

10110

Rocky Mountain Aspen Forest and Woodland

BpS Model/Description Version: Aug. 2020

Modelers		Reviewers	
Krista Waid-Gollnick	krista_waid@blm.gov	Hugh Safford	hughsafford@fs.fed.us
Sarah Heide	sarah_heide@blm.gov	Jon Bates	jon.bates@oregonstate.edu
Julia H. Richardson	jhrichardson@fs.fed.us	None	None

Vegetation Type

Forest and Woodland

Map Zones

6, 10, 12, 17, 18, 19

Geographic Range

This widespread ecological system is more common in the southern and central Rocky Mountains, but occurs throughout much of the western United States and northward into Canada, in the montane and subalpine zones. Also found in the Great Basin and throughout the western United States on drier sites.

In map zone (MZ) 18, this biophysical setting (BpS) is sparsely distributed across the landscape and at low frequency, although it increases in importance toward the southwestern part of the zone.

Biophysical Site Description

Elevations generally range from 1,525-3,050m (5,000-10,000ft), but occurrences can be found at lower elevations in some regions. Distribution of this ecological system is primarily limited by adequate soil moisture required to meet its high evapotranspiration demand and, secondarily, is limited by the length of the growing season or low temperatures.

Vegetation Description

These are upland forests and woodlands dominated by *Populus tremuloides* without a significant conifer component (<25% relative conifer tree cover, often termed “stable aspen”). On many ranges in Nevada, southwestern Idaho, and southeastern Oregon, conifers other than pinyon and juniper (e.g., limber pine, white fir, and subalpine fir) are largely absent or uncommon. In southeastern Oregon and southwestern Idaho, western juniper are infrequent and are found between 6,000ft and 7,000ft. Stable aspen is often used to name BpS 1011.

The understory structure may be complex, with multiple shrub and herbaceous layers, or simple, with just an herbaceous layer. The herbaceous layer may be dense or sparse, dominated by graminoids or forbs. Common shrubs include *Acer glabrum*, *Amelanchier alnifolia*, *Artemisia tridentata*, *Juniperus communis*, *Prunus virginiana*, *Rosa woodsii*, *Shepherdia canadensis*, and *Symphoricarpos oreophilus*; and the dwarf-shrubs *Mahonia repens* and *Vaccinium* spp. The herbaceous layers may be lush and diverse. Common graminoids may include *Bromus carinatus*, *Calamagrostis rubescens*, *Carex siccata* (= *Carex foenea*), *Carex geyeri*, *Carex rossii*, *Elymus*

glaucus, *Elymus trachycaulus*, *Festuca thurberi*, and *Hesperostipa comata*. Associated forbs may include *Achillea millefolium*, *Eucephalus engelmannii* (= *Aster engelmannii*), *Delphinium* spp., *Geranium viscosissimum*, *Heracleum sphondylium*, *Ligusticum filicinum*, *Lupinus argenteus*, *Osmorhiza berteroi* (= *Osmorhiza chilensis*), *Pteridium aquilinum*, *Rudbeckia occidentalis*, *Thalictrum fendleri*, *Valeriana occidentalis*, *Wyethia amplexicaulis*, and many others.

BpS Dominant and Indicator Species

Symbol	Scientific Name	Common Name
POTR5	<i>Populus tremuloides</i>	Quaking aspen
SYOR2	<i>Symphoricarpos oreophilus</i>	Mountain snowberry
RIBES	<i>Ribes</i>	Currant

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

Disturbance Description

Replacement fire and ground fire were common in stable aspen and both depended heavily on native burning. It is important to understand that aspen are considered a fire-proof vegetation type that do 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, which occurred mostly during the spring and fall. Replacement fire has a mean annual fire return interval (FRI) of approximately 60yrs. Mean annual FRIs for mixed-severity fire may have been as frequent as 20yrs, averaging approximately 50yrs. With the encroachment of conifers following extended periods of fire exclusion, the mean FRI of mixed-severity fire increased to 20yrs whereas that of replacement fire remained unchanged.

Under pre-settlement conditions, mortality from disease and insect infestation did not appear to have major effects; however, older aspen stands were susceptible to outbreaks every 200yrs on average. Disturbance effects would also have varied from clone to clone. Many aspen clones situated on steep slopes are prone to disturbance caused by avalanches and mud-/rockslides. Riparian aspen are prone to flooding and beaver clearcutting. Conifers, where co-dominant in aspen stands, would experience insect/disease outbreaks every 300yrs on average.

Fire Frequency

Severity	Avg FI	Percent of All Fires	Min FI	Max FI
Replacement	67	46	50	300
Moderate (Mixed)	56	54	20	60
Low (Surface)				
All Fires	30	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

Patch size for this type ranges from tens to hundreds of acres. (MZ06, MZ12, and MZ17 indicated that patch size could range from tens to thousands of acres.) Patches may be linear along riparian areas and cover large areas, with aspen reaching side slopes.

Adjacency or Identification Concerns

If conifer are present in significant amount, please review BpS 1061, 1045, 1050, or 1056. On mountain ranges of the Great Basin and Columbia Plateau that do not support fir trees, stable

aspen occurs at all elevations, but tend to be more common at higher elevations and in the draws at more mesic sites. Sagebrush groups, especially mountain big sagebrush and high-elevation Wyoming big sagebrush, occurred below and in places around this group. Forest types such as ponderosa pine or warm/dry mixed conifer with more frequent fire may influence fire frequency in stable aspen to facilitate regeneration.

Aspen decline varies across the region. Declines have been documented in Utah, Nevada, Arizona, and New Mexico, but not in Colorado (especially southwestern Colorado). Drought is currently impacting many stands in the Great Basin and Columbia Plateau. Nearly 100yrs of fire suppression and uncharacteristic ungulate grazing have reduced clones or created senescent stands lacking suckers for regeneration (Kay 2001a, b, c).

Under current conditions, herbivory can significantly affect stand succession. Kay (1997, 2001a, b, 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.

Issues or Problems

East of the Great Basin, Baker (1925) studied closely the pre-settlement period for aspen and noted fire scars on older trees and evidence of frequent fire. Bartos and Campbell (1998) supported these findings. We interpreted ground fires that scarred trees, probably started by Native Americans, as mixed-severity fire that also promoted abundant suckering.

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. These are typically self-perpetuating stands. Although not dependent upon disturbance to regenerate, aspen were adapted to a diverse array of disturbances.

Native Uncharacteristic Conditions

Comments

MZ06, MZ10, MZ12, MZ17, MZ18, and MZ19 were combined during the 2015 BpS review. The few descriptive differences between the zones are noted in the revised description.

To represent insect outbreaks, modelers assumed that 20% of outbreaks resulted in heavy insect/disease stand-replacing events, whereas 80% of outbreaks would thin trees older than 40yrs.

For LANDFIRE National, MZ06, MZ12, and MZ17 were modeled by Julia Richardson and Louis Provencher (lprovencher@tnc.org) and were intended to represent stable aspen as found on many ranges in Nevada. MZ06 was reviewed by Hugh Safford. MZ18 was developed by K. Waide and S. Heide, with review by J. Bates. For MZ18, reviewer Jon Bates suggested minor changes for MZ18. First, western juniper was added to the list of uncommon conifers. Second, the maximum aspen height description was increased from 6ft to 12ft in Class A (adjusted also in Class B) based on field observations.

The reviewer for the Sierra Nevada version of 1011 commented that 68yrs for mean FRI of replacement fires seems short.

D. Major made changes to vegetation class structural values in response to MTD v3.1 updates (K. Pohl, 18 July 2005 request). These changes have not been reviewed and accepted by model developers as of 24 July 2005.

Succession Classes

Mapping Rules

Upper Layer Lifeform	Height (m)	Canopy Cover (%)									
		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	A
Tree	5-10	D	D	D	D	B	B	B	B	B	B
Tree	10-25	D	D	D	D	C	C	C	C	C	C
Tree	25-50	D	D	D	D	C	C	C	C	C	C
Tree	>50	D	D	D	D	C	C	C	C	C	C

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 14 Early Development 1 - Closed

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
SYOR2	Symphoricarpos oreophilus	Mountain snowberry	Middle
RIBES	Ribes	Currant	Middle

Description

Aspen suckers. Grass and forbs present.

Maximum Tree Size Class

Sapling >4.5ft; <5" DBH

Class B	40	Mid Development 1 - Closed
----------------	-----------	-----------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
SYOR2	Symphoricarpos oreophilus	Mountain snowberry	Lower
RIBES	Ribes	Currant	Lower

Description

Aspen trees dominate. Canopy cover is highly variable. Mixed-severity fire consumes litter and woody debris and may stimulate suckering.

Maximum Tree Size Class

Medium 9-21" DBH

Class C	45	Late Development 1 - Closed
----------------	-----------	------------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
SYOR2	Symphoricarpos oreophilus	Mountain snowberry	Lower
RIBES	Ribes	Currant	Lower

Description

Aspen trees 5-16in in DBH. Canopy cover is highly variable. Mixed-severity fire, while thinning some trees, promotes suckering.

Maximum Tree Size Class

Medium 9-21" DBH

Class D	1	Late Development 1 - Open
----------------	----------	----------------------------------

Indicator Species

Symbol	Scientific Name	Common Name	Canopy Position
POTR5	Populus tremuloides	Quaking aspen	Upper
ABLA	Abies lasiocarpa	Subalpine fir	Upper
ABCO	Abies concolor	White fir	Upper
PIFL2	Pinus flexilis	Limber pine	Upper

Description

Aspen 5-16in+ in DBH and conifers co-dominate, with conifers present in the mid story and overtopping aspen in older stands. Aspen comprises 80% of the overstory in younger stands, whereas conifer can reach up to 40% cover in overstory in older stands. Mixed-severity fire and insect/disease outbreaks thin conifers.

Maximum Tree Size Class

Medium 9-21" DBH

Model Parameters

Deterministic Transitions

From Class	Begins at (yr)	Succeeds to	After (years)
Early1:CLS	0	Mid1:CLS	9
Mid1:CLS	10	Late1:CLS	39
Late1:CLS	40	Late1:CLS	999
Late1:OPN	100	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
Replacement Fire	Mid1:CLS	Early1:CLS	0.017	59	Yes	0
Mixed Fire	Mid1:CLS	Mid1:CLS	0.02	50	No	0
Insects or Disease	Late1:OPN	Late1:CLS	0.003	333	Yes	0
Replacement Fire	Late1:OPN	Early1:CLS	0.017	59	Yes	0
Mixed Fire	Late1:OPN	Late1:CLS	0.05	20	Yes	0
Alternative Succession	Late1:CLS	Late1:OPN	1	1	Yes	100
Insects or Disease	Late1:CLS	Early1:CLS	0.001	1000	Yes	0
Insects or Disease	Late1:CLS	Mid1:CLS	0.004	250	Yes	0
Replacement Fire	Late1:CLS	Early1:CLS	0.017	59	Yes	0
Mixed Fire	Late1:CLS	Late1:CLS	0.02	50	No	0

References

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

Bartos, D.L. 2001. Landscape dynamics of aspen and conifer forests. Pages 5-14 in: W.D. Shepperd, D. Binkley, D.L. Bartos, T.J. Stohlgren and L.G. Eskew, compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings. RMRS-P-18. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 460 pp.

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.

Bradley, A.E., N.V. Noste and W.C. Fischer. 1992. Fire ecology of forests and woodlands in Utah. GTR-INT-287. Ogden, UT: USDA Forest Service, Intermountain Research Station. 128 pp.

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

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: USDA Forest Service, Rocky Mountain Research Station.

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

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

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. 2001a. Evaluation of burned aspen communities in Jackson Hole, Wyoming. In: W.D. Shepperd, D. Binkley, D.L. Bartos, T.J. Stohlgren and L.G. Eskew, compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings. RMRS-P-18. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 460 pp.

Kay, C.E. 2001b. Long-term aspen exclosures in the Yellowstone ecosystem. In: W.D. Shepperd, D. Binkley, D.L. Bartos, T.J. Stohlgren and L.G. Eskew, compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings. RMRS-P-18. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 460 pp.

Kay, C.E. 2001c. Native burning in western North America: Implications for hardwood forest management. General Technical Report NE-274. USDA Forest Service, Northeast Research Station. 8 pp.

Mueggler, W.F. 1988. Aspen community types of the intermountain region. USDA Forest Service, General Technical Report INT-250. 135 pp.

Mueggler, W.F. 1989. Age distribution and reproduction of intermountain aspen stands. *Western Journal of Applied Forestry* 4(2): 41-45.

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

Romme, W.H., M.L. Floyd, D. Hanna and J.S. Redders. 1999. Landscape condition analysis for the South Central Highlands Section, southwestern Colorado & northwestern New Mexico. Draft report to San Juan National Forest, Durango, Colorado.

Shepperd, W.D. 1990. A classification of quacking aspen in the central Rocky Mountains based on growth and stand characteristics. *Western Journal of Applied Forestry* 5: 69-75.

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: W.D. Shepperd, D. Binkley, D.L. Bartos, T.J. Stohlgren and L.G. Eskew, compilers. 2001. Sustaining aspen in western landscapes: symposium proceedings; 13-15 June 2000; Grand Junction, CO. Proceedings. RMRS-P-18. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 460 pp.

Shepperd, W.D., D.L. Bartos and A.M. Stephen. 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 pp.