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 2004-2005. For more information, please visit www.landfire.gov. Please direct questions to helpdesk@landfire.gov.

Potential Natural Vegetation Group (PNVG):

R1PICOdy **Sierra Nevada Lodgepole Pine - Dry Subalpine**

General Information

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

Modelers

Anthony C. Caprio tony_caprio@nps.gov

Reviewers

Vegetation Type

Forested

Dominant Species*

PICO

General Model Sources

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

LANDFIRE Mapping Zones

3 6
4
5

Rapid Assessment Model Zones

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

Geographic Range

Dry subalpine lodgepole pine is distributed in the upper montane of the central and southern portions of the Sierra Nevada. Stands are typically located at elevations ranging from ~2400 m to ~3200 m.

Biophysical Site Description

Lodgepole dominates on upper montane dry sites, often located on benches but also occurs on moderate slopes. Stands are typically in broken terrain and thus few large contiguous areas of this type exist. Stands persist on nutrient poor granitic or pumice soils (Sheppard and Lassoie 1988: Agee 1993: Keifer 1991). Climate is Mediterranean with wet winters (Nov.-Apr.) and dry summers although summer thunderstorms occur sporadically. Forest understory is typically sparse with few shrubs and low-to-moderate herbaceous cover. Fuel is considered sparse (Parker 1986; van Wagtendonk 1991).

Vegetation Description

Stands can exist in a range of densities from open woodland to stands with a closed canopy (Potter 1994, 1998). In the south central Sierra Nevada stands grade into foxtail pine at dry upper elevations (Rourke 1988: Keifer 1991). Western hemlock dominance increases at wetter sites in the central Sierra. At lower elevations and as available moisture increases there is an increasing dominance of red fir and western white pine. On warmer dry lower elevation sites lodgepole is associated with Jeffrey pine and western juniper.

Disturbance Description

Disturbance patterns have been poorly studied in Sierran lodgepole pine. Stands in the southern Sierra have been described as self perpetuating (regeneration from tree-fall gaps) with long intervals between fires (Parker 1986, Keeley 1980, Potter 1998). Sparse fuels are believed to limit ignition and fire spread (Parker 1986). In contrast, fire history studies from dry subalpine lodgepole pine forest in the southern Sierra have found moderate FRI in some stands (Keifer 1991: Caprio in review and unpublished data). Intervals ranged from 31 to 74 years (Chagoopa Plateau, Sequoia NP and Palisades Canyon, Kings Canyon NP). Fire

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

severity was mixed and ranged from understory burns on areas up to 100s of ha to high severity crown fire in patches up to 10s of ha. FRG of III. Season of fires was late summer or early fall. Seasonal fire scar position on Chagoopa and Palisades (SEKI) was 40.7% and 15% latewood and 59.3% and 80% dormant respectively (Caprio unpublished data).

Adjacency or Identification Concerns

Scale Description

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

Disturbance scale in persistent stands is small (0.1 ha - tree fall; Parker 1986). Disturbance scale in areas with long to short FRI is variable. Most fires are small (<1 ha) but the less common large fires affect large areas (10s to 100s ha) and may have the greatest influence on forest dynamics. Severity is generally low (understory burns with individual to scattered groups of trees impacted) to less common stand replacing fire, either high severity understory fire or canopy fire (patches up to 10s of ha on 5% to 20% of burned area) that occurs with more extreme weather (wind - observations by Sequoia-Kings Canyon National Park fire monitors during 1996 Chagoopa and 2003 Williams Fires burning in PICO) .

Issues/Problems

Limited information about disturbance is available. Available information from limited geographical sites. Divergent fire occurrence patterns ranging from moderate frequency to very long FRI. Differences may be related to ignition and fire spread probabilities.

Model Evolution and Comments

For the model, FRI assumed to be relatively short in "open" sites and longer in the closed sites. Probability of fire can be high because of dryness of sites with actual fire occurrence governed by ignition and fire spread probability. Thus some dry sites may have long intervals and thus have a more closed canopy. Dryness of sites limits fuel accumulations and fire tends to be of mixed severity leading to more open stands (multi-aged).

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

Lodgepole pine regeneration following stand replacing fire (severe understory fire or canopy fire). Moderate density to doghair thickets.

Indicator Species* and Canopy Position

PICO

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	100 %
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

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

Fuel Model no data

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

Class B 10 %

Mid1 Closed

Description

Mid-maturity lodgepole pine undergoing intrinsic stand thinning. Considerable surface fuel from tree mortality from previous fire.

Indicator Species* and Canopy Position

PICO

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

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

Fuel Model no data

Class C 15 %

Mid1 Open

Description

Mid-maturity lodgepole pine where surface fire or other disturbance has opened the stand.

Indicator Species* and Canopy Position

PICO

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	49 %
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

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

Fuel Model no data

Class D 55 %

Late1 Open

Description

Areas that have experienced one or more low severity understory fires that had reduced stand density or old stands that have not experienced fire but have been thinned by other processes (tree falls etc.). Stands are uneven aged.

Indicator Species* and Canopy Position

PICO

Structure Data (for upper layer lifeform)

	Min	Max
Cover	10 %	49 %
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

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

Fuel Model no data

Class E 15 %

Late1 Closed

Description

Old stands where fire has had minimal influence.

Indicator Species* and Canopy Position

PICO

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	no data	no data
Tree Size Class	no data	

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☐ Tree

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

Fuel Model no data

Disturbances

Non-Fire Disturbances Modeled

- ☑ Insects/Disease
- ☑ Wind/Weather/Stress
- ☐ Native Grazing
- ☐ Competition
- ☐ Other:
- ☐ Other:

Fire Regime Group: 1

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

Historical Fire Size (acres)

Avg:
Min:
Max:

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 the 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.

Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	250	31	500	0.004	11
Mixed	60	31	350	0.01667	45
Surface	60	9	350	0.01667	45
All Fires	27			0.03733	

References

Agee, J.K. 1993. Fire Ecology of Pacific Northwest Forests. Island Press, Washington, DC. 494 pp.

Caprio, A.C. (in press). Reconstructing fire history of lodgepole pine on Chagoopa Plateau, Sequoia National Park, California. In: Proceedings 2002 Fire Conference: Managing Fire and Fuels in the Remaining Wildlands and Open Spaces of the Southwestern United States, Dec. 2-5, 2002, San Diego CA.

Caprio, A.C. and D.M. Graber. 2000. Returning fire to the mountains: can we successfully restore the ecological role of pre-Euro-American fire regimes to the Sierra Nevada? Pp 233-241. In: D.N. Cole, S.F. McCool, W.T. Borrie, J. O'Loughlin (comps). Proceedings: Wilderness Science in a Time of Change-- Vol. 5 Wilderness Ecosystems, Threats, and Management; 1999 May 23-27; Missoula, MT. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Proceedings RMRS-P-15-VOL-5.

Keeley, J.E. 1980. Reproductive cycles and fire regimes. Pp 231-277. In: H.A. Mooney , T.M. Bonnicksen, N.L. Christensen, J.E. Lotan, and W.A. Reiners (tech. coord.). Proceedings of the Conference: Fire Regimes and Ecosystem Properties. Dec. 11- 15, 1978, Honolulu, Hawaii. USDA Forest Service, GTR- WO-26, 594 pp.

Keifer. M. 1991. Forest age structure, species composition, and fire disturbance in the Sierra Nevada subalpine zone. MS Thesis, Univ. of Arizona. 111 pp.

Parker, A. J. 1986. Persistence of lodgepole pine forests in the central Sierra Nevada. Ecology 67:1560–67.

Parker, A.J. 1988. Stand structure in subalpine forests of Yosemite National Park, California. For. Sci. 34:1047-1058.

Potter, Don. 1994. Guide to Forested Communities of the Upper Montane in the Central and Southern Sierra Nevada. R5-ECOL-TP-003.

Potter, Donald A. 1998. Forested communities of the upper montane in the central and southern Sierra Nevada. Gen. Tech. Rep. PSW-GTR-169. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture; 319 p.

Rourke, M.D. 1988. The biogeography and ecology of foxtail pine, Pinus balfouriana (Grev. And Balf.), in the Sierra Nevada of California. PhD dissertation, Univ. or Arizona.

Sheppard, P.R. and J.P. Lassoie. 1998. Fire regime of the lodgepole pine forest of Mt. San Jacinto, California. Madroño 45:47-56.

Taylor, A.H. and M.N. Solem. 2001. Fire regimes and stand dynamics in an upper montane forest landscape in the southern Cascades, Caribou Wilderness, California. J. Torrey Bot. Soc. 128:350-361.

van Wagtendonk, J.W. 1991. Spatial analysis of lightning strikes in Yosemite National Park. Pp. 605-611 In: P. Andrews and D.F. Potts (eds.) Proceedings of the Eleventh Conference on Fire and Forest Meteorology. Society of American Foresters, Bethesda, MD.