LANDFIRE Biophysical Setting Model

Biophysical Setting 0810470 Northern Rocky Mountain Mesic Montane Mixed Conifer Forest

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

General Information

Contributors (also see the Comments field) **Date** 10/5/2005

Modeler 1	Mike Simpson	mlsimpson@fs.fed.us	**Reviewer**	Bruce Hostetler	bhostetler@fs.fed.us
Modeler 2	Dave Swanson	dswanson@fs.fed.us	**Reviewer**		
Modeler 3	Dave Powell	dcpowell@fs.fed.us	**Reviewer**		

Vegetation Type
Forest and Woodland

General Model Sources
☑ Literature
☑ Local Data
☑ Expert Estimate

Dominant Species
ABGR
PSME
PIPO
LAOC

Map Zone
8

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

Geographic Range
This type is modal in MZ10. It also occurs on stream and river canyons in the foothills of the Blues and of the Northern Rockies. If this type occurs in MZ08, it would occur in the foothills of Yakima and Klickitat counties, especially on stream slopes.

Biophysical Site Description
This type occurs above the 25in precipitation zone in the Blue Mtns, and on a wide range of elevation. Soils are commonly deep ash (2-3ft) with high moisture content.

Vegetation Description
Includes ABGR, ABCO and PSME with various amounts of LAOC, PIPO, CADE3, PIEN, TABR or PICO. ABCO hybridizes with ABGR throughout the Blue Mtns. Important understory associates are ASCA3, CLUN, LIBO2, VAME, ACGL and TRCA3.

Disturbance Description
Fire regime is mixed (III). Average fire return intervals range from approximately 45yrs at the warm dry end of this BpS to approximately 100yrs at the transition to ABLA2 or TSME in the Wallowas and ABLA2 in the Blue Mountains. Insect and disease interactions are important in the mid and late closed conditions. Important insect and diseases include fir engraver, Douglas-fir beetle, armillaria and other root diseases, stem decay caused by indian paint fungus and defoliating insects (western spruce budworm, Douglas-fir tussock moth and larch casebearer). Root diseases occur in smaller patches (<100ha) and attack all age classes, while bark beetles cause mid-sized patches (<1000ha), especially older trees. Defoliaters can cause patches in the same size range as the replacement fires, primarily effecting younger trees.

**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 BpS occurs below subalpine fir and above dry mixed conifer (pine dominated) in the Blue Mtns. Management in the '60s and '70s planted more ponderosa pines than were originally present. These pines are now showing extensive snow and ice damage. There was likely more larch in the past than presently occurs, due either to high-grading, or to preferential removal for domestic uses. Also, blister rust has removed much of the white pine.

Native Uncharacteristic Conditions

Scale Description

Stand replacement fire occurs in large events covering 1000-10000ac patches.

Issues/Problems

This mixed conifer type occurs on the cool moist sites, while Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest (1045) occurs on warm dry sites.

Comments

This model was derived from the R#MCONms. Review of an initial model (with Dave Swanson) resulted in the conversion of the deterministic succession from Class D to E, into a time-since-disturbance transition.

Vegetation Classes

Class A **15 %**

Early Development 1 All Structure

Upper Layer Lifeform

- ☐ Herbaceous
- ☑ Shrub
- ☐ Tree

Fuel Model

5

Indicator Species and Canopy Position

CEVE Upper
ACGL Upper
SASC Upper
PHMA5 Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	100 %
Height	Shrub 0.6m	Shrub 3.0m
Tree Size Class	Sapling >4.5ft; <5"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Shrub communities usually dominate following stand replacement disturbance. Important species vary by ecoregion. ACGL, CEVE and PHMA are important in the Blue Mtns.

Succession to class B after 30yrs. Replacement fire MFRI 500yrs. Some sites are limited or shrub dominated (due to a reburn) and succeed to class C. These shrub fields (CEVE and SASC) may recycle in A for extended periods of time.

Class B **40 %**

Mid Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

8

Indicator Species and Canopy Position

PSME Upper
ABGR Upper
PIPO Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	51 %	100 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

**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.

LAOC
Upper

Description

This class is the primary direction of succession from class A. Class B is pole to small in size (5-20in). These sites have prolific reproduction and quickly close. Class B is dominated by various mixtures of shade tolerant and intolerant conifers. Species vary by ecoregion. PSME and/or ABGR have higher cover than LAOC, PIPO, PIMO or PICO.

Succession to E after 70yrs in this class. Replacement fire MFRI 250yrs. Mixed fire opens it up to class C (MFRI 250yrs). Other disturbances (insect/disease, such as defoliaters, and wind/stress) also open up the stands class C.

Class C **10 %**

Mid Development 1 Open

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model
9

Indicator Species and Canopy Position

PIPO
Upper
LAOC
Upper
PSME
Mid-Upper
ABGR
Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	50 %
Height	Tree 5.1m	Tree 25m
Tree Size Class	Medium 9-21"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Small amounts of this BpS do not immediately close or are created by mixed fire and insect/disease in Class B. Class C is pole to small in size (5-20in) with shade intolerant species are dominant. PIPO, LAOC are more important components than PSME and ABGR or ABCO in this Class.

Succession to class D after 50yrs in this class. Replacement fire MFRI 100yrs. Surface (MFRI 50yrs) and mixed (MFRI 60-70yrs) fires maintain the patch in class C. If there has been no fire for 40yrs, the patch will transition to class B.

Class D **10 %**

Late Development 1 Open

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model
9

Indicator Species and Canopy Position

PSME
Upper
PIPO
Upper
LAOC
Upper
ABGR
Mid-Upper

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	50 %
Height	Tree 25.1m	Tree >50.1m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Class D is created by mixed fire and insect/disease in class E or development of Class C. Size of this class is large (over 20in) but canopy closure is low and sites may be single or multiple canopied. PSME, PIPO and LAOC are more important than ABGR or ABCO in this class.

Maintains in this class with disturbance. Replacement fire MFRI 350yrs. Mixed fire MFRI 100yrs maintains in Class D. Insect/disease, including bark beetles, (probability/yr 0.008) attacks the older trees and transitions

---

**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 stand to class C. Surface fire is rare, and maintains in Class D. There is occasional wind/snow damage that maintains in Class D. After 40yrs without fire, the stand will close in to Class E.

Class E 25 %

Late Development 1 Closed

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model

10

Indicator Species and Canopy Position

ABGR	Upper
PSME	Upper
PIPO	Upper
LAOC	Upper

Structure Data (for upper layer lifeform)

	Min	Max
Cover	51 %	100 %
Height	Tree 25.1m	Tree >50.1m
Tree Size Class	Very Large >33"DBH	

☐ Upper layer lifeform differs from dominant lifeform.

Description

Large trees dominate class E. Stands typically have multiple canopies. Species composition may be mixed shade tolerant species or include minor amounts of shade intolerant pines or larch.

Replacement fire MFRI 150yrs. Mixed fire (MFRI 100yrs) opens up the stand and transitions it to class D. Insects, including bark beetles, usually removes the older trees and opens the stand up to class C, though sometimes merely opens it to Class D.

Disturbances

Fire Regime Group:** III

Historical Fire Size (acres)

Avg
Min
Max

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	35
Mixed	150			0.00667	47
Surface	400			0.0025	18
All Fires	71			0.01417	

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

Burleson, W. 1981 (unpublished report) North slope fire frequency -- western Ochoco Mountains.

Camp, A., C. Oliver, P. Hessburg and R. Everett. Predicting late-successional fire refugia pre-dating European settlement in the Wenatchee Mountains. For. Ecol. Manage. 95: 63-77.

Lehmkuhl, J.F., P.F Hessburg, R.L. Evertt, M.H.Huff and R.D. Ottmar. 1994. Historical and current forest landscapes ofeastern Oregon and Washington. Part 1: vegetation pattern and insect and disease hazards, PNW-GTR-328. Portland, OR: USDA Forest Service, Pacific Northwest Research Station. 88p.

**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.

Hessburg, P.F., R.G. Mitchell and G.M. Filip, G.M. 1994. Historical and Current Roles of Insects and Pathogens in Eastern Oregon and Washington Forested Landscapes. PNW-GTR-327. Portland, OR: USDA Forest Service, Pacific Northwest Research Station, 72 pp.

Hessl A.E., D. McKenzie and R. Schellhaus. 2004. Drought and pacific decadal oscillation linked to fire occurrence in the inland Pacific Northwest. Ecological Applications, 14(2): 425-442.

Hummel, S. and J.K. Agee. 2003. Western spruce budworm defoliation effects on forest structure and potential fire behavior. Northwest Science. 77(2): 159-169.

Johnson, C.G. and R.R. Clausnitzer. 1992. Plant associations of the Blue and Ochoco Mountains. P6-ERW-TP-036-92. Portland, OR: USDA Forest Service, Pacific Northwest Reigion. 164 pp. + appendices.

Johnson, C.G. and S.A. Simon. 1986. Plant associations of the Wallowa-Snake province. R6-ECOL-TP-255b-86. Portland, OR: USDA Forest Service, Pacific Northwest Reigion. 272 pp. + appendices.

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

Simon, S.A. 1991. Fire history in the Jefferson Wilderness Area east of the Cascade Crest. Final report to the Deschutes National Forest Fire Staff. 29 pp.

Volland, L. 1982. Plant Associations of the Central Oregon Pumice Zone. R6-ECOL-104-1982

Volland, L. Ecology Plot Data Unpublished Data Collected Mid 1960's to Mid 1970's

Wickman, B.E., R.R. Mason and T.W. Swetnam 1994. Searching for long-term patterns of forest insect outbreaks Pages 251-261 in: S.R. Leather, K.F. Walters, N.A. Mills and A.D. Watt, eds. Individuals, Populations and Patterns in Ecology. Andover, United Kingdom: Intercept Press.

Wright, C.S. and J.K. Agee. 2004. Fire and vegetation history in the eastern cascade mountains, Washington. Ecological Applications, 14(2): 443-459.

**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.