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):

R2ASMCup **Aspen with Conifer--High Elevations**

General Information

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

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Vegetation Type

Forested

Dominant Species*

POTR5
ABLA
ABCO
ACMI2

General Model Sources

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

LANDFIRE Mapping Zones

12 17
13 18
16

Rapid Assessment Model Zones

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

Geographic Range

Great Basin, California, northern Rockies, Alaska, Pacific Northwest, and north central regions.

Biophysical Site Description

This type typically occurs on flat to steep terrain (<80%) on all aspects. Elevation ranges fro 8000' to 11,000'. Soils are highly variable, but generally cool. The type is found through the spruce-fir forests and borders with the low to mid elevation mixed conifer on the lower edge.

Vegetation Description

As a species, aspen is adapted to a much broader range of environments than most plants found associated with it. Aspen exists in singe-storied or multi-storied stands. Conifer species are common and upper elevations are characterized by presence of true fir (Abies) and/or spruce (Picea). Douglas-fir (Pseudotsuga menziesii) may also be present. Douglas-fir was the fire adapted species that occurred in open savannas as old trees on ridges and rocky outcrops that provided some protection from periodic fires. The presence of even a single aspen tree in a stand provides strong evidence that the area historically supported aspen cover type. Areas with as few as five aspen trees per acre may return to an aspen community following disturbance.

Disturbance Description

This is a strongly fire adapted community with FRIs varying greatly with the encroachment of conifers. Without regular fire and with high levels of herbivory, conifers may replace the aspen community. The community type is usually patchy and small in area (<1,000 acres), thus fires are mostly small. However, fires can immigrate into aspen/mix conifers from adjacent mountain sagebrush and conifer communities. Before conifer encroachment in developing stands (<50 yrs), we adopted the FRI of stable aspen (R2ASPN), i.e., no fire in early development and only replacement fire every 75 years in yound stand between 10-50 yrs old. Similarly, older stands (>150 yrs) dominated by conifers would experience replacement fire every 75

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

yrs. For stands between 50-150 yrs with encroaching conifers, replacement, mixed severity, and surface fires were more frequent. According to Baker (1925), who most closely studied the historic condition, the FRI for replacement fire was 40-60 yrs (min-max), whereas the FRI for surface and mixed severity fires was 10-30 yrs (min-max) based on frequent fire scars left on aspen. Mixed severity fire occurred in closed aspen stands (50-150 yrs) with conifers encroaching, whereas surface fire was found in open stands that had previously experienced mixed severity fire (50-150 yrs). Indian burning was the primary sources of fire, especially surface and mixed severity fires. Probably counter to most aspen preconceptions, surface fire was documented in Bartos and Campbell (1998) to clean up litter without killing larger trees. Mixed severity fire thins young conifers in closed stands of aspen/conifer types. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal lightening season, yet evidence of frequent fire scars and historical studies show that native burning was the only source of fire that occurred mostly during the spring and fall.

Adjacency or Identification Concerns

The aspen type is often associated with conifer dominated types, mountain big sagebrush, or grass-forb communities. Douglas-fir is also found in aspen with mixed conifers at low and mid elevations.

This PNVG is similar to the PNVGs R0PSMEco for the Northern and Central Rockies model zone and to R3MCONcm for the Southwest model zone. The Southwest model includes some mixed severity fire. The Great Basin model has a class (E) that is pure conifer without aspen.

Scale Description

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

This type occurs in a landscape mosaic from small- to moderate-sized patches.

Issues/Problems

The role of mixed severity fire in closed mix aspen-conifer stands is less well documented. It was assumed that native burning caused greater fire activity between 50-150 yrs of stand development. This parameter has a large effect on the relative composition of classes C and D. A large disturbance rate for mixed severity increases the percentage of open aspen/conifer stands (D), whereas a smaller rate increases substantially that of the close aspen/conifer stands. More information is needed on this process. Experts and modelers expressed different views about the frequency of all fires, citing FRIs longer than those noted by Baker (1925), who actually studied the historic condition. The FRIs used here were a compromise: 1) the longer FRIs of stable aspen (R2ASPN) were used for the earlier and oldest development states and 2) the maximum FRI of Baker (1925) was used for stands between 50 and 150 yrs that were being encroached by higher elevation conifers.

Sub-alpine fir and/or white fir are found in the mid elevation aspen with mixed conifer model. We debated whether this high elevation aspen model is Fire Regime 3 or FR 4, which may depend on timing. We placed in FR 3 as we observe both replacement and mixed severity. Our local fires seem to burn 1/3 high severity, 1/3 moderate severity, and 1/3 low severity, which indicates FR3.

Model Evolution and Comments

This type is more highly threatened by conifer replacement than stable aspen. Aspen probably functioned most of the time as a mid-sized tree with random inclusions of old age Douglas-fir where the more frequent fires had burned by.

Succession Classes

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

Class A 10 %

Early1 PostRep

Description

Grass/forb and aspen suckers < 6' tall. Generally, this is expected to occur 1-3 years post-disturbance. No fire in this class. Succession to B after 10 years.

Indicator Species* and Canopy Position

POTR5
ACMI2
THFE
LUPIN

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	99 %
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 40 %

Mid1 Closed

Description

Aspen saplings over 6' tall dominate. Canopy cover is highly variable. Immature aspen with canopy cover >70%. Aspen is typically 2 -20 years old. Replacement fire is every 75 years on average, the FRI of stable aspen. Succession to C after 40 yrs.

Indicator Species* and Canopy Position

POTR5
SYMPH
ACMI2
LUPIN

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	70 %	99 %
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 C 15 %

Mid2 Open

Description

Aspen trees 5-16" DBH dominate. Less than 25% conifer may be present in both the over and understory. Both small replacement and mixed severity fires caused by native burning greatly affect dynamics. Small conifers are an important source of fuel. Baker's (1925) maximum replacement FRI of 60 yrs was used, whereas Baker's (1925) maximum FRI of 40 yrs was used for mixed severity fire (transition to D). Succession to E after 100 years.

Indicator Species* and Canopy Position

POTR5
ABCO
ABLA
SYMPH

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	40 %	69 %
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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*Dominant and Indicator Species are from the NRCS PLANTS database. To check a species code, please visit http://plants.usda.gov.

Class D 30 %

Late1 Open

Description

Aspen trees 5-16" DBH dominate. If dominant trees are > 16" DBH, this is considered unusual. Conifers in the understory, becoming codominant with the aspen. The replacement FRI of 60 yrs (max from Baker [1925]) was used. The FRI of 30 years was used for surface fire (max from Baker [1925]). Stands only transition to E (conifer dominant) if they do not burn for 2-3 FRIs, i.e., 100 years.

Indicator Species* and Canopy Position

POTR5
ABCO
ABLA
PIEN

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	70 %	99 %
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 5 %

Late1 Closed

Description

Aspen is 150 + years old, conifer dominate. Often fire exclusion area. Greater than 50% conifer in the overstory. Close late development for conifer. FRI is longer for conifers than for aspen; 75 yrs.

Indicator Species* and Canopy Position

PIEN
ABLA
ABCO
POTR5

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	50 %	99 %
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

Non-Fire Disturbances Modeled

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

Historical Fire Size (acres)

Avg:
Min:
Max:

Fire Regime Group: 3

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 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.

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Sources of Fire Regime Data

- ☑ Literature
- ☑ Local Data
- ☑ Expert Estimate

	Avg FI	Min FI	Max FI	Probability	Percent of All Fires
Replacement	76			0.01316	47
Mixed	196			0.00510	18
Surface	100			0.01	35
All Fires	35			0.02826	

References

Baker, F. S., 1925. Aspen in the Central Rocky Mountain Region. USDA Department Bulletin 1291 pp. 1-47.

Bartos, D. L. 2001. Landscape Dynamics of Aspen and Conifer Forests. Pages 5-14 in: Shepperd, W. D.; Binkley, D.; Bartos, D. L.; Stohlgren, T. J.; and Eskew, L. G., compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p.

Bartos, D. L. and R. B. Campbell, Jr. 1998. Decline of Quaking Aspen in the Interior West – Examples from Utah. Rangelands, 20(1):17-24.

Campbell, R. B. and Bartos, D. L. 2001. Objectives for Sustaining Biodiversity. In: Shepperd, W. D.; Binkley, D.; Bartos, D. L.; Stohlgren, T. J.; and Eskew, L. G., compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p.

Bradley, A. E., Noste, N. V., and W. C. Fischer. 1992. Fire Ecology of Forests and Woodlands in Utah. GTR-INT-287. Ogden, UT. U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 128 p.

Brown, J.K. and D.G. Simmerman. 1986. Appraisal of fuels and flammability in western aspen: a prescribed fire guide. General technical report INT-205. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

Brown, J.s K. Smith, J. Kapler, eds. 2000. Wildland fire in ecosystems: effects of fire on flora. Gen. Tech. Rep. RMRS-GTR-42-vol. 2. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 257 p.

Campbell, R. B. and , D. L. Bartos. 2001. Objectives for Sustaining Biodiversity. In: Shepperd, W. D.; Binkley, D.; Bartos, D. L.; Stohlgren, T. J.; and Eskew, L. G., compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p.

Debyle, N.V., C.D. Bevins, and W.C. Fisher. 1987. Wildfire occurrence in aspen in the interior western United States. Western Journal of Applied Forestry. 2:73-76.

Kay, C. E. 1997. Is aspen doomed? Journal of Forestry 95: 4-11.

Kay, C. E. 2001. Evaluation of burned aspen communities in Jackson Hole, Wyoming. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 8 p.

Kay, C.E. 2001. Long-term aspen exclosures in the Yellowstone ecosystem. Proceedings RMRS-P-18.. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 15 p.

Kay, C.E. 2001. Native burning in western North America: Implications for hardwood forest management. General Technical Report NE-274. U.S. Department of Agriculture, Forest Service, Northeast Research Station. 8 p.

Mueggler, W. F. 1988. Aspen Community Types of the Intermountain Region. USDA Forest Service, General Technical Report INT-250. 135 p.

Mueggler, W. F. 1989. Age Distribution and Reproduction of Intermountain Aspen Stands. Western Journal of Applied Forestry, 4(2):41-45.

Romme, WH, L. Floyd-Hanna, D. D. Hanna ,and E. Bartlett. 2001. Aspen's ecological role in the west. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, RMRS Proceedings-P-18. Pages 243-259.

Shepperd, W.D. and E.W. Smith. 1993. The role of near-surface lateral roots in the life cycle of aspen in the central Rocky Mountains. Forest Ecology and Management 61: 157-160.

Shepperd, W. D. 2001. Manipulations to Regenerate Aspen Ecosystems. Pages 355-365 in: Shepperd, W. D.; Binkley, Dan; Bartos, Dale L.; Stohlgren, Thomas J.; and Eskew, Lane G., compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings RMRS-P-18. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 460 p.

Shepperd, W. D., D. L. Bartos, and A. M. Stepen. 2001. Above- and below-ground effects of aspen clonal regeneration and succession to conifers. Canadian Journal of Forest Resources; 31: 739-745.

USDA Forest Service. 2000. Properly Functioning Condition: Rapid Assessment Process (January 7, 2000 version). Intermountain Region, Ogden, UT. Unnumbered.

Welsh, S. L, N. D. Atwood, S. l. Goodrich, and L. C. Higgins. 2003. A Utah Flora, Third edition, revised. Print Services, Brigham Young University, Provo, UT. 912 p.