

Class C **30 %**

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
PINUS	Upper
SALIX	Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	61 %	100 %
Height	Tree 0m	Tree 50m
Tree Size Class	Large 21-33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

This class represents mature, large cottonwood, conifer, etc. woodlands. Beaver (Castor canadensis) activity thins (Option1) trees causing an infrequent transition to class B (prob/yr=1/1000). 1000yr flooding events (weather-related stress) cause a transition to class A, whereas 200yr flood events cause a transition to class B. Replacement fire occurs very 100yrs on average.

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

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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: V**

Historical Fire Size (acres)

Avg 100
Min 1
Max 1000

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals	*Avg FI*	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	370			0.00270	99
Mixed					
Surface					
All Fires	370			0.00272	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other (optional 1) Beaver
- ☐ Other (optional 2)

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**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.

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Walford, G., G. Jones, W. Fertig and K. Houston. 1997. Riparian and wetland plant community types of the Shoshone National Forest. Unpublished report. Wyoming Natural Diversity Database for The Nature Conservancy and the USDA Forest Service. Wyoming Natural Diversity Database, Laramie. 227 pp.

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**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.

LANDFIRE Biophysical Setting Model

Biophysical Setting: **1711600** **Rocky Mountain Subalpine/Upper Montane Riparian Systems**

☐ *This BPS is lumped with:*
☐ *This BPS is split into multiple models:*

General Information

Contributors (also see the Comments field) **Date** 3/18/2005

Modeler 1 Don Major dmajor@tnc.org **Reviewer** Louis Provencher lprovencher@tnc.org
Modeler 2 **Reviewer**
Modeler 3 **Reviewer**

Vegetation Type
Wetlands and Riparian

Map Zone
17

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

Dominant Species*
POPUL ABLA
SALIX PICEA
POTR5
CAREX

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Geographic Range
Higher elevations of the Great Basin, CA, northern Rockies and Pacific Northwest.

Biophysical Site Description
This ecological system represents the combination of numerous riparian types occurring in the upper montane/sub-alpine zones. Found at 1500-3500m (4920-11500ft). This ecological system exists as relatively small linear stringers.

Vegetation Description
This ecological system encompasses a broad array of riparian species. These systems are highly variable and generally consist of one or more of the following five basic vegetation forms: 1) cottonwoods; 2) willows and other shrubs; 3) sedges and other herbaceous vegetation; 4) aspen; and 5) conifers (primarily spruce and sub-alpine fir).

Disturbance Description
Flooding events and availability of water during drier periods are the major influences to this system. Five year flood events maintain vegetation but do not scour it, whereas 100yr events scour and reset succession to early development.

The moisture associated with riparian areas promotes lower fire frequency compared with adjacent uplands, and rapid recovery from fire events. Wet meadow types seldom burn. In riparian systems the preburn herbaceous plant community is not permanently destroyed and rapidly recovers. Recovery is possible within a single growing season. Woody species (ie, aspen, Salix spp and occasionally cottonwood species) can be topkilled, but generally resprout within a short period. In systems with conifers, post-fire establishment is from seed. Older vegetation experienced fire when replacement fires burned the uplands (MRI of 100yrs).

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Surface fire (mean FRI of 50yrs) affected the early development class through a combination of replacement fire from uplands and occasional native burning.

In addition, beaver (Castor canadensis) were historically important in many of these systems.

Adjacency or Identification Concerns

This BpS includes narrow meadows, shrublands and woodlands of conifers and aspen.

Over-grazing and irrigation use have had major impacts on some of these systems. This ecological system occurs at scales below 30-m resolution of LANDFIRE.

Native Uncharacteristic Conditions

Scale Description

These systems are small linear features in the lansdscape.

Issues/Problems

There is a paucity of fire information on this system and the very heterogeneous nature of the system is challenging for model building.

Comments

BpS 1160 for MZs 12 and 17 was adopted as-is from MZ16. The model for MZ16 was developed by Charles Kay (ckay@hass.usu.edu) and Don Major (dmajor@tnc.org). Fire behavior in these systems is stronly influenced by the adjacent uplands. Hydrological processes (eg, flooding) are the determining factors in these systems.

Vegetation Classes

Class A **65 %**

Early Development 1 All Structures

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
SALIX	Upper
CAREX	Upper
PICEA	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	100 %
Height	Shrub 0m	Shrub >3.1m
Tree Size Class	None	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Immediate post-fire resposes in this ecological system are dependent on pre-burn vegetation form. Post-burn condition sensitive to scouring and blow-out from floods. This class is shrub or grass dominated. Composition varies both within/among reaches. Generally, this class is expected to occur 1-3yrs post-disturbance. Re-establishment of conifers may require 50-100yrs.

Flooding disturbances (modeled as weather-related stress) include five year events that do not scour and 100yr events that resets the vegetation to age zero. Beaver (Option 1) reset succession every 10yrs on average by moving along the river with tree depletion. Replacement fire was typically rare and not included, whereas surface fire was more frequent (mean 50yrs FRI) and a combination of upland-driven fire and native burning. Succession to class B after 24yrs, however this is highly variable due to high moisture levels and high species variability.

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Class B **35 %**

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 3

Indicator Species* and Canopy Position

POPUL	Upper
SALIX	Upper
CAREX	Upper
PICEA	Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	51 %	100 %
Height	Tree 0m	Tree 50m
Tree Size Class	Pole 5-9" DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Highly dependent on the hydrologic regime. For example, could include any combination of the five vegetation forms described above. Composition of adjacent uplands is the determining factor for future fire events. Conifer establishment in these higher elevation areas causes a mean FRI of 100yrs.

Class C **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 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:** III

Historical Fire Size (acres)

Avg 10
Min 1
Max 100

Sources of Fire Regime Data

- ☐ Literature
- ☐ Local Data
- ☑ Expert Estimate

Fire Intervals	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	270			0.00370	23
Mixed					
Surface	81			0.01235	77
All Fires	62			0.01606	

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.

Additional Disturbances Modeled

- ☐ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☑ Other (optional 1) Beaver
- ☑ Other (optional 2) 100-year flood events

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**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.

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