Rapid Assessment Reference Condition Model

The Rapid Assessment is a component of the LANDFIRE project. Reference condition models for the Rapid Assessment were created through a series of expert workshops and a peer-review process in 2004 and 2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG)

R#ALME **Alpine and Subalpine Meadows and Grasslands**

General Information

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

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Vegetation Type

Grassland

Dominant Species*

CAGE
VACCI
CANI2
FEVI

General Model Sources

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

LANDFIRE Mapping Zones

1 2 7 8 9

Rapid AssessmentModel Zones

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

Geographic Range

Above 5500 feet in Northern Cascades Range to above 6500 feet in the Strawberry Mountains, and above 7500 feet in the Wallowa and Elkhorn Matins (Johnson 2004). The upper limit of the vegetation zone was found to be around 7130 feet (2600 meters) in Washington's northern Cascades (Douglass and Bliss 1977). Above this, snow fields, glaciers and rock dominate. On the northeast side of Mount Rainier, the upper limit extended to as much as 7200 feet (2625 meters) (Hamann 1972).

Biophysical Site Description

Snow pack is retained for much of the year, the growing season is short and degree days (days warm enough for root or shoot growth) are relatively few. Exposure is extreme with high solar insolation and severe desiccating winds. Temperature fluctuations from day to night are large, and the average daily minimum temperatures very low. Low temperatures mean slow organic decomposition, so nutrients tend to be locked up in organic matter for relatively long periods of time.

Vegetation Description

Many vegetation communities have been described in the subalpine and alpine areas of the Pacific Northwest. Distribution of high elevation herbaceous vegetation types are thought to be determined by timing of snow melt (i.e. solar insolation), soil depth and drainage, and degree of summer drought (Douglas and Bliss 1977, Franklin and Dyrness 1988). The soils in northern Cascade Mountain range of this zone are generally poorly developed with the least developed soils, Entisols, associated with unstable snow bed sites or high windswept ridges and plateaus (Douglas and Bliss 1977). Inceptisols typically occur under herbaceous dominated communities including poorly drained snow bed types to the well-drained dry grass and dry sedge communities. Spodosols are associated with both forest patches and shrublands.

The alpine and subalpine herbaceous vegetation group includes a wide variety of plants including the following genera: Carex, Festuca, Stipa, Saxifraga, Xeropyllum, Phyllodoce, Vaccinium, Dryas, Kalmia, and Lupinus.

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

Disturbance Description

Little information is available about historic fire regimes in the nonforest areas above timberline (Agee 1994). Lightning strikes are undoubtedly common, but these ecosystems probably do not ignite or carry fire readily. Conditions that would allow a fire to spread are likely rare and fuels are discontinuous, limiting fire spread.

Most fires burning in the alpine meadows probably originated in the adjacent forests, and thus, their fire frequency is greater or equal to that of the adjoining forest type. Moist conditions probably lengthen fire free intervals in most meadows, although fescue dominated sites may mimic fire frequencies of the adjacent forest.

Fire patterns are highly variable because conditions vary greatly between watersheds (Agee 1994, Schellhaas et al. 2001). Agee (1993) lists fire return intervals in subalpine forests as ranging from more than 1500 years in the Olympic Mountains, to 250 years in subalpine fir forests of the Pasayten Wilderness. Frequencies in whitebark pine stands ranged from 50 to 300 years in the Rocky Mountains. East side subalpine forests burn more frequently than westside and Olympic Mountains (Agee 1993).

Fire behavior in subalpine forests are typically weather-driven events and depend on development of a fuel complex capable of supporting crown fire behavior. In rare events, Agee (1993) concedes that crown fire will occur regardless of fuel conditions, if fire storms are of sufficient magnitude, like with the Yellowstone fires of 1988.

Long fire return intervals (periods between fires) in this group mean that fire suppression activities have had little effect on alpine and subalpine areas. Agee (1994) proposes that at the landscape scale there may be a slight shift toward late seral communities and away from early seral communities.

Adjacency or Identification Concerns

This type intermixes at lower elevations with patches of whitebark pine (Pinus albicaulis), mountain hemlock (Tsuga mertensiana), subalpine fir (Abies lasiocarpa), and subalpine larch (Larix lyallii).

Scale Description

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

Burn patterns tend to be patchy in nature since most often the fire spread is through spotting and limited spread within the meadow. Under extreme burning conditions the entire meadow may burn. Fire size tends to range from 10s to 100s acres, with the smaller sizes predominating.

Issues/Problems

Historically, sheep used alpine and subalpine areas during summer months, and impacts can still be found in some areas. Today, these high elevation areas are popular destinations for recreation enthusiasts. Studies have looked at two aspects of recreation's effects on high elevation vegetation, first trampling, and second, pack stock grazing. Cole (1995) looked at various plant communities and individual species to determine their resistance and resilience (ability to recover from damage) to trampling damage by hikers. Cole determined that plant morphology of species within a community explained the greatest amount of variation in resistance to trampling and resilience after trampling. He found that the most resistant plants were caespitose (growing in dense low tufts) or matted graminoids like Carex species, and the least resistant plants were erect forbs like Thermopsis and Dryopteris. The species that recovered the most poorly after trampling (least resilient) were generally shrubby species with perennating buds located above the ground surface (chamaephytes) like Vaccinium scoparium, Pachistema mysinities and Phyllodoce empetriformis. Erect forb species had high recovery rates after trampling (Cole 1995).

Model Evolution and Comments

Fire return intervals inferred from adjacent forested communities.

From Review: This PNVG appears to incorporate dry subalpine meadows and grasslands (usually eastern,

dominated by fescue) and moist subalpine meadows and grasslands (more typical of the Olympics and Northern Cascades, and dominated by heather, vaccinium and carex). The fire frequency was initially developed with consideration for the drier sites. At review, the fire return values (and model values) were adjusted to encompass the longer intervals of the Cascades and Olympics, too.

Succession Classes**

Succession classes are the equivalent of "Vegetation Fuel Classes" as defined in the Interagency FRCC Guidebook (www.frcc.gov).

Class A 5 %

Early1 PostRep

Description

The early seral communities following fire events vary greatly in composition. Generally the dominant species in both grass- and shrub-dominated areas resprout. Unusually severe fire can result in total mortality of some patches within the meadow. Timing of fire can influence the ability of heathers and huckleberries to resprout. Forb composition may be relatively higher in this stage than at later stages.

[Replacement fire recycles; and an alternative succession to C allows for a portion of the PNVG to burn at higher severity.]

Dominant Species* and Canopy Position

VACCI
VASI
FEVI
XETE

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	5 %	20 %
Height	no data	no data
Tree Size Class	no data	

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

Class B 90 %

Late1 Closed

Description

Grass- and shrub-dominated communities both have high cover values. Plants are vigorous and well established. Fires are rare, and the community responds quickly.

Minimum cover may be as low as 20% in areas with extensive bare ground.

[Replacement fire causes succession to A. Succession to C with a mixed severity fire.]

Dominant Species* and Canopy Position

FEVI
CAGE2
PHEM
VACCI

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	80 %
Height	no data	no data
Tree Size Class	no data	

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

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Class C 5 %

Mid1 Open

Description

Severely burned patches recover much more slowly, creating openings that remain forb-dominated for a longer period of time.

[Replacement fire causes succession to A. Recycles in C with a mixed severity fire.]

Dominant Species* and Canopy Position

VASI
POPH
LUHI4

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	20 %	50 %
Height	no data	no data
Tree Size Class	no data	

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

Class D 0 %

Late1 Closed

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

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

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

Class E 0 %

Late2 Closed

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

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

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

Disturbances

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Disturbances Modeled

- [x] Fire
- [ ] Insects/Disease
- [ ] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [ ] Other:
- [ ] Other

Historical Fire Size (acres)

Avg: no data
Min: no data
Max: no data

Sources of Fire Regime Data

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

Fire Regime Group: **5**

I: 0-35 year frequency, low and mixed severity
II: 0-35 year frequency, replacement severity
III: 35-200 year frequency, low and mixed severity
IV: 35-200 year frequency, replacement severity
V: 200+ year frequency, replacement severity

Fire Intervals (FI)

Fire interval is expressed in years for each fire severity class and for all types of fire combined (All Fires). Average FI is central tendency modeled. Minimum and maximum show the relative range of fire intervals, if known. Probability is the inverse of fire interval in years and is used in reference condition modeling. Percent of all fires is the percent of all fires in that severity class. All values are estimates and not precise.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	350	200	500	0.00286	68
Mixed	750	500	1000	0.00133	32
Surface					
All Fires	239			0.00420	

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