# LANDFIRE Biophysical Setting Model

## *Biophysical Setting* 0910470 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


| | | | | | |
|---|---|---|---|---|---|
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| **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**
9

**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 county, especially on stream slopes.

### Biophysical Site Description
This type occurs above 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 PNVG 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. Defoliators can cause patches in the same size range as the replacement fires, primarily effecting younger trees.

### 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

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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 MCON 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 Mountains. 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, SASC) may recycle in A for extended periods of time. R. Haugo (01/08/2013) expanded to include max height up to 5m inorder for continuous mapping criteria.

### *Class B* 40 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

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**Indicator Species and Canopy Position**

PSME Upper
ABGR Upper
PIPO Upper
LAOC 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.

**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.

**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.

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 defoliators, 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-small in size (5-20") with Shade intolerant species are dominant. PIPO and 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 DBH) 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 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 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

**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.

**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** Upper

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 to class D.

## Disturbances

**Fire Regime Group**:** III

**Historical Fire Size (acres)**

Avg
Min
Max

**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* | 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**

- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [x] 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.

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

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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* 0910532 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna - Xeric

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *Suggest splitting into a mesic and xeric. This model is the xeric and more commonly found in MZ09. Represented by longer mfri than mesic in areas with <17in precipitation.*

## *General Information*

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

| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIPO
ARTR
CELE
JUOC

**Map Zone**
9

**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 BpS occurs in the forest shrub steppe interface along the east side of the Fremont and Deschutes National Forests and along the southern fringe of the Blue Mountains to the ID border.

### Biophysical Site Description
This BpS occurs in precipitation zones between 15-17in. This precipitation band reaches from the east side of the Fremont NF north along the east side of the Deschutes NF to the south edge of the Blues, and east along the Ochocos and Malheur NF. This type may occur in Idaho opposite the Snake River.

### Vegetation Description
Tree species common in this type are PIPO and JUOC. Minor amounts of PSME may occur. Understory vegetation is dominated by ARTR, ARAR, CELE and PUTR2. Important herbaceous species include FEID, AGSP (now PSSP6), SIHY, POSA and various Stipa species.

### Disturbance Description
Mixed and stand replacement fires dominate this type. Large wind driven events originating in the shrub steppe or juniper woodland vegetation zones heavily influence this BpS. Fire return intervals in this type are more like adjacent shrub steppe or juniper woodland communities than typical low intensity frequent fire PIPO communities.

### Adjacency or Identification Concerns
Typically this vegetation type occurs between JUOC/ARTR, JUOC/ARAR, JUOC/PUTR, ARTR or PUTR and PIPO or dry mixed conifer sites with frequent fire return intervals. These communities have higher shrub components and longer fire return intervals with more of a mixed severity fire regime.

This type is distinct from ponderosa pine mesic (RA: R#PIPOm; LANDFIRE: 091053mesic) in that it

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typically occurs in regions with <45cm/year precipitation. This model is designed to address the mappable pockets of PIPO that exist on low productivity, low moisture and high stress sites resulting in lower reproductive rates and slower growth.

### Native Uncharacteristic Conditions

### Scale Description

Stand replacement events can be tens of thousands of acres in size.

### Issues/Problems

This model attempts to capture the forest-shrub steppe interface areas where lack of fuel continuity increases the fire return intervals and significant dry shrub communities increase the occurrence of stand replacement and mixed fires.

### Comments

Oct. 4 Update: Amy Waltz (awaltz@tnc.org) and Kori Buford (kbuford@tnc.org) also helped with the model. The RA model (R#PIPOxe) was adapted for Landfire without modification to the model but we enhanced the descriptions and addressed reviewer comments (below) in Adjacency box.
Reviewers requested greater clarification between this model and R#PIPOm. Furthermore, it was suggested that the replacement fire may occur too frequently resulting in too much mid-seral (classes B and C). A run with reduced replacement fire (0.003 for open classes C and D; 0.01 for classes A, B and E) moved 15% of the landscape from class A and C into class D, and nearly doubled the MFRI of replacement fires.

## *Vegetation Classes*

### *Class A* 25 %

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

ARTR
Upper
CHVI8
Middle
PSSP6
Lower
ELEL5
Lower

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 50 % |
| *Height* | Tree 0m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Class A is a grass/forb/shrub and seedling sapling and pole stage (age 0-49 yrs). Initial establishment of grass and herbaceous species (and CHVI if present in the pre-disturbance community) gives way to shrubs at 15-30yrs. JUOC and PIPO are often established after the shrub community is in place. Re-establishment of the trees may be delayed by the large disturbance size and removal of nearby seed sources.

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### *Class B* 5 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
JUOC
Mid-Upper
FEID
Lower
ARTR
Middle

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 25 % | 70 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"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.

Class B represents pole to small tree (5-20in DBH, age 50-149, succession to class E) dominated sites with significant competition between trees even though canopy cover does not exceed 70%. Shrub and herbaceous species are often depauperate or declining in this stage due to the competition from overstory trees. This stage is susceptible to mountain pine beetle attack which cycles this stage to class C. R. Haugo (01/08/2013), modified to min canopy closure 30% and max canopy closure 80%.

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***Class C*** **25 %**

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
ARTR
Middle
PUTR2
Middle
PSSP6
Lower

**Structure Data (for upper layer lifeform)**

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

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Class C represents pole to small tree (5-20in DBH, age 50-149yrs) dominated sites with open canopies. Understories are more vigorous than class B and have similar species composition to class A. If two or three fire cycles are missed this stand would convert to class E. R. Haugo (01/08/2013), modified to max canopy closure 30%.

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***Class D*** **40 %**

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
ARTR
Middle
CELE3
Middle
ELEL5
Lower

**Structure Data (for upper layer lifeform)**

| | *Min* | *Max* |
|---|---|---|
| *Cover* | 0 % | 25 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Class D represents large trees (20in+, age 150yrs+) and open canopy conditions. Often this gives a savanna-like appearance. Shrub and herbaceous communities are similar to class A. If two or three fire cycles are missed this stand would convert to class E. R. Haugo (01/08/2013), modified to max canopy closure 30%.

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***Class E*** **5 %**

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
CELE3
Middle
JUOC
Mid-Upper
FEID
Lower

**Structure Data (for upper layer lifeform)**

| | *Min* | *Max* |
|---|---|---|
| *Cover* | 25 % | 70 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Class E (age 150yrs+) occurs when class D misses 2-3 fire intervals. This stage is susceptible to western pine beetle events which cycle this stage to class C. R. Haugo (01/08/2013), modified to min canopy closure 30%

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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.

and max canopy closure 80%.

## Disturbances

**Fire Regime Group**:** III

**Historical Fire Size (acres)**

Avg
Min
Max

**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* | 130 | | | 0.00769 | 37 |
| *Mixed* | 100 | | | 0.01 | 48 |
| *Surface* | 300 | | | 0.00333 | 16 |
| *All Fires* | 48 | | | 0.02103 | |

***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
- [x] 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.

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

**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* 0910610 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**
Forest and Woodland

**General Model Sources**
☑ Literature
☑ Local Data
☑ Expert Estimate

**Dominant Species**
POTR
ABCO
ABLA
PIFL2

**Map Zone**
9

**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 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, 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

**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.

understand that aspen is considered a fire-proof vegetation type that does not burn during the normal 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 presettlement 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 1000 yrs), whereas 80% of outbreaks would thin older trees >40 yrs (average return interval 250 yrs). 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 NV.

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 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

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 presettlement 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 (e.g., 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

Model for MZ09 was imported from MZ12 without modification. BpS 1061 for MZs 12 and 17 is a compromise among the Rapid Assessment model R2ASMClw (aspen-mixed conifers low-mid elevation),

**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.

BpS 1011 for MZs 12 and 17, and BpS 1061 for MZ 16. BpS 1061 for 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, WY drainage, 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 throughout 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 is adapted to a diverse array of disturbances.

## Vegetation Classes

### Class A 14 %

Early Development 1 All Structure

**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

**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.

C after 30yrs.

### *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 thinning some trees, promotes suckering and maintains vegetation in this class. Insect/disease 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)

**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.

causes a transition to class D. Insect/disease outbreaks will thin older conifers (transition to class D) every 300yrs on average.

## Disturbances

**Fire Regime Group**:** I

**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 | 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**

- ☑ 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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# LANDFIRE Biophysical Setting Model

***Biophysical Setting* 1010451** **Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Ponderosa Pine-Douglas-fir**

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *This BpS is split into three types based on dominance: one dominated by ponderosa pine with Douglas-fir; one dominated by western larch; and one dominated by grand fir.*

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIPO
PSME
PICO
CARU
CAGE
PHMA5
ABGR
LAOC

**Map Zone**
10

**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
Northern Rocky Mountains in western MT, eastern WA and northern ID, extending south to the Great Basin.

### Biophysical Site Description
Generally found in the montane zone on well-drained, thin soils, generally on relatively warm, steep settings in the non-maritime influenced portion of the mapping zones. Elevation ranges from >4000ft in the southern area and >2500ft in the northern extent. Sites can range from nearly flat to steep on all aspects.

Common habitat types include: PSME/CARU - all phases, PSME/PHMA, PSME/SYAL, ABGR/LIBO and ABGR/XETE

### Vegetation Description
Ponderosa pine is generally the dominant species on southerly aspects and drier sites, with Douglas-fir dominating on northerly aspects. Southerly aspects support relatively open stands. Northerly aspects support more closed stands. On mesic sites with longer fire return intervals, Douglas-fir often co-dominates the upper canopy layers. In the absence of fire, Douglas-fir and grand fir dominate stand understories. Western larch and lodgepole pine may also be present and become more abundant throughout the northern range of the BpS.

Understory can be dominated by shrubs such as ceanothus, ninebark, spiraea, willow and ocean spray, or open grass dominated by carex and pinegrass. Ninebark can have high cover (>30%) in some stands.

**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

Consists of Fire Regime Groups I and III with surface and mixed severity fires at varying intervals (MFIs range from 7-80yrs). Occasional replacement fires may also occur. Mixed severity fire increases and surface fires decrease further north and higher elevations.

Insects and disease play an important role, especially in the absence of fire. Bark beetles such as mountain pine beetle, western pine beetle, and Douglas-fir beetle are active in the mid and late structural stage, especially in closed canopies. Weather related disturbances, including drought, tend to affect the late closed structure more than other structural stages.

Root rot is a minor concern in the northern extent of this BpS.

Mistletoe is present in the southern portion of this BpS and increases in occurrence with a lack of fire.

## Adjacency or Identification Concerns

The mixed conifer zone in the Northern Rockies is broad, and represents a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland system was thus split into three BpS to represent differences in species dominance and fire regimes. 10451 represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low severity fire regime. 10452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed severity fires. 10453 is dominated by grand fir and represents more mesic, cool sites with longer mixed severity fire regimes.

At lower elevations or southerly aspects, this type generally borders dry ponderosa pine or shrub systems. At higher elevations or northerly aspects, it borders larch, grand fir, spruce, and subalpine fir. At ecotones, it may be very difficult to distinguish between this BpS and 1053 (Northern Rocky Mountain Ponderosa Pine Woodland) in mid and late closed seral states.

This BpS corresponds to Pfister et al. (1977) and Steele et al. (1981) warm dry Douglas-fir (PSME/AGSP, PSME/ARUV PSME/FESC, PSME/SPBE and PSME/SYAL) and grand fir habitat types (ABGR/PHMA and ABGR/SPBE). In the western portion of MZ10, this type may occupy portions of habitat type PSME/SYOR.

This BpS generally occupies moderate environmental settings between more xeric ponderosa pine or shrub communities at lower elevations and moist grand fir or Douglas-fir communities at higher elevations.

Because of fire suppression, xeric ponderosa pine types may be disproportionally invaded by Douglas-fir today. It may be especially difficult in fire suppressed areas to distinguish between ponderosa pine and ponderosa pine-Douglas-fir BpS. It is also very difficult to distinguish between this BpS and the 1053 (Northern Rocky Mountain Ponderosa Pine Woodland) mid and late closed seral states.

## Native Uncharacteristic Conditions

Canopy closure of >80% is considered to be uncharacteristic for this BpS.

## Scale Description

Patch sizes were probably highly variable. Surface and mixed severity fires may have been variable in size (10s to 100s of acres).

## Issues/Problems

In the northern range of this BpS, the younger age/size classes (class A, B and C) may be more extensive owing to larger and more frequent mixed or stand-replacement fires (relative to surface fires).

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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.

This type is extensive on the Colville National Forest, but has not been captured adequately in previous national mapping projects.

### Comments

Additional reviewers included Cathy Stewart (cstewart@fs.fed.us), Pat Green (pgreen@fs.fed.us), Steve Rawlings (srawlings@fs.fed.us), Catherine Phillips (cgphillips@fs.fed.us), Lyn Morelan (lmorlan@fs.fed.us), Susan Miller (smiller03@fs.fed.us) and Steve Barrett (sbarrett@mtdig.net).

Peer review resulted in changes to the description and a slight reduction in the overall fire frequency (from 15yrs to 20yrs).

This BpS was adapted from RA PNVG R0PPDF by Lynette Morelan and Jane Kapler Smith, which was reviewed by Pat Green, Cathy Stewart and Steve Barrett. Modifications to the Rapid Assessment model included a slightly increased fire frequency (from approximately 20yrs to 15yrs). Relative proportions of surface, mixed and replacement fire were unchanged. The resulting percentages in classes C and D changed slightly.

The Rapid Assessment included two additional grand fir types. There was some disagreement among modelers and reviewers about whether two or three types should be developed from this BpS to capture slight differences in fire regimes. The BpS was not split at that time.

## *Vegetation Classes*

***Class A*** **10 %**

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO Upper
LAOC Upper
PSME Upper
PICO Upper

**Structure Data (for upper layer lifeform)**

| | *Min* | *Max* |
|---|---|---|
| *Cover* | 0 % | 100 % |
| *Height* | Tree 0m | Tree 10m |
| *Tree Size Class* | Sapling >4.5ft; <5"DBH | |

☑ Upper layer lifeform differs from dominant lifeform.

Some sites exhibit resprouting shrubs (physocarpus malvaceus) as the dominant lifeform. Other sites may be dominated by pine grass (calamagrostis rubescens).

**Description**

Openings of grass and forbs that are created by infrequent, stand replacement fire. Seedlings and saplings of ponderosa pine, western larch, Douglas-fir and lodgepole pine may be present; grand fir would be rare in the early succession stage. On the moist end of the BpS's range, western larch will be dominant; on the drier end ponderosa pine will be dominant. Following very severe replacement fires, this class may be dominated by lodgepole pine on the moist end of the BpS's range.

Additional dominant species (low in the canopy) will include ninebark (PHMA5; Physocarpus malvaceus) and ceanothus (CESA; Ceanothus sanguineus). Spiraea may also be present. Elk sedge and pine grass are also present.

After 30yrs, this class succeeds to C (mid-development open) unless a replacement or mixed severity fire occurs.

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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*** **15 %**

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
PSME
Upper
PICO
Middle
LAOC
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 61 % | 80 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole and medium sized Douglas-fir and ponderosa pine. Larch regeneration will decrease due to shade intolerance. Grand fir as a minor component will remain or increase due to shade tolerance.

Replacement fire will return this class to A. Mixed fire can open the stand and convert this class to class C (mid-development open). Surface fires are rare, but would maintain the class. Pathogens can create gaps and cause a transition to class C (mid-development open).

---

***Class C*** **30 %**

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
PSME
Upper
LAOC
Upper
PICO
Middle

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 60 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole and medium sized ponderosa pine or Douglas-fir are the dominant trees. Western larch may also be present on the moist end of the BpS's range.

Additional dominant species (low in the canopy) will include ninebark (PHMA5; Physocarpus malvaceus) and ceanothus (CESA; Ceanothus sanguineus). Spiraea may also be present in the shrub layer. Elk sedge and pinegrass are also major components of the understory.

Replacement fire, though rare, will cause a transition to class A (early development). Surface fires, mixed fires and insects will maintain the open condition. If this class escapes fire for 35yrs, it will succeed to class B (mid-development closed). If fires do occur, it will succeed at 115yrs to class D (late-development open).

---

***Class D*** **35 %**

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
PSME
Upper
LAOC
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 21 % | 60 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"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.

Lower

**Description**

Large and very large sized ponderosa pine and Douglas-fir are the dominant trees. Western larch (on the moist end of the BpS's range) and grand fir may also be present in small proportions. Structure may be patchy depending on fire severities in previous class. Ceanothus will be decreasing and willow, spiraea, ninebark, elk sedge and pine grass will still be present.

Replacement fire, though rare, will cause a transition to class A (early development). Surface fires, mixed fires and insects will maintain the open condition. If this class escapes fire for 35yrs, it will succeed to class E (late-development closed).

### *Class E* 10 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
PSME
Upper
ABGR
Middle
LAOC
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 61 % | 80 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Large and very large diameter ponderosa pine, Douglas-fir, grand fir and western larch (on the moist end of the BpS's range). Ninebark and spiraea will be present, but ceanothus will be absent. Some pinegrass and elk sedge will be present.

Replacement fire will return this class to A. Mixed fire can open the stand and convert this class to class D (late-development open). Surface fires are rare, but would maintain the class. Pathogens can create gaps and cause a transition to class D (mid-development open). R. Haugo (01/08/2013) - included pixels with forest height 25 to 50 meters and canopy cover 80 to 100% so they will be accounted in Landfire Active Treatment Analysis, rather than lumping with UN.

## *Disturbances*

**Fire Regime Group**:** I

**Historical Fire Size (acres)**

Avg 1000
Min 100
Max 30000

**Sources of Fire Regime Data**

- ☑ Literature
- ☐ Local Data
- ☑ Expert Estimate

**Fire Intervals**

| | *Avg FI* | *Min FI* | *Max FI* | *Probability* | *Percent of All Fires* |
|---|---|---|---|---|---|
| *Replacement* | 300 | 167 | 500 | 0.00333 | 7 |
| *Mixed* | 60 | 40 | 75 | 0.01667 | 34 |
| *Surface* | 35 | 25 | 85 | 0.02857 | 59 |
| *All Fires* | 21 | | | 0.04857 | |

***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* 1010452 Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Larch

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *This BpS is split into three types based on dominance: one dominated by ponderosa pine with Douglas-fir; one dominated by western larch; and one dominated by grand fir.*

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005

| | | | | | |
|---|---|---|---|---|---|
| **Modeler 1** | Cathy Stewart | cstewart@fs.fed.us | **Reviewer** | Steve Barrett | sbarrett@mtdig.net |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
LAOC
PICO
PSME
ABLA

**Map Zone**
10

**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
Western MT and northern ID, west of the Continental Divide.

### Biophysical Site Description
Montane and lower subalpine zones, approximately 3000-6000ft primarily on north-facing aspects west of the Continental Divide. Lower subalpine sites typically occur as relatively moist subalpine fir habitat types.

### Vegetation Description
Western larch occurs on more mesic/northerly Douglas-fir habitat types and more moist, productive subalpine fir habitat types. Larch is mixed in with seral Douglas-fir, lodgepole pine or some ponderosa pine in the overstory. At lower elevations within this BpS, lodgepole pine can be the dominant seral species and will persist in areas where the fire return intervals are <~80yrs (Williams et al. 1995, observation of White Mountain 1988 fire area in the Colville National Forest). Longer fire intervals promote the development of Engelmann spruce and subalpine fir stands. Mountain pine beetles often reduce the lodgepole pine component, possibly promoting mixed severity fires and inclusions of stand-replacing fires.

Understory species include: Vaccinium globulare, Clintonia uniflora, Menziesia ferruginia, Linnea borealis, Alnus sinuata and Physocarpus malvaceus.

### Disturbance Description
Fire Regime Group III, with a mean fire return interval of approximately 40yrs. The fire regime is dominated by mixed severity fire, with more rare replacement fire and occasional small, patchy surface

**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.

Mountain pine beetle will reduce canopy cover of lodgepole pine. Mistletoe may affect western larch stands, but is not included in the quantitative model.

### Adjacency or Identification Concerns

The mixed conifer zone in the Northern Rockies is broad, and represents a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest and Woodland system was thus split into three BpS to represent differences in species dominance and fire regimes. 10451 represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low severity fire regime. 10452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed severity fires. 10453 is dominated by grand fir and represents more mesic, cool sites with longer mixed severity fire regimes.

This system equates with Pfister et al. (1977) moist Douglas-fir, subalpine fir and mesic grand fir habitat types: ABLA/CLUN, all phases, ABLA/LIBO, ABLA/MEFE, ABGR/CLUN, PSME/PHMA, PSME/VAGL and PSME/LIBO (PSME habitat types apply only to MT, not to ID).

### Native Uncharacteristic Conditions

### Scale Description

Scale can be in small patches of 50ac but generally is hundreds to thousands of acres (due to stand replacing fires requiring dry conditions or being wind driven).

### Issues/Problems

### Comments

Additional author was Ed Lieser (elieser@fs.fed.us). Dan Leavell and Cathy Steward provided additional post-workshop review of this model.

This model was originally conceived for the BpS "Northern Rocky Mountain Western Larch Woodland" and was revised slightly to be a split within the Dry-Mesic Mixed Conifer BpS (Pohl 11/18/2005).

Peer review of this model resulted in minor changes to the model description and the VDDT model. Reviewers agreed that mean fire return intervals should be more frequent (from 60yrs to 40yrs) with the inclusion of more frequent mixed severity fire. Two reviewers agreed that surface fire should be included at a low probability. The results of these changes was less class E, more class D and a more frequent MFI.

Based on the Rapid Assessment model R0WLLPDF, developed by Cathy Stewart (cstewart@fs.fed.us) and reviewed by Steve Barrett (sbarrett@mtdig.net).

For the Rapid Assessment, review comments incorporated on 3/16/2005. As a result of the peer-review process, this type was modified to increase the amount of mixed severity fire to 70% (from 60%) and the age ranges of late-development classes were adjusted to begin at 80yrs (from 65yrs). The end results were more late-development conditions (E) and more closed conditions (B and E).

## *Vegetation Classes*

**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 Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC Upper
PICO Upper
PSME Upper
ABLA Lower

**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**

Young larch and lodgepole establish with some Douglas-fir. In some cases, lodgepole pine may dominate following stand replacement fire and may persist for 60-100yrs before western larch begins to dominate.

Recent observations of this succession stage in the White Mountain 1988 fire area in the Colville National Forest show Alnus sinuata, Salix scouleriana and western larch dominating upper layers at higher elevations; at lower elevations lodgepole pine and Salix scouleriana dominate. Abies lasiocarpa and Picea engelmannii are present at low cover values in the lower canopy at all elevations (Colville National Forest ecology data).

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### *Class B* 15 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC Upper
PICO Upper
PSME Upper
ABLA Middle

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Larch, lodgepole and Douglas-fir (poles to medium trees) continue to dominate. Without disturbance, Douglas-fir can increase in understory. Subalpine fir may be present. Canopy cover rarely >60%.

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### *Class C* 25 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC Upper
PSME Upper
PICO Upper
ABLA Middle

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | None | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Larch, with some Douglas-fir, lodgepole and subalpine fir. Open condition is created by disturbance (fire, insect or disease), which opens up more closed conditions (ie, B or 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.

### *Class D* 30 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC
Upper
PSME
Upper
PICO
Mid-Upper
ABLA
Middle

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | None | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Large larch and Douglas-fir, favored by disturbance. Subalpine fir, grand fir and lodgepole pine will be reduced or eliminated by fire, insect or disease.

### *Class E* 20 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

ABLA
Upper
PSME
Upper
LAOC
Upper
ABGR
Mid-Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | None | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Large diameter larch and Douglas-fir dominate overstory, subalpine fir and grand fir are present in the middle and understory. Lodgepole pine will be largely absent.

Canopy cover will rarely >60%.

## *Disturbances*

**Fire Regime Group**:** III

**Historical Fire Size (acres)**

Avg
Min
Max

**Fire Intervals**

| | Avg FI | Min FI | Max FI | Probability | Percent of All Fires |
|---|---|---|---|---|---|
| *Replacement* | 200 | 50 | 250 | 0.005 | 20 |
| *Mixed* | 65 | 20 | 140 | 0.01538 | 62 |
| *Surface* | 225 | | | 0.00444 | 18 |
| *All Fires* | 40 | | | 0.02483 | |

***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.

**Sources of Fire Regime Data**

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

**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* 1010453** **Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer Forest - Grand Fir**

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models:* *This BpS is split into three types based on dominance: one dominated by ponderosa pine with Douglas-fir; one dominated by western larch; and one dominated by grand fir.*

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PICO
PSME
LAOC
ABGR

**Map Zone**
10

**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 BpS occurs mostly in ID, eastern WA , eastern OR and western MT. It is very important in Bailey's section M332.

### Biophysical Site Description
Occurs above 4500ft elevation, just below the spruce-fir zone. Soils are underlain by granitics, metamorphics and minor volcanic rocks. Most have a volcanic ash influenced loess surface layer.

### Vegetation Description
Stands range from relatively open to densely stocked, and are usually dominated by a mix of early to mid seral species, including lodgepole pine and western larch, with lesser amounts of grand fir, Englemann spruce and ponderosa pine. Grand fir increases markedly during mid to late successional stages, in the absence of fire and in response to pathogens that affect other species, like bark beetles. Stand understories range from moderately open to dense and include beargrass, mountain huckleberry, grouse whortleberry, serviceberry and snowberry.

Sources on historic composition are derived from Losensky (1993) and sub-basin assessments from the 1930s (USDA 1997-2003).

### Disturbance Description
Fire regime group III, with stand replacing fires sometimes punctuated by mixed severity fires. Root disease and mountain pine beetle are very active in this BpS.

### Adjacency or Identification Concerns
The mixed conifer zone in the Northern Rockies is broad, and represents a moisture gradient that affects fire regimes and species dominance. The Northern Rocky Mountain Dry-Mesic Montane Mixed Conifer

**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.

Forest and Woodland system was thus split into three BpS to represent differences in species dominance and fire regimes. 10451 represents the drier sites and is dominated by ponderosa pine and Douglas-fir with a very frequent, low severity fire regime. 10452 is dominated by western larch and represents slightly more mesic sites. The fire regime is dominated by moderately frequent, mixed severity fires. 10453 is dominated by grand fir and represents more mesic, cool sites with longer mixed severity fire regimes.

This BpS represents the warm/moderately moist grand fir habitat types (Pfister et al. 1977) including ABGR/VAGL, ABGR/ASCA and ABGR/XETE. This BpS grades into larch-dominated sites at lower elevations (10452) and western spruce-fir forest at higher elevations. This BpS typically supports more lodgepole pine than the adjacent (lower elevation) larch mixed-conifer type.

### Native Uncharacteristic Conditions

### Scale Description

Terrain is usually rolling hills, convex ridges and mountain slopes with little dissection, so fires spread easily. Large infrequent fires result in large patch sizes of 100s to 1000s of acres, and some occurrence of 10000s of acres.

### Issues/Problems

Proportion of seral structural stages may fluctuate widely over time because large stand replacing fires can affect 100000ac at a time.

### Comments

This model is identical to the Rapid Assessment model R0GFLP with minor modifications to the description.

Rapid Assessment review comments incorporated on 3/16/2005. As a result of the peer-review process, the mean fire return interval was increased to approximately 70yrs (from 55yrs) and the proportion of mixed fire to replacement fire was increased from 55:45 to approximately 70:30.

## *Vegetation Classes*

***Class A*** **15 %**

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

XETE Lower
VAGL Lower
PICO Low-Mid
PSME Low-Mid

**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**

Post stand-replacing fire, lasting about 30yrs. This class is initially dominated by resprouting forbs and shrubs, and transitions to seedling and sapling-dominated. Lodgepole pine is a frequent early seral dominant. Douglas fir and larch are common, while ponderosa pine and grand fir are less common. Residual, large western larch often survive all but the most severe fire to serve as seed sources.

**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*** **15 %**

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO
Upper
PSME
Upper
LAOC
Upper
ABGR
Mid-Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole and immature forest (or mature lodgepole) of 30-100yrs. Tree canopy cover of 40% or more. Lodgepole pine is the most common dominant. Douglas-fir and western larch are secondary dominants. Larch may be reduced by grand fir competition, in the absence of fire.

***Class C*** **25 %**

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO
Upper
ABGR
Mid-Upper
PSME
Upper
LAOC
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole and immature forest (or mature lodgepole) of 30-100yrs. Tree canopy <40%. These are usually created by mixed fire, root disease activity or mountain pine beetle activity in mixed conifer stands.

***Class D*** **20 %**

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC
Upper
PSME
Upper
PIPO
Upper
PICO
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 10.1m | Tree 50m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Mature forest of 100yrs+. Tree canopy <40%. These are usually the result of mixed severity fire, leaving an overstory of larch, Douglas fir, with some residual grand fir or ponderosa pine and lodgepole. They may also occur as a result of insect or pathogen activity removing a Douglas-fir, lodgepole or grand fir understory.

**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*** **25 %**

Late Development 1 Closed

**Upper Layer Lifeform**

☐ Herbaceous
☐ Shrub
☐ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

LAOC
Upper
ABGR
Upper
PSME
Upper
PICO
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 10.1m | Tree 50m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Mature forest of 100yrs or more. Tree canopy cover >40%. These are usually the result of uninterrupted succession in areas of low root disease occurrence or in areas of larch dominance.

## *Disturbances*

**Fire Regime Group**:** **III**

**Historical Fire Size (acres)**

Avg
Min
Max

**Fire Intervals**

| | *Avg FI* | *Min FI* | *Max FI* | *Probability* | *Percent of All Fires* |
|---|---|---|---|---|---|
| *Replacement* | 220 | 50 | 250 | 0.00455 | 31 |
| *Mixed* | 100 | 35 | 150 | 0.01 | 69 |
| *Surface* | | | | | |
| *All Fires* | 69 | | | 0.01456 | |

***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.

**Sources of Fire Regime Data**

☑ Literature
☑ Local Data
☐ Expert Estimate

**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* 1010460 Northern Rocky Mountain Subalpine Woodland and Parkland

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIAL
ABLA
PIEN
LALY
PIFL

**Map Zone**
10

**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
Western MT and northern and central ID. Limited distribution in northeastern OR and WA.

### Biophysical Site Description
Upper subalpine zone (6000-9500ft) on moderate to steep terrain (eg, 40-70% slope). Landforms include ridgetops, mountain slopes, glacial trough walls and moraines, talus slopes, land and rock slides, and cirque headwalls and basins. Some sites have little snow accumulation because of high winds and sublimation, which increases summer drought.

Patchy distribution of this type may be controlled by edaphic conditions, including soil depth and susceptibility to summer drought.

### Vegetation Description
Forest communities range from nearly homogeneous stands of five-needled pines on harshest, highest elevation sites to mixed species inclucing shade tolerant firs. Vegetation is stunted with short, dwarfed trees, including krumholz vegetation on the harshest sites. Historically, whitebark pine dominated on southerly aspects, while northerly aspects were dominated by alpine larch or subalpine fir and Engelmann spruce. Lodgepole pine may be present as an early succession species. Limber pine may be present in southeast and eastern ID, but in these mapping zones it is not typically a subalpine species (it favors lower treeline habitat). In this harsh windswept environment trees are often stunted and flagged from wind damage.

Whitebark pine is a keystone species in many of these forests. Mature whitebark pine trees ameliorate local conditions on harsh sites and facilitate the establishment of less hardy subalpine species. The seeds of whitebark pine provide an important food source for wildlife, particularly grizzly bears and Clark's nutcrackers. Whitebark pine also depends exclusively upon Clark's nutcrackers for seed dispersal and subsequent tree establishment.

**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 Groups III and IV, primarily long-interval (eg, 100-200yrs+) mixed severity (25-75% top kill) and stand replacement fires. Ignitions are frequent due to lightning, though fires seldom carry due to lack of fuel from the slow-growing vegetation. Individual tree torching is more common. Nonlethal surface fires may dominate where continuous light fuel loading (ie, grasses) exists (Kapler-Smith and Fischer 1995), but would typically be small in extent and are not modeled here. Recent dendroecological data collected in whitebark pine forests near Missoula, in western Montana, found numerous small fires (MFIs <50yrs) punctuated by less frequent, larger fires (MFIs 75-100yrs) and implicated large-scale climate variability (eg, the Little Ice Age) as a driver of temporal changes in the fire regimes of these forest systems (Larson 2005).

The mountain pine beetle is an important disturbance agent in whitebark pine and lodgepole pine forests, and past outbreaks have caused widespread morality in these forest types throughout the region. Spruce budworm may be present on higher density spruce sites. Snow, wind and other weather events may cause damage and cause transitions between classes.

## Adjacency or Identification Concerns

This BpS corresponds to cold upper subalpine and timberline habitat types (Pfister et al. 1977, Steele et al. 1983 and Cooper et al. 1991), including ABLA/LUHI, PIAL/ABLA, LALY/ABLA, PIAL/LALY and ABLA/XETE. Lower subalpine forests border at lower elevations, including lodgepole pine, Douglas-fir, Engelmann spruce and subalpine fir types. Successional trajectory towards more shade tolerant species in absence of fire.

Whitebark pine blister rust has decimated whitebark pine in moist ranges of this BpS (eg, near Glacier National Park). Mountain pine beetle is a natural agent of mortality affecting five-needle pines. Infestations occur periodically and are a natural agent of disturbance in these systems.

Early grazing, fire suppression and climate change may have altered natural fire frequency. Live and dead trees are potential dendro-climatic resources.

## Native Uncharacteristic Conditions

## Scale Description

Fires could range from individual trees to 100s of acres, though topography and continuity of fuel beds influence fire spread.

## Issues/Problems

Empirical data for the upper subalpine forest is generally sparse; quantification of fire regimes, succession and other disturbances continues.

## Comments

Additional reviewers included Steve Barrett (sbarrett@mtdig.net), Evan Larson (lars2859@umn.edu), Susan Miller (smiller03@fs.fed.us), Steve Rawlings (srawlings@fs.fed.us) and Cathy Stewart (cstewart@fs.fed.us).

Peer review resulted in changes to the description, but no changes to the model. Two reviewers disagreed about the fire frequency-- one suggesting it be changed to 150yrs MFI, another suggesting it be changed to ~100yrs. No changes were made to the MFI.

Based on Rapid Assessment model R0WBLP by Steve Barrett and reviewed by Cathy Stewart. Adjustments for MZs 10 and 19 resulted in additions to the description and an increased fire frequency (from 155yrs to 133yrs MFI).

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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.

10/01/07: 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 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIAL Upper
LALY Upper
PICO Upper
PIFL 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.

Higher elevation sites will be dominated by herbaceous species.

**Description**

Early succession after moderately-long to long interval replacement fires, and highly variable interval mixed severity fires. Whitebark pine, limber pine and subalpine larch will typically be early pioneers. Lodgepole pine may be present.

Wind, weather, insects, disease and replacement fire from all succession classes cause a transition to class A. This class will transition to class B after approximately 50yrs, although limited resources may cause this class to persist longer.

### Class B 40 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIAL Upper
ABLA Upper
PIEN Mid-Upper
PICO Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 31 % | 100 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Stands dominated by small-diameter with a mix of shade tolerant and intolerant species. High elevation or harsh sites may exhibit krummholz growth form. Whitebark pine and subalpine larch will typically be early pioneers on harsh sites.

This class succeeds to E at 130yrs.

**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 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIAL
Upper
LALY
Upper
PICO
Upper
PIFL
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 30 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Stands dominated by small-diameter with a mix of shade tolerant and intolerant species. High elevation or harsh sites may exhibit krummholz growth form. Whitebark pine (especially on southerly aspects) and subalpine larch (especially on northerly aspects) will typically be early pioneers on harsh sites. Limber pine may also occur on these sites.

This class succeeds to D at 130yrs.

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### *Class D* 5 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIAL
Upper
LALY
Upper
PICO
Upper
PIFL
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Mid to large diameter mixed conifer species in small to moderate size patches generally on southerly aspects. Open canopy conditions occur on sites where soil is less developed or on wind-exposed, south-facing aspects. Whitebark pine (especially on southerly aspects) and subalpine larch (especially on northerly aspects) will typically dominate.

This class will persist until a disturbance causes a transition. R. Haugo (01/08/2013), extend to maximum height of 50m to avoid UN classification.

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### *Class E* 20 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIAL
Upper
ABLA
Upper
PIEN
Upper
PIFL
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Mid to larger diameter mixed conifer species in small to moderate size patches generally on southerly aspects. Subalpine fir is likely to be encroaching upon these sites. Closed canopy conditions occur on sites that are

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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.

more protected (ie, northerly aspects) or have better soil development.

This class will persist until a disturbance causes a transition. R. Haugo (01/08/2013), extend to maximum height of 50m to avoid UN classification.

## Disturbances

**Fire Regime Group**:** III

**Historical Fire Size (acres)**

Avg 0
Min 10
Max 1000

**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* | 400 | 100 | 1000 | 0.0025 | 40 |
| *Mixed* | 270 | | | 0.00370 | 60 |
| *Surface* | | | | | |
| *All Fires* | 161 | | | 0.00621 | |

***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
- [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* 1010471 Northern Rocky Mountain Mesic Montane Mixed Conifer Forest

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models: Nearly pure cedar groves, with much longer fire return intervals, have been split from this system into BpS 10472.*

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
|---|---|---|---|---|---|
| **Modeler 1** | Larry Kaiser | larry_kaiser@blm.gov | **Reviewer** | Steve Barrett | sbarrett@mtdig.net |
| **Modeler 2** | Katie Phillips | cgphillips@fs.fed.us | **Reviewer** | Pat Green | pgreen@fs.fed.us |
| **Modeler 3** | Randall Walker | rmwalker@fs.fed.us | **Reviewer** | Steve Rawlings | srawlings@fs.fed.us |


**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIMO
LAOC
PSME
ABGR
THPL
TSHE

**Map Zone**
10

**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 BpS occupies maritime influenced sites in north-central to northern ID, northeastern WA and northwestern MT within the range of western red cedar.

### Biophysical Site Description

This BpS occurs on low to mid-elevation slopes within the montane mesic forest, generally on northerly aspects. It can also occur on east-facing slopes and lower slopes of west or south-facing aspects in most maritime settings. This is primarily the Thpl/Asca, Tshe/Asca, Thpl/Clun and Tshe/Clun habitat types, in north Idaho Fire Group 8.

### Vegetation Description

Vegetation composition will vary widely geographically, but is today dominated by Douglas-fir and grand fir with other mixed conifers. Western larch, western white pine, western hemlock and western red cedar may be present. Ponderosa pine (on warmest and driest sites, such as ridge-tops), Engelmann spruce and subalpine fir (on coldest sites) and pacific yew (on the most maritime sites) may be present. Today, the decline of white pine has led to the increase of grand fir and Douglas-fir in these forests, which have a high propensity to root rot.

In the northern extent of this system, this BpS was dominated by white pine and western larch with lesser components of Douglas-fir and grand fir. Today, white pine and western larch each comprise less than five percent of the relative canopy cover in the Idaho Panhandle National Forest (Art Zack, unpublished data). Historically, white pine may have occupied >30% of the relative canopy cover, and western larch may have occupied >10% (Art Zack, personal communication). On potassium limited soils, white pine was historically dominant (>60%). The removal of white pine and western larch is due to the non-native blister rust, logging and fire suppression (see also Adjacency/Identification concerns).

**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.

This system represents some of the most productive forests in this region. Forests are typically even-aged with scattered residuals (ie, 1-3 fire-regenerated age classes present in patches) with moderately dense to dense stands.

This type corresponds with warm/moderate, moist grand fir, western redcedar and western hemlock habitat types (Pfister et al. 1977). Daubenmire and Daubenmire (1968) characterized upland red cedar associates as "Paxistima myrsinites union".

Understory associates may include Linnaea borealis, Paxistima myrsinites, Alnus incana, Acer glabrum, Spiraea betulifolia, Rubus parviflorus, Taxus brevifolia, Gymnocarpium dryopteris and Vaccinium membranaceum.

### Disturbance Description

Fire Regime Group III or IV. Fires are mostly mixed severity (50-150 year frequency) with the wetter sites experiencing longer fire return intervals and higher severity fires (~200yr frequency) (Zack and Morgan 1994). Mixed fire regimes, however, are very complex and occur "along a gradient that may not necessarily be stable in space or time" (Agee 2005). In the Idaho Panhandle National Forest, Zack and Morgan (1994) found replacement fire intervals at 200yrs and total fire interval at 65yrs for these systems.

Less productive sites may be susceptible to insects or disease. Douglas-fir bark beetle will affect Douglas-fir or grand fir. Root rot will affect Douglas-fir, grand fir and subalpine fir.

### Adjacency or Identification Concerns

This type is distinguished from BpS 10472 (Northern Rocky Mountain Western Hemlock-Western Red Cedar Forest: Cedar Groves) because it has a more diverse mix of species, is more upland, and has a much shorter MFI.

Vegetation composition has changed significantly from the historic conditions. White pine is almost non-existent today due to blister rust. Fire suppression and logging have also significantly reduced the amount of larch. Larch is particularly dependent on mixed severity fires, which have been readily suppressed.

Forest structure has also changed significantly in this system. In the Idaho Panhandle National Forest, forests were historically dominated by late-development conditions (40-50%). Today, they are dominated by mid-development conditions (>50%).

Northern Rocky Mountain Conifer Swamp (1161) late successional forests and pure cedar groves (10472) will be present in bottomlands and toeslopes.

### Native Uncharacteristic Conditions

### Scale Description

Scales of fires tended to be highly variable and extensive (tens of thousands of acres) in area (Agee 1993, Graham and Jain 2005). Landscapes will typically be mosaics of single age-class patches resulting from stand-replacement fires, especially at mid-slopes. Broad ridges and riparian stringers may include more mixed-age stands due to mixed severity fire regime.

### Issues/Problems

PIMO is able to persist for 200 yrs+ following stand replacing disturbance (T. Jain, personal communication). PIMO should be considered a dominant species in S-Class E. R. Haugo, 01/03/2013

### Comments

Additional reviewer was Cathy Stewart (cstewart@fs.fed.us). Peer review resulted in modifications to the

**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 and a slightly longer MFI (from 65yrs to 80yrs), but the change in MFI did not change the proportion in each class.

Based on the Rapid Assessment model ROMCCH by Kelly Pohl and reviewed by Steve Barrett and Pat Green. One reviewer suggested referencing the following historical document: John B. Leiberg. Nineteenth Annual Report of the United States Geological Survey to the Secretary of the Interior, 1987-98, Part V-Forest Reserves. However, due to time constraints recovery and incorporation of this document was not possible.

10/01/07: 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 15 %

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

8

**Indicator Species and Canopy Position**

CEVE Upper
SASC Upper
PIMO Middle
LAOC 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**

Post-fire vegetation is shrub dominated with some seedling and sapling trees present. Establishment of western or paper birch, quaking aspen or black cottonwood is favored by fires that remove the duff layer (Williams et al. 1995). After 20yrs, this class succeeds to mid-development closed (class B).

### Class B 30 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

8

**Indicator Species and Canopy Position**

PIMO Upper
LAOC Upper
ABGR Upper
PSME Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 61 % | 100 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole and medium sized trees of mixed conifer species have overtopped the shrubs and dominate the site. Canopy cover is dense (will often be 100%). At 65yrs post-fire, this class succeeds to late-closed (class E). Western red cedar and western hemlock may be present in the understory. White pine, western larch, grand fir and Douglas-fir will be present in the overstory. Subalpine fir or Engelmann spruce may be important seral species on cooler sites (Williams et al. 1995).

**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* 5 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

8

**Indicator Species and Canopy Position**

PIMO
Upper
LAOC
Upper
THPL
Low-Mid
ABGR
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 60 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Open canopy conditions may be a result of topoedaphic conditions or disturbances. Mixed severity fires result in open, patchy stand conditions, and favor western larch and white pine. This condition will succeed to mid-development closed (B) after 20yrs, unless mixed severity fires maintain the open condition. Seedling/sapling western red cedar and western hemlock will be present in the understory.

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### *Class D* 10 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

8

**Indicator Species and Canopy Position**

PIMO
Upper
LAOC
Upper
THPL
Upper
ABGR
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 60 % |
| *Height* | Tree 25.1m | Tree >50.1m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Open canopy conditions are rare and may be a result of topoedaphic conditions or disturbances. Mixed severity fires result in open, patchy stand conditions. Western red cedar and western hemlock will be codominant with western white pine, western larch, and grand fir. Seedling/sapling western red cedar and grand fir will be present in the understory. After 30yrs, this condition succeeds to late-development closed (E).

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### *Class E* 40 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

10

**Indicator Species and Canopy Position**

THPL
Upper
TSHE
Upper
PSME
Upper
ABGR
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 61 % | 100 % |
| *Height* | Tree 25.1m | Tree >50.1m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Late-development closed conditions are multi-storied, dense canopies. Understories will tend to be depauperate due to dense overstory. Large woody debris is abundant caused by in-stand competition. Fuel loadings range from 18-40 tons/acre (Kapler-Smith and Fischer 1995). This class will shift to open conditions with mixed severity fire or disease. Root rot will affect Douglas-fir and grand fir in patches. R. Haugo Notes: Follow review with Terrie Jain (Dec. 2012), note that western white pine will continue to be a dominant component of these stands for 200+ years in the absence of white pine blister rust. As such, western white pine should also be noted as a characteristic species of Class 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.

## Disturbances

**Fire Regime Group**:** III

**Historical Fire Size (acres)**

Avg 500
Min 5
Max 30000

**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 | 200 | 150 | 500 | 0.005 | 40 |
| Mixed | 133 | | | 0.00752 | 60 |
| Surface | | | | | |
| All Fires | 80 | | | 0.01253 | |

***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* 1010472 Northern Rocky Mountain Mesic Montane Mixed Conifer Forest - Cedar Groves

☐ *This BPS is lumped with:*

☑ *This BPS is split into multiple models: Nearly pure cedar groves, with much longer fire return intervals, have been split from the more common cedar-hemlock type (BpS 10471).*

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005

| | | | |
|---|---|---|---|
| **Modeler 1** | Steve Barrett | sbarrett@mtdig.net | **Reviewer** |
| **Modeler 2** | | | **Reviewer** |
| **Modeler 3** | | | **Reviewer** |

**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
THPL
ABGR
LAOC

**Map Zone**
10

**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
Occurs in the maritime-influenced zone of northern ID and northwestern MT.

### Biophysical Site Description
Wet canyon bottoms and toeslopes below 5000ft elevation; generally small to moderate size "stringer" groves dominated by Thuja plicata that often escape burning during fires on adjacent slopes.

### Vegetation Description
Sheltered groves of nearly pure uneven aged Thuja plicata, with occasional minor associates Abies grandis, Tsuga heterophylla and Larix occidentalis. Understories are usually dominated by low growing forbs and ferns such as Asarum caudatum, Viola orbiculata, Clintonia uniflora, Tiarella trifoliata, Coptis occidentalis, Oplopanax horridum, Athyrium filix-femina and Adiantum pedatum.

### Disturbance Description
Long-interval stand-replacement fire regime (200-500yrs) with occasional mixed severity fires (ie, burn margin effect from fires on adjacent drier slopes).

### Adjacency or Identification Concerns
Type transitions to cedar/hemlock types (10471) with increasing slope steepness and elevation. This type is distinguished by the more mesic conditions (ie, riparian areas, draws and canyon bottoms) and composition of pure or nearly pure western red cedar.

### Native Uncharacteristic Conditions

### Scale Description
Stand replacing disturbances tended to be extensive in the surrounding landscape, but smaller patches of mixed severity fire can occur during less-severe fire weather. This vegetation type represents relatively

**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.

small imbedded "fire refugia," where Thuja plicata groves can persist for 500-1000yrs between stand-replacement fires.

### Issues/Problems

Should seek reviewer advice about the roles of diseases; root rots and other fungi were important in stand successional patterns & pathways, but mostly for producing local gap-phase openings rather than stand replacement.

### Comments

This model was adopted as-is from the Rapid Assessment model R0WERC with minor modifications to meet LANDFIRE standards.

10/01/07: 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 Structure

**Upper Layer Lifeform**

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

**Fuel Model**

**Indicator Species and Canopy Position**

CLUN Lower
ADPE Lower
ATFI Lower
THPL Upper

**Structure Data (for upper layer lifeform)**

| | *Min* | *Max* |
|---|---|---|
| *Cover* | 0 % | 100 % |
| *Height* | Herb 0m | Herb >1.1m |
| *Tree Size Class* | Sapling >4.5ft; <5"DBH | |

- [x] Upper layer lifeform differs from dominant lifeform.

Herbaceous layer will be up to 100% cover and may dominate prior to the development of cedar and hemlock saplings.

**Description**

Post-burn sites dominated by forbs, ferns and shrubs; tree regeneration generally consists of western redcedar and grand fir seedlings to saplings. R. Haugo (01/08/213), increased maximum height to 10m to maintain S-Class continunity.

### *Class B* 40 %

Mid Development 1 Closed

**Upper Layer Lifeform**

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

**Fuel Model**

**Indicator Species and Canopy Position**

THPL Upper

**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**

Moderate to heavy regeneration of pole size western redcedar. Occasional grand fir, western larch and other species may be present.

**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* 5 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

THPL
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Uncommon mid-open successional class resulting after mixed severity fire and blowdowns; dominated by western redcedar with occasional grand fir and western larch. The scale of open classes would be primarily local rather than landscape (ie, gap-phase openings within stands).

### *Class D* 5 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

THPL
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Uncommon mid-late open successional class resulting after mixed severity fire, blowdowns, disease; dominated by western redcedar with occasional grand fir and western larch. The scale of open classes would be primarily local rather than landscape (ie, gap-phase openings within stands).

### *Class E* 40 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

THPL
Upper
ABGR

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Moderately dense to densely stocked old growth groves dominated by western redcedar; generally depauperate understories as a result of heavy shading.

## *Disturbances*

**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
Min
Max

| Fire Intervals | Avg FI | Min FI | Max FI | Probability | Percent of All Fires |
|---|---|---|---|---|---|
| Replacement | 385 | 75 | 1000 | 0.0026 | 86 |
| Mixed | 2500 | | | 0.0004 | 13 |
| Surface | | | | | |
| All Fires | 334 | | | 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.

**Sources of Fire Regime Data**

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

**Additional Disturbances Modeled**

- [x] Insects/Disease
- [ ] Native Grazing
- [ ] Other (optional 1)
- [ ] Wind/Weather/Stress
- [ ] Competition
- [ ] 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* 1010530 Northern Rocky Mountain Ponderosa Pine Woodland and Savanna

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIPO
FEID
PSSP6
PUTR2

**Map Zone**
10

**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
Throughout the northern and central Rocky Mountains in MT, central ID and northeastern WA. In ID, the distribution of this BpS is limited to lower slope positions in the Boise, Payette and Salmon River drainages. In northeastern WA, it is found on sites <4500ft, particularly along the Columbia and Kettle Rivers and in the Okanogan Highlands.

### Biophysical Site Description
These stands typically occurred on hot, dry, south and west-facing slopes at lower elevations with well drained soils and gentle to moderately steep slopes.

### Vegetation Description
Frequent fires promoted a grass-dominated understory with sparse shrubs and a ponderosa pine overstory. Douglas-fir and Rocky Mountain juniper may occur as incidental individuals, but overall Douglas-fir cover will be <10%.

Common snowberry, antelope bitterbrush and chokecherry are important shrubs, and mountain mahogany may also occur on rocky outcrops. Grasses may include Idaho and rough fescue (Fischer and Bradley 1987). More mesic shrubs may be present if it is a wetter habitat type that historically maintained an open stand via frequent fire.

Fischer and Bradley (1987), Fischer and Clayton (1983) and Kapler-Smith and Fischer (1997) would characterize this BpS as predominantly Fire Groups 2 and 4 for western MT and central ID, Fire Group 3 for eastern MT and WY, and Fire Group 1 for northern ID. Also refer to Crane and Fischer (1986).

### Disturbance Description
Frequent, non-lethal surface fires were the dominant disturbance factor, occurring every 3-30yrs (Arno

**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.

and Petersen 1993, Arno 1976, Fischer and Bradley 1987). Three-year fire return intervals are likely very localized and associated with Native American burning. However, there is some disagreement as to the extent of Native burning. More median fire return intervals were likely about 15yrs. Mixed-severity fires likely occurred about every 50yrs; again, depending on the vegetative state. Stand-replacement fires likely occurred in stands and small patches on the order of a few hundred acres every 300-700yrs depending on the vegetative state. Some authors note that little information is available regarding the exact nature of stand replacement fire severity in this BpS.

Western pine beetle can attack large ponderosa pine in any canopy density.

### Adjacency or Identification Concerns

Vegetation is characterized by Pfister et al. (1977) as the ponderosa pine series, by Steele et al. (1981) as the ponderosa pine series and by Williams et al. (1995) as Douglas-fir-ponderosa pine.

These sites typically formed the lower timberline in the area and were historically found adjacent to grasslands and shrublands that dominated valley bottoms. The early seral stages often resemble adjacent shrubland or grassland BpS.

In the 21st century, after missing several fire return intervals, these stands may support an overabundance of stagnant ponderosa pine pole thickets, heavy duff and litter layers and few grasses or shrubs. As a result it may be difficult to distinguish this BpS in its mid and late seral stages from BpS 1045.

Dense pockets of Douglas-fir may also occur. This BpS may be found on several different habitat types depending on the local fire regime; FRG I maintained these stands as ponderosa pine, but today they may be supporting Douglas-fir in some areas.

This vegetation type continues to be commercially logged. Site modifications include plantations and terracing.

### Native Uncharacteristic Conditions

Cover >60% can be considered uncharacteristic in this woodland community.

### Scale Description

Stands dominated by ponderosa pine with frequent fire return intervals commonly exhibit very small patch sizes even though fire events occurred over hundreds or thousands of acres (Agee 1998). Open, late-seral stands typically dominated the landscape with frequent fire, though even-aged stands were uncommon. In ID, this type was often found as a narrow band between grassland/shrublands at lower elevations and Douglas-fir types at higher elevations.

### Issues/Problems

1) Fischer and Bradley (1987) show only a single pathway from the dense pole stage characterized by succession without a fire disturbance (Class A to Class B). However, it seems that under a frequent fire regime, these stands would typically bypass Class B and move directly to Class C--unless there is not enough fuel to carry fire at this stage (insufficient stand density and leaf litter). 2) Mixed-severity and stand-replacement fire return intervals are not well documented in the literature for this BpS. Some evidence suggests these fires indeed occurred, but there may be room to improve the assumptions used in this modeling effort. 3) There was some debate in the in-workshop peer review over the probability of mixed fire. Currently the model shows a fire interval of about 70yrs for mixed severity fire; some thought it should be more like 50yrs.

The southern portion of MZ10 may have supported a more frequent fire regime and thus more of class D. The BpS was not split for MZ10.

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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

Additional reviewers were Steve Barrett (sbarrett@mtdig.net), Susan Miller (smiller03@fs.fed.us), Lyn Morelan (lmorelan@fs.fed.us), Catherine Phillips (cgphillips@fs.fed.us) and Cathy Stewart (cstewart@fs.fed.us). Peer review resulted in additions to the description.

This model was adapted from the Rapid Assessment model R0PIPOnr by Tonja Opperman and Lynnette Morelean and reviewed by Steve Barrett, Cathy Stewart and Jane Kapler-Smith.

## *Vegetation Classes*

### *Class A* 5 %

Early Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

FEID
Lower
PSSP6
Lower
PIPO
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 60 % |
| *Height* | Tree 0m | Tree 5m |
| *Tree Size Class* | Sapling >4.5ft; <5"DBH | |

☑ Upper layer lifeform differs from dominant lifeform.

Grass species are the dominant lifeform in this class attaining maximum heights of three feet and being patchy in distribution (25-75% cover).

**Description**

Fire-maintained grass/forb and/or seedlings and saplings. Seedling/sapling size class would be less than five inches in diameter; no very large or old-growth trees would be present in patches of 10s to 100s of acres to be counted in this class. This is due to poor site conditions and abundance of rock outcroppings.

Dispersed large diameter fire remnant ponderosa pines with snag trees also present. These large diameter trees would have a density of less than one tree/acre. R. Haugo (01/08/2013), increased max canopy closure to 100% to maintain S-Class continuity.

### *Class B* 10 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
FEID
Lower
PSSP6
Lower
PSME
Mid-Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 60 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Closed PIPO pole and medium stand; may have Douglas-fir as incidentals. Larger, old-growth trees may be present in this class, the pole and medium diameter class (5-21in) occurring between these large trees is most abundant and characteristic of this class. May see large diameter snags, dead and down trees present. High density stunted pole stands are counted here; may see insect/disease here. R. Haugo (01/08/2013), increased max canopy closure to 100% to maintain S-Class continuity.

**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* 20 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
FEID
Lower
PSSP6
Lower
PSME
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**

Open PIPO pole and medium stand that may have Douglas-fir as incidentals. Larger, old-growth trees may be present in this class, the pole and medium (5-21in) diameter trees are what should be counted for this class. These patches have probably had recent fire or are drier therefore retaining a more open condition.

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### *Class D* 55 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIPO
Upper
FEID
Lower
PSSP6
Lower
PSME
Mid-Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Fire-maintained open, park-like PIPO; nearly any fire maintains; Douglas-fir may be seen as incidentals or in patches, but not a major component of the overstory. The overstory is characterized by large and very large ponderosa pine and isolated Douglas-fir. Understory is dominated by grasses and is relatively open. Seedlings are very infrequent, with <10% cover usually occurring in patches.

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### *Class E* 10 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

10

**Indicator Species and Canopy Position**

PIPO
All
PSME
All

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 60 % |
| *Height* | Tree 25.1m | Tree 50m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

High density, multi-storied PIPO stand; Douglas-fir regeneration on some sites. Thickets of various size classes distributed within the class and may be interspersed with large snags. R. Haugo (01/07/2013) changed the minimum canopy height from 10.1m to 25.1m to maintain mutually exclusive structural characteristics between S-Classes. Assumed min height of 10.1m was an error. R. Haugo (01/08/2013), increased max canopy closure to 100% to maintain S-Class continuity.

## *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**:** I

**Historical Fire Size (acres)**

Avg 0
Min 0
Max 0

**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* | 360 | 50 | 1000 | 0.00278 | 4 |
| *Mixed* | 55 | 16 | 100 | 0.01818 | 24 |
| *Surface* | 18 | 12 | 20 | 0.05556 | 73 |
| *All Fires* | 13 | | | 0.07652 | |

***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.

Kapler-Smith, J. and W.C. Fischer. 1997. Fire ecology of the forest habitat types of northern Idaho. INT-GTR-363. Ogden, UT: USDA Forest Service, Intermountain Research Station. 142 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* 1010550** **Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland**

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
ABLA
PIEN
PICO
CAGE
CARU

**Map Zone**
10

**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
Northeastern WA, northern and central ID and northwestern MT.

### Biophysical Site Description
Subalpine zone, with lower extent at about 4500ft (in NE WA) or 6500ft (in MT and ID) and the upper extent at about 8500ft.

### Vegetation Description
Lodgepole pine, subalpine fir and Engelmann spruce dominate. Lodgepole pine comprises a greater component on dryer sites and earlier successional stages, and can be a canopy dominant for over 250yrs in some stands (Kipfmueller and Kupfer 2005). Pockets of pure lodgepole pine are not uncommon. At high elevations and southerly aspects, whitebark pine may occur. Western larch and Douglas-fir may be early seral components at lower portions of this BpS. Aspen may be present, especially east of the Continental Divide and in the southern portions of MZs 10 and 19. Mountain hemlock may be present in the north and west portions of MZs 10 and 19.

Understory associates may include: Vaccinium scoparium, beargrass (Xerophyllum tenax), Rhododendron albiflorum, Linnaea borealis, Menziesia ferruginea and Alnus sinuata. Understory shrubs will be more prevalent on east and north-facing aspects.

### Disturbance Description
Fire Regime Group IV or III, primarily moderately long-interval mixed and stand replacement fires. Lightning strikes are frequent, but will often result in small, patchy spot fires. Some recent data show more frequent MFIs (8-71yrs) in systems that may include this BpS (personal communication, Elaine Sutherland, USFS Rocky Mountain Research Station, August 2005). In southern and western portions of MZs 10 and 19 this BpS may have more frequent fire regimes.

**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.

In some areas, spruce beetle and mountain pine beetle can influence successional stage, species composition and stand density. Spruce beetle and mountain pine beetle may act to accelerate succession by removing the lodgepole pine and promoting the more shade-tolerant species. Large scale insect infestations may create large patches of early seral conditions and/or create conditions that lead to large, stand-replacement fires.

### Adjacency or Identification Concerns

This BpS corresponds to the following habitat types (Pfister et al. 1977): ABLA/CAGE, ABLA/VASC, TSME/XETE, TSME/MEFE, TSME/CLUN, PICEA/GART, PICEA/LIBO and PICEA/PHMA.

In northeastern WA and northern ID, this type may transition to mountain hemlock where it becomes more maritime.

Non-native insects and disease, including balsam wooly adelgid and whitebark pine blister rust, affect these forests today. Some local populations of whitebark pine have experienced >90% mortality from blister rust.

At lower elevations this type is adjacent to upper montane, including western hemlock, western redcedar, grand fir and Douglas-fir. At higher elevations, it is adjacent to Northern Rocky Mountain Subalpine Woodland and Parkland (1046).

### Native Uncharacteristic Conditions

### Scale Description

Fires could range widely in size from 1000s to 100000s of acres. Smith and Fischer (1997) suggest fires ranged from 500-1000ac. Spot fires are common (Williams et al. 1995). Variability of climate, topography and other site factors can result in a wide range of representation of successional stages on the landscape (Schoennagel et al. 2004). Equilibrium landscapes are not likely to develop in areas <500000ac.

### Issues/Problems

Fire regimes in this system are strongly related to climatic cycles. Long-term changes in climate as well as interannual climate variability will affect the frequency of fire in this system and its distribution along an elevational gradient.

Moisture gradients control the fire regime of these systems relative to the lower elevation montane mixed conifer types (eg, BpS 1045). Disturbance regimes may operate on a similar gradient. Where this system is in close proximity to montane mixed conifer systems, fire regimes may be more similar to the mixed conifer system (ie, more frequent with more mixed severity fire).

### Comments

Additional reviewers included: Steve Barrett (sbarrett@mtdig.net), Pat Green (pgreen@fs.fed.us), Susan Miller (smiller03@fs.fed.us), Cathy Stewart (cstewart@fs.fed.us) and Beverly A. Yelczyn (byelczyn@fs.fed.us). Peer review resulted in minor adjustments to the description. There was some debate among reviewers about the elevational range of this type and whether it should be split into lower (dominated by lodgepole pine with some Douglas-fir) and upper subalpine (dominated by spruce and fir) types. The single type was retained and improvements were made to the description after additional consultations with reviewers.

This type is lumped with BpS 1056, which is deemed to have a very similar fire regime.

Based on Rapid Assessment model R0SPFI by Kathy Roche and reviewed by Bill Baker, Dennis Knight and Bill Romme.

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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 15 %

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

8

**Indicator Species and Canopy Position**

PICO
Upper
ABLA
Lower
PIEN
Lower

Middle

**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 stage after long interval replacement fires. There can be extended periods (as long as 300yrs) of grass/seedling stage after fire replacement events.

Whitebark pine may be present in the central ID and southwestern MT. Western larch and Douglas-fir may be present in northern ID, eastern WA, and western MT.

### Class B 45 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO
Upper
ABLA
Low-Mid
PIEN
Low-Mid

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| Cover | 41 % | 100 % |
| Height | Tree 5.1m | Tree 10m |
| Tree Size Class | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

High density lodgepole pine with spruce-fir in midstory. Tree heights of lodgepole pine will rarely exceed 25m. R. Haugo (01/07/2013), adjust maximum height to 10m, assume 50m was error.

### Class C 15 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO
Upper
ABLA
Low-Mid
PIEN
Low-Mid

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| Cover | 0 % | 40 % |
| Height | Tree 5.1m | Tree 10m |
| Tree Size Class | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Low density pole to medium diameter trees. Primarily occurs after mixed severity fires, on droughty substrates or after insects or disease thin denser stands. Reburn events may also result in lack of seed source. Douglas-fir and whitebark pine may be present in this class. R. Haugo (01/07/2013), adjust maximum height to 10m, assume 50m was error.

**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**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 10.1m | Tree 50m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Low density dominated by spruce-fir with declining lodgepole pine. Primarily occurs after mixed severity fires, on droughty substrates or after insects or disease thin denser stands. Reburn events may also result in lack of seed source.

Douglas-fir and whitebark pine may be present in this class.

### *Class E* 20 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 10.1m | Tree 50m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

High density dominated by spruce-fir with declining lodgepole pine. This type will occur in the more mesic portions of the BpS's range, with longer fire return intervals. Fires will tend to be more stand replacing in this type.

## *Disturbances*

**Fire Regime Group**:** IV

**Historical Fire Size (acres)**

Avg 0
Min 100
Max 300000

**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 | 100 | 600 | 0.005 | 67 |
| *Mixed* | 400 | | | 0.0025 | 33 |
| *Surface* | | | | | |
| *All Fires* | 133 | | | 0.00751 | |

***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)

**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* 1010560** **Rocky Mountain Subalpine Mesic-Wet Spruce-Fir Forest and Woodland**

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 4/14/2006

| | | | | | |
|---|---|---|---|---|---|
| **Modeler 1** | Kathy Roche | kroche@fs.fed.us | **Reviewer** | Steve Barrett | sbarrett@mtdig.net |
| **Modeler 2** | | | **Reviewer** | Jeff Jones | jjones@fs.fed.us |
| **Modeler 3** | | | **Reviewer** | Brendan Ward | bward@fs.fed.us |

**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PIEN
ABLA
PICO

**Map Zone**
10

**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
Northern Rockies, including MT, ID and WY.

This specific model was refined to fit the mapped distribution of 10560 in the LANDFIRE BpS layer. This type occurs in western MT and ID north of the Salmon River.

### Biophysical Site Description
Upper subalpine zone and mesic sites. 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. 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.

### Vegetation Description
Engelmann spruce and subalpine fir dominate on most aspects with lodgepole pine comprising a greater component on dryer sites or earlier successional stages. Vaccinium scoparium is a common understory associate.

In the northern Rocky Mountains of northern ID and MT, Tsuga mertensiana occurs as small to large patches within the matrix of this mesic spruce-fir system and only in the most maritime of environments (the coldest and wettest of the more continental subalpine fir forests).

Mesic understory shrubs include Menziesia ferruginea, Vaccinium membranaceum, Rhododendron albiflorum, Amelanchier alnifolia, Rubus parviflorus, Ledum glandulosum, Phyllodoce empetriformis and Salix spp. Herbaceous species include Actaea rubra, Maianthemum stellatum, Cornus canadensis, Erigeron eximius, Gymnocarpium dryopteris, Rubus pedatus, Saxifraga bronchialis, Tiarella spp,

**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.

Lupinus arcticus ssp. subalpinus, Valeriana sitchensis and graminoids Luzula glabrata var. hitchcockii or Calamagrostis canadensis.

### Disturbance Description

Fire Regime Group V or IV; primarily long-interval stand replacement fires. In some areas, spruce beetle can influence successional stage, species composition and stand density. Spruce beetle may act to accelerate succession.

### Adjacency or Identification Concerns

Adjacent to drier, lower subalpine forests (lodgepole-spruce-fir) and to krummholz and alpine vegetation. This system typically has more precipitation and longer winters than lower subalpine types.

Climate (severely dry conditions) is the primary driver of fire regimes in this system. Long-term changes in climate as well as interannual climate variability will affect the frequency of fire in this system.

This BpS corresponds to the following habitat types (Pfister et al. 1977): ABLA/ALSI, ABLA/CAGE, ABLA/VASC, TSME/XETE, TSME/MEFE, TSME/CLUN, PICEA/GART, PICEA/LIBO and PICEA/PHMA.

### Native Uncharacteristic Conditions

### Scale Description

Fires could range from 1000s-10000s of acres. Variability of climate, topography and other site factors can result in a wide range of representation of successional stages on the landscape. Equilibrium landscapes are not likely to develop in areas <500000ac.

### Issues/Problems

### Comments

This model was corrupted and had to be recreated months after it was delivered for MZs 10 and 19. Kathy Roche authored the model, but we were unable to get the model reviewed again prior to mapping. The comments from an earlier review that indicated the fire return interval should be around 175yrs were incorporated into this version of the model.

This model produced anomalous results in LANDSUM, and was revised on 7/28/06 by Brendan Ward with LANDFIRE at the Missoula Fire Sciences Lab. During revisions, it was discovered that this model was intended for extremely cold, long-return interval systems representing a more rare type of site within the distribution of spruce/fir, and was not representative of this system in the areas mapped to it in the LANDFIRE BpS layer. This current model was built from the previous version of the model delivered in January 2005 and was updated to reflect some of the characteristics of the revised model from April 2006. The disturbance and succession rates were further refined through dialogue with the modeler and the reviewer of a previous version. Notable changes include a fire frequency of around 175yrs, increased rates of insect disturbance, decreased durations in A, B and C, and the slight probability that some wind/weather/stress events will transition to B. This model was reviewed by the modeler (Kathy Roche), Steve Barrett and Jeff Jones on 7/28/06.

This model was adapted from the Rapid Assessment model R0SPFI, which was reviewed by Bill Baker (bakerwl@uwyo.edu), Dennis Knight (dhknight@uwyo.edu) and Bill Romme (romme@cnr.colostate.edu). Based on input for MZs 10 and 19 (Steve Barrett, sbarrett@mtdig.net; and Cathy Stewart, cstewart@fs.fed.us), minor modifications were made to the description and a reduction in the overall mean fire return interval (from 300yrs to 175yrs).

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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 15 %

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Mid-Upper
PICO
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 stage after long interval replacement fires. There can be extended periods (as long as 300yrs) of grass/seedling stage after fire replacement events. This stage may occupy 3-50% of the landscape depending upon climatic conditions and variability of fire return intervals.

Sucession to B after 30yrs. Replacement fire every 200yrs resets this class to age zero.

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### Class B 30 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Upper
PICO
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

High density saplings to poles. May occupy 5-50% of the landscape.

Sucession to D after 70yrs. Replacement fire every 200yrs causes a transition to class A. Wind/weather/sress occurs every 1000yrs, resulting in a transition to A half of the time and C the remaining half. Insects and disease occur every 500yrs causing a transition to C. Competition/maintenance was modeled once every 500yrs with a transition to C to represent the stem-exclusion phase of more pure lodgepole pine stands.

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### Class C 10 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Upper
PICO
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 5.1m | Tree 50m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Low density saplings to poles. Primarily occurs after insects, disease or weather stress thins denser stands. This occupies 3-50% of landscape.

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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.

Sucession to D after 50yrs. Replacement fire every 200yrs causes a transition to class A. Wind/weather/sress occurs every 1000yrs, resulting in a transition to A half of the time and remaining in C the other half. Insects and disease occur every 1000yrs with no transition to other classes.

***Class D*** **45 %**

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper
ABLA
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 10.1m | Tree 50m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole to larger diameter trees. This stage occupies 15-50% of the landscape.

Persistant state unless disturbance causes a transition. Replacement fire every 150yrs causes a transition to class A. Wind/weather/sress occurs every 1000yrs, resulting in a transition to A half of the time and C the remaining half. Insects and disease occur every 500yrs causing a transition to C.

***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 2000
Min 100
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* | 172 | 100 | 600 | 0.00581 | 100 |
| *Mixed* | | | | | |
| *Surface* | | | | | |
| *All Fires* | 172 | | | 0.00583 | |

***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)

**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* 1011610 Northern Rocky Mountain Conifer Swamp

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
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**Vegetation Type**
Wetlands/Riparian

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

**Dominant Species**
PIEN
THPL

**Map Zone**
10

**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
Northern Rocky Mountains from northwestern WY north into the Canadian Rockies and west into eastern OR and WA. Most common where the inland Pacific maritime influence is strongest. The biggest expanse of late-successional status currently is from Upper Priest Lake, ID to the Canadian border.

### Biophysical Site Description
Poorly drained soils that are saturated a significant portion of the growing season may have seasonal flooding in the spring. Soils conditions may include exposed rock and gravel at the surface or, more rarely, organic matter. Stands generally occupy sites on benches, toeslopes or valley bottoms along mountain streams. May occupy upland sites (especially on northerly aspects) where high water table allows saturation part of the growing season.

### Vegetation Description
Composition will vary geographically, but is generally dominated by large, old Picea engelmannii. Thuja plicata may be present on warm-wet lowland sites as well. Large downed logs are often common (50 tons/acre possible). Large old cedars tend to have heartrot.

Understory associates will vary widely geographically, but include Oplopanax horridum (devil's club), Athyrium filix-femina, Dryopteris spp, Lysichiton americanus, Gymnocarpium dryopteris, Equisetum arvense, Senecio triangularis, Mitella breweri (colder and wetter end of the range), Mitella pentandra, Streptopus amplexifolius and Calamagrostis canadensis (colder and wetter end of the range).

### Disturbance Description
Fire regime group V with rare stand replacement fires (>200yrs+). Fire frequency is highly dependant on adjacent vegetation and relative patch size compared to the surrounding matrix. In the subalpine zone, these systems act as fuel breaks. However, frequency of fire is increased where drainage is oriented with prevailing wind. Fuel loading in adjacent vegetation may sometimes be important. Small patch fire events (individual lightning strikes) may occur within patches, but do not meet the threshold of mixed severity

**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.

Openings the overstory canopy often results in windthrow (Williams et al. 1995).

Spruce beetle outbreaks may occur and be linked to subsequent fire events.

### Adjacency or Identification Concerns

The wetland types are generally distinguishable from other upland forests and woodlands by shallow water tables and mesic or hydric undergrowth vegetation.

### Native Uncharacteristic Conditions

### Scale Description

Linear features and smaller patches. 10s-1000s of acres in size.

### Issues/Problems

This is typically a small patch system and may be difficult to map.

This is a relatively stable ecosystem dominated by positive feedback mechanisms and so they were highly variable over space and time. Variability was dependent on patch size, native burning and adjacent vegetation.

### Comments

Art Zack (azack@fs.fed.us) and Craig Glazier (cglazier@fs.fed.us) provided input to an earlier version of this model.

In general, modelers and reviewers had trouble with the NatureServe description of this type, as it combines two very different systems-- upland redcedar groves and lowland, seasonally flooded conifer (spruce) bogs. The upland redcedar type was split into a separate model for zones 10 and 19 (10472), and this "conifer swamp" type was modeled differently than the NatureServe description. As a result of peer review, mixed severity fire was removed from the model.

Peer review resulted in general concern that this system is too small in concept compared to other BpS and should not be included in LANDFIRE.

## *Vegetation Classes*

***Class A*** **10 %**

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Mid-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.

Riparian sprouting species may be considered trees or shrubs. Nurse crops of white pine, lodgepole, or cottonwood may comprise this class, in which case tree heights would be very tall (>30m).

**Description**

Sprouting riparian shrubs and deciduous trees, such as black cottonwood, Douglas maple, willow and birch. Engelmann spruce and some other conifers may be regenerating.

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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.

The probability of fire is highest in this class and fires will often creep in from adjacent vegetation types.

Loss of large trees post-burn can alter the water table and reduce subsequent tree regeneration, causing this class to last many years.

***Class B*** **20 %**

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 100 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | None | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Typically closed overstory of Engelmann spruce. Riparian deciduous species present but not dominant.

***Class C*** **70 %**

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PIEN
Upper

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 100 % |
| *Height* | Tree 25.1m | Tree >50.1m |
| *Tree Size Class* | None | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Typically closed, old Engelmann spruce trees. Canopy closure tends to be >60%.

***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**

**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 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* | 400 | 250 | 750 | 0.0025 | 99 |
| *Mixed* | | | | | |
| *Surface* | | | | | |
| *All Fires* | 400 | | | 0.00252 | |

***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.

Northwest Research Station. 375 pp.

**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* 1011660 Middle Rocky Mountain Montane Douglas-fir Forest and Woodland

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


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**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PSME
PICO
PIFL
CARU
CAGE
BERE
PHMA5

**Map Zone**
10

**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 BpS occurs in the southeast and eastern portions of MZs 10 and 19 (eastern Salmon River mountains, Pioneer mountains and Soldier mountains, Helena NF).

### Biophysical Site Description
The xeric Douglas-fir type primarily exists on lower foothills immediately above grasslands/shrublands in elevation. Upper elevations border on dry subalpine fir. Slopes range from gentle to steep.

### Vegetation Description
Generally dominated by Douglas-fir with an understory of graminoides and sparse shrubs. Stands are typically open and dominated by moderate to large diameter Douglas-fir. Limber pine may be present. Lodgepole pine can co-dominate in cooler portions of the mapping zones.

### Disturbance Description
Fire regime is predominantly mixed with a MFI of approximately 35-50yrs (Crane and Fischer 1986, Bradley et al. 1992) . Mixed-severity fires occur with a typical frequency of 30-50yrs primarily in dense stands (classes B and E).

### Adjacency or Identification Concerns
This BpS corresponds with cool, dry Douglas-fir and limber pine habitat types (Pfister et al. 1977, Steele et al. 1981), including PSME/CAGE, PSME/FEID, PSME/SYOR, PSME/ARCO, PSME/JUCO, PIFL/FEID/FEID phase and PIFL/JUCO.

This type often forms an ecotone with mountain grasslands/sagebrush. Class A in this model is equivalent with a Class A in neighboring grassland/shrubland types. Higher elevations of this type border dry subalpine fir systems and persistent lodgepole pine in frost pockets and cooler areas of the map zone.

**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.

Douglas-fir increases in canopy density in the absence of fire disturbance. Much of this landscape today has canopy cover denser than the historic range of variability.

### Native Uncharacteristic Conditions

Canopy closure of >90% in this BpS is considered uncharacteristic.

### Scale Description

Since this type is dominated by mixed fires, patches tend to be smaller in size due to limited fuels. Fire sizes are generally variable. Analysis areas of several thousand acres would probably be adequate.

### Issues/Problems

### Comments

Additional reviewer was Susan Miller (smiller03@fs.fed.us).

This BpS was adapted from Rapid Assessment model R0PSMEdy, by Jeff Jones and reviewed by Steve Barrett and Cathy Stewart.

Review comments incorporated on 3/16/2005, resulting in clarification in description and slightly more surface fires and higher MFI overall.

## *Vegetation Classes*

### *Class A* 20 %

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PSME Upper
PICO Upper
PIFL Upper
CARU Lower

**Structure Data (for upper layer lifeform)**

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

☑ Upper layer lifeform differs from dominant lifeform.

Graminoids are the dominant lifeform in this class.

**Description**

Dominated by graminoids and seedling and sapling sized Douglas-fir, lodgepole pine and/or limber pine. Understory may be dominated by Calamagrostis rubescens and Carex geophila.

### *Class B* 15 %

Mid Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PSME Upper
PICO Upper
PIFL Lower
CARU Lower

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 90 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Medium 9-21"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Relatively dense pole and medium sized Douglas-fir or lodgepole pine. The understory is open and relatively depauperate. Mixed severity fire may open up the canopy. Understory may be dominated by Calamagrostis rubescens and Carex geophila.

**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* 30 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PSME
Upper
PICO
Upper
PIFL
Upper
CARU
Lower

**Structure Data (for upper layer lifeform)**

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

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Open poles and medium sized Douglas-fir, lodgepole pine or limber pine with patchy graminoid cover and dispersed shrubs. Understory may be dominated by Calamagrostis rubescens and Carex geophila. R. Haugo (01/09/2013), extend min canopy closure to 10% to maintain continuity of S-Class mapping criteria.

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### *Class D* 20 %

Late Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PSME
Upper
PICO
Upper
PIFL
Upper
CARU
Lower

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 21 % | 40 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Open canopy of medium-large sized lodgepole pine and/or limber pine and large to very large Douglas-fir and/or limber pine with a graminoid and sparse shrub understory. Understory may be dominated by Calamagrostis rubescens and Carex geophila. R. Haugo (01/09/2013), extend min canopy closure to 10% and max height to 50m to maintain continuity of S-Class mapping criteria.

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### *Class E* 15 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PSME
Upper
PICO
Upper
PIFL
Upper
CARU
Lower

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 90 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Very Large >33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Multi-storied Douglas-fir, sometimes with lodegpole pine and limber pine present. Mixed severity fire may open up the canopy. Sparse understory dominated by Calamagrostis rubescens and Carex geophila. R. Haugo (01/09/2013), extend max canopy closure to 100% and max height to 50m to maintain continuity of S-Class mapping criteria.

## *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**:** I

**Historical Fire Size (acres)**

Avg 0
Min 0
Max 0

**Sources of Fire Regime Data**

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

**Additional Disturbances Modeled**

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

| Fire Intervals | Avg FI | Min FI | Max FI | Probability | Percent of All Fires |
|---|---|---|---|---|---|
| Replacement | 75 | 20 | 130 | 0.01333 | 42 |
| Mixed | 55 | 50 | 700 | 0.01818 | 57 |
| Surface | 2500 | | | 0.0004 | 1 |
| All Fires | 31 | | | 0.03192 | |

***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.

## References


Barrett, S.W. 2004. Fire history database. June 17, 2004.

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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* 1011670 Rocky Mountain Poor-Site Lodgepole Pine Forest

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

## *General Information*

**Contributors** (also see the Comments field) **Date** 11/18/2005


| | | | | | |
|---|---|---|---|---|---|
| **Modeler 1** | Dana Perkins | dana_perkins@blm.gov | **Reviewer** | Lynn Bennett | lmbennett@fs.fed.us |
| **Modeler 2** | Carly Gibson | cgibson@fs.fed.us | **Reviewer** | Steve Barrett | sbarrett@mtdig.net |
| **Modeler 3** | John DiBari | Jdibari@email.wsu.edu | **Reviewer** | Roy Renkin | roy_renkin@nps.gov |


**Vegetation Type**
Forest and Woodland

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

**Dominant Species**
PICO
CAGE2
VASC
CARU
CARO5

**Map Zone**
10

**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
Northern Rockies, south western MT and central ID.

### Biophysical Site Description
This type occurs on coarse, nutrient poor soils derived largely from silicic rocks, (rhyolite, granite and some sterile sandstone). This type may be considered an edaphic climax that occurs on rocky soils in cold air pockets. These are subalpine forests where the dominance of Pinus contorta is related to topo-edaphic conditions and nutrient-poor soils. These include excessively well-drained pumice deposits, glacial till and alluvium on valley floors where there is cold air accumulation, warm and droughty shallow soils over fractured quartzite bedrock, and shallow moisture-deficient soils with a significant component of volcanic ash. Soils on these sites are typically well-drained, gravelly, coarse-textured, acidic, and rarely formed from calcareous parent materials. Annual precipitation averages 25-35in. with fairly even distribution across the months with slightly more in the spring and less during the summer.

### Vegetation Description
Following stand-replacing fires, Pinus contorta will rapidly colonize and develop into dense, even-aged stands and then persist on these sites that are too extreme for other conifers to establish. Mature to overmature stands are dominated by slow growing lodgepole pine (Pinus contorta Dougl.). Lodgepole pine occurs in nearly pure stands throughout all successional stages (ie, lodgepole pine plays early-seral and quasi-climax roles in this system). These stands can be dense (80-100 basal area (ft sq)).

Understory will typically be sparse except in gaps. Species may include: Geyer's sedge, Ross' sedge, Vaccinium spp, pine grass, twin flower and kinnikinnick. Early succession stands can be dense with lodgepole pine seedlings and saplings that thin over time to widely spaced trees with a multi-aged structure.

**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 is infrequent and often quite patchy due to lack of surface fuel. Winds carry crown fire for stand replacing events. Mountain pine beetles kill trees in endemic and epidemic disturbance events. Large diameter trees (>8in DBH) are preferred by mountain pine beetles but in epidemics, 5in DBH class trees have been known to be killed. Generally younger trees are not host trees. Patches of mortality provide gaps for regeneration. Mortality of trees from mountain pine beetles produces fuel for large stand replacing fires. The interrelationships between fire and insects are the principle drivers in this system.

Mistletoe may cause mortality in older trees, a profusion of induced branches and partial crown mortality, which may predispose them to intense torching that may lead to crown fire.

### Adjacency or Identification Concerns

May be confused with dense stands of lodgeople dominated seral stages of more moist subalpine forested environments. Seral lodegpole pine stands can be distinguished because they have a more continuous cover of herbaceous growth and will have the occasional presence of spruce or fir seedlings. This BpS cannot support any coniferous species other than lodgepole pine.

This type corresponds to cool habitat types dominated by lodgepole pine (Pfister et al. 1977) but may not contain subalpine firs and spruce.

### Native Uncharacteristic Conditions

### Scale Description

Patch size ranges from a few tens of acres to a few hundred on sandstone outcrops to areas of thousands to tens of thousand on rhyolite and granitic substrates.

### Issues/Problems

### Comments

Additional reviewer was Ward McCaughey (wmccaughey@fs.fed.us). Peer review resulted in a longer overall MFI (from 175yrs to 300yrs) and a significant reduction in the amount of mixed severity fire ( from ~40% to ~10%). There was some debate among reviewers about the exact nature of this BpS compared to subalpine, seral lodgepole pine. Additional adjustments were made in the model description to clarify these differences.

Based on the Rapid Assessment model R0PICO by Don Despain (don_despain@usgs.gov) and reviewed by Steve Barrett (sbarrett@mtdig.net) and Cathy Stewart (cstewart@fs.fed.us).

## *Vegetation Classes*

***Class A*** **15 %**

Early Development 1 All Structure

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO Upper
CAGE2 Low-Mid
CARO5 Lower

**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**

Sparse to dense lodgepole pine seedlings to young pole-sized trees. Sparse herbaceous ground cover mostly of Carex geyeri and C. rossii. Lodgepole are slow growing, and succession to class B occurs after 40yrs.

**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**

**Indicator Species and Canopy Position**

PICO

CAGE2

CARO5

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 5.1m | Tree 10m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole sized lodgepole pine and a sparse herbaceous layer dominated by Carex geyeri. Disturbance caused gaps may cause a transition to class C. Competition in the doghair condition may delay succession and prolong stay in this class. Self thinning would cause a transition to C. Otherwise the class succeeds to class D after 150yrs.

### *Class C* 15 %

Mid Development 1 Open

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO

CAGE2

CARO5

VASC

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 0 % | 40 % |
| *Height* | Tree 5.1m | Tree 25m |
| *Tree Size Class* | Pole 5-9" DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Pole sized lodgepole pine with a Carex spp dominated understory. At 150yrs, this class succeeds to class D. R. Haugo (01/09/2013), extend max height to 50m to maintain continuity of S-Class mapping criteria.

### *Class D* 45 %

Late Development 1 Closed

**Upper Layer Lifeform**

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

**Fuel Model**

**Indicator Species and Canopy Position**

PICO

CAGE2

CARO5

VASC

**Structure Data (for upper layer lifeform)**

| | Min | Max |
|---|---|---|
| *Cover* | 41 % | 100 % |
| *Height* | Tree 10.1m | Tree 25m |
| *Tree Size Class* | Large 21-33"DBH | |

☐ Upper layer lifeform differs from dominant lifeform.

**Description**

Nearly homogenous even aged or uneven aged lodgepole pine stands with limited recruitment in gaps. Understory herbaceous cover is sparse and limited to where there is sunlight. Mountain pine beetle infestations at epidemic levels may cause transition of class A. Blowdowns and endemic population levels of beetles result in opening and the transition to class C. R. Haugo (01/09/2013), extend max height to 50m to maintain continuity of S-Class mapping criteria.

**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 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* | 350 | 300 | 600 | 0.00286 | 87 |
| *Mixed* | 2500 | | | 0.0004 | 12 |
| *Surface* | | | | | |
| *All Fires* | 307 | | | 0.00327 | |

***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*


Barrett, S.W. 2004. Altered fire intervals and fire cycles in the Northern Rockies. Fire Management Today 64(3): 25-29.

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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.