

11660

Middle Rocky Mountain Montane Douglas-fir Forest and Woodland

BpS Model/Description Version: Aug. 2020

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Reviewer: Kerry Kemp

Vegetation Type

Forest and Woodland

Map Zones

9, 10, 19

Geographic Range

This Biophysical Setting (BpS) occurs in the southeast and eastern portions of map zone (MZ) 10 and MZ19 (eastern Salmon River Mountains, Pioneer Mountains, and Soldier Mountains, Helena NF). Pockets of this type may occur sporadically west into eastern Oregon.

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 or lodgepole pine. 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 MZs.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir
PICO	<i>Pinus contorta</i>	Lodgepole pine
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush
CARU	<i>Calamagrostis rubescens</i>	Pinegrass
CAGE2	<i>Carex geyeri</i>	Geyer's sedge
MARE11	<i>Mahonia repens</i>	Creeping barberry
PHMA5	<i>Physocarpus malvaceus</i>	Mallow ninebark
FEID	<i>Festuca idahoensis</i>	Idaho fescue

Species names are from the NRCS PLANTS database. Check species codes at <http://plants.usda.gov>.

Disturbance Description

Fire frequency estimates vary considerably. Crane and Fischer (1986) cite studies with frequencies of 5-67yrs for their Fire Groups 4 and 5, which are dominated by Douglas-fir.

Bradley et al. (1992) cite studies with frequencies ranging from 15-100yrs for their Fire Groups 2 and 3, which are Douglas-fir-dominated.

There is little information about the relative proportions of low-, mixed-, and replacement-severity fire. Arno and Gruell (1983) did not report fire frequency by severity type, but they did describe frequent surface fire along a Douglas-fir-grassland ecotone. In southwest Montana, Heyerdahl et al. (2006) found little evidence of crown fire on Douglas-fir tree islands adjacent to sagebrush-grasslands.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	112	24		
Moderate (Mixed)	55	50		
Low (Surface)	107	26		
All Fires	27	100		

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is the central tendency modeled. Percent of all fires is the percent of all fires modeled in that severity class. Minimum and Maximum FIs show the relative range of fire intervals as estimated by model contributors, if known.

Scale Description

Since this type is dominated by mixed fires, patches tend to be smaller in size. Fire sizes are generally variable. Patch sizes can range from 0-100s of hectares in current fires and probably were quite variable in the past as well. Fires likely burned 1,000s of acres at a time though not the 300,000 acres that we are seeing currently in some of these forests. Analysis areas of several thousand acres would probably be adequate.

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 MZ.

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.

Issues or Problems

Native Uncharacteristic Conditions

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

Comments

This model was reviewed by Kerry Kemp during the 2016 BpS Review. The 2,500yr surface fire return interval of the model was questioned during the review. Kemp noted field observations of low-severity fire in pure Douglas-fir stands in the Salmon Mountains and Frank Church

Wilderness and estimated that at least 15-20% of fires in this BpS could be low-severity. Based on citations in the Disturbance Description (especially Arno and Gruell 1983 and Heyerdahl et al. 2006) and Kemp's review, Kori Blankenship modified the model to make surface fire more frequent and replacement fire less frequent.

This BpS is mapped in MZs 9, 10, 19, 21, 22 and 29. In MZ19, LANDFIRE National modelers split out a fire-maintained subtype. During the 2016 BpS Review, Kori Blankenship asked reviewers if the fire-maintained subtype was found in other zones.

- One reviewer, familiar with MZs 9, 10 and 19, felt that if this type existed it could be found at the forest-grass/shrub ecotone. The reviewer noted that she had only observed it in MZ10 and that it may not warrant a separate model.

- Another reviewer felt that the subtype did exist in MZs 8, 9, 10 and 22 and was more common on southern and southwestern aspects.

- Cameron Naficy responded that in his study areas (manuscript in development) in Zone 21, he "documented very few low density, multi-cohort Douglas-fir stands resulting from repeated low severity fire, i.e. these stands occupied a small portion of the landscape. Many of these stands were ecotonal with grasslands and seemed to be in topographic safe sites such as rocky outcrops, concave depressions or on soil types with little organic material. Some of these factors might help you map the distribution of this forest type, but the relatively fine scale of the effects I'm describing and their inconsistency (i.e. not all rocky outcrops or concave depressions have fire-maintained forest) would make this challenging. In zones 21 and 19, most of our multi-cohort Douglas-fir stands showed clear evidence of initiating following high severity fire, but were subsequently affected by a variable number of non stand-replacing wildfires. Thus, they were multi-cohort, but resulting from a mix of severities over time rather than repeated low severity fires. Our dataset paints a picture primarily of non equilibrium dynamics over time at the patch scale, meaning that most patches in our study areas experienced a mix of fire severities over time and there were likely state switches between forest/non forest conditions over time in portions of the forest-grassland ecotone. Overall, I'm not sure it's accurate to invoke an equilibrium dynamics model to describe these stands as is implied by the fire-maintained label. Doing so, I think, misinterprets the dynamics and processes that likely characterized many relatively open Douglas-fir forests historically. Rather than creating a unique fire-maintained subgroup for each zone, unless there is good evidence for the existence of those dynamics in a specific region, I think it's more accurate to stick with a mixed severity model for most of these forests and work to try to refine the parameters."

Since the feedback was inconclusive, Blankenship made no changes. This issue should be reconsidered for future model refinement efforts.

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

Succession Classes

Mapping Rules

		Canopy Cover (%)
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Upper Layer Lifeform	Height (m)	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100
Herb	0-0.5	A	A	A	A	A	A	A	A	A	A
Herb	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Herb	>1.0	A	A	A	A	A	A	A	A	A	A
Shrub	0-0.5	A	A	A	A	A	A	A	A	A	A
Shrub	0.5-1.0	A	A	A	A	A	A	A	A	A	A
Shrub	1.0-3.0	A	A	A	A	A	A	A	A	A	A
Shrub	>3.0	A	A	A	A	A	A	A	A	A	A
Tree	0-5	A	A	A	A	A	A	A	A	A	UN
Tree	5-10	C	C	C	C	B	B	B	B	B	UN
Tree	10-25	D	D	D	D	E	E	E	E	E	UN
Tree	25-50	D	D	D	D	E	E	E	E	E	UN
Tree	>50	D	D	D	D	E	E	E	E	E	UN

Succession class letters A-E are described in the Succession Class Description section. Some classes use a leafform distinction where a qualifier is added to the class letter: Brdl (broadleaf), Con (conifer), or Mix (mixed conifer and broadleaf). UN refers to uncharacteristic native or a combination of height and cover that would not be expected under the reference condition. NP refers to not possible or a combination of height and cover which is not physiologically possible for the species in the BpS.

Description

Class A 21 Early Development 1 - All Structures

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush	Upper
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower

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*.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B 17 Mid Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush	Lower
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower

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

Medium 9-21" DBH

Class C	34	Mid Development 1 - Open
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Symbol	Scientific Name	Common Name	Canopy Position
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush	Upper
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower

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*.

Medium 9-21" DBH

Class D	20	Late Development 1 - Open
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Symbol	Scientific Name	Common Name	Canopy Position
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush	Upper
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower

Open canopy of medium-large 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*.

Very Large >33" DBH

Class E	8	Late Development 1 - Closed
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Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
PSME	<i>Pseudotsuga menziesii</i>	Douglas-fir	Upper
PICO	<i>Pinus contorta</i>	Lodgepole pine	Upper
PIFL	<i>Pieris floribunda</i>	Mountain fetterbush	Upper
CARU	<i>Calamagrostis rubescens</i>	Pinegrass	Lower

Description

Multi-storied Douglas-fir, sometimes with lodgepole pine and limber pine present. Sparse understory dominated by *Calamagrostis rubescens* and *Carex geophila*.

Maximum Tree Size Class

Very Large >33" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:ALL	0	Mid1:OPN	29
Mid1:OPN	30	Late1:OPN	129
Mid1:CLS	30	Late1:CLS	89
Late1:CLS	90	Late1:CLS	999
Late1:OPN	130	Late1:OPN	999

Probabilistic Transitions

Disturbance Type	Disturbance occurs In	Moves vegetation to	Disturbance Probability	Return Interval (yrs)	Reset Age to New Class Start Age After Disturbance?	Years Since Last Disturbance
Alternative Succession	Early1:ALL	Mid1:CLS	1	1	Yes	28
Surface Fire	Early1:ALL	Early1:ALL	0.005	200	No	0
Wind or Weather or Stress	Early1:ALL	Early1:ALL	0.01	100	Yes	0
Replacement Fire	Early1:ALL	Early1:ALL	0.02	50	Yes	0
Mixed Fire	Early1:ALL	Early1:ALL	0.02	50	No	0
Alternative Succession	Mid1:OPN	Mid1:CLS	1	1	Yes	45
Insects or Disease	Mid1:OPN	Mid1:OPN	0.001	1000	No	0
Replacement Fire	Mid1:OPN	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Mid1:OPN	Mid1:OPN	0.01	100	No	0
Surface Fire	Mid1:OPN	Mid1:OPN	0.0133	75	No	0
Mixed Fire	Mid1:OPN	Mid1:OPN	0.0167	60	No	0
Wind or Weather or Stress	Mid1:CLS	Mid1:OPN	0.005	200	Yes	0

Insects or Disease	Mid1:CLS	Mid1:OPN	0.005	200	Yes	0
Surface Fire	Mid1:CLS	Mid1:CLS	0.005	200	No	0
Replacement Fire	Mid1:CLS	Early1:ALL	0.008	125	Yes	0
Mixed Fire	Mid1:CLS	Mid1:OPN	0.02	50	Yes	0
Alternative Succession	Late1:OPN	Late1:CLS	1	1	Yes	45
Insects or Disease	Late1:OPN	Late1:OPN	0.001	1000	No	0
Replacement Fire	Late1:OPN	Early1:ALL	0.005	200	Yes	0
Wind or Weather or Stress	Late1:OPN	Late1:OPN	0.01	100	No	0
Surface Fire	Late1:OPN	Late1:OPN	0.0133	75	No	0
Mixed Fire	Late1:OPN	Late1:OPN	0.0167	60	No	0
Surface Fire	Late1:CLS	Late1:CLS	0.005	200	No	0
Wind or Weather or Stress	Late1:CLS	Late1:OPN	0.01	100	Yes	0
Insects or Disease	Late1:CLS	Late1:OPN	0.01	100	Yes	0
Replacement Fire	Late1:CLS	Early1:ALL	0.01	100	Yes	0
Mixed Fire	Late1:CLS	Late1:OPN	0.023	43	Yes	0

References

Arno, S.F. and G.E. Gruell. 1983. Fire history at the forest-grassland ecotone in southwestern Montana. *Journal of Range Management*. 36(3): 332-336.

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

Barrett, S.W. 2004. Fire Regimes in the Northern Rockies. *Fire Management Today* 64(2): 32-38.

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

Bradley, A.F., W.C. Fischer and N.V. Noste. 1992. Fire ecology of the forest habitat types of eastern Idaho and western Wyoming. Gen. Tech. Rep. INT-290. Ogden, UT: USDA Forest Service, Intermountain Research Station. 92 pp.

Crane, M.F. and W.C. Fisher. 1986. Fire ecology of the forested habitat types of central Idaho. General Technical Report INT-218, USDA Forest Service. 86 pp.

Fischer, W.C. and B.D. Clayton. 1983. Fire ecology of Montana forest habitat types east of the Continental Divide. Gen. Tech. Rep. INT-141. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 83 pp.

Heyerdahl, E.K. and R.F. Miller. 2004. Fire and forest history in a high-elevation mosaic of Douglas-fir forest and sagebrush-grass, Fleece Mountains, Montana: A pilot study. Final report to BLM, Butte Field Office, 15 December 2004. 38 pp. On file at the USFS Region 1, Regional Office, Fire, Air, and Aviation Unit.

Heyerdahl, E.K., R.F. Miller and R.A. Parsons. 2006. History of fire and Douglas-fir establishment in a savanna and sagebrush-grassland mosaic, southwestern Montana, USA. *Forest Ecology and Management*. 230: 107-118.

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

Pfister, R.D., B.L. Kovalchik, S.F. Arno and R.C. Presby. 1977. Forest habitat types of Montana. General Technical Report INT-34. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 174 pp.

Steele, R., R.D. Pfister, R.A. Ryker and J.A. Kittams. 1981. Forest habitat types of central Idaho. Gen. Tech. Rep. INT-114. Ogden, UT: USDA Forest Service, Intermountain Forest and Range Experiment Station. 138 pp.