10611

Inter-Mountain Basins Aspen-Mixed Conifer Forest and Woodland - Low Elevation

BpS Model/Description Version: Aug. 2020

Update: 3/28/2018

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Linda Chappell | lchappell@fs.fed.us | One anonymous reviewer |  |
| Stan Kitchen | skitchen@fs.fed.us |  |  |
| Charles Kay | ckay@hass.usu.edu |  |  |

Vegetation Type

Forest and Woodland

Map Zones

16, 23, 24

Model Splits or Lumps

This Biophysical Setting (BpS) is split into multiple models: 10611 represents lower elevation (<~8,500') aspen and mixed conifer forests, where ponderosa pine, lodgepole pine, and Douglas-fir are associated conifers; 10612 represents higher elevation (>~8,500') aspen and mixed conifer forests, where Engelmann spruce and subalpine fir are the associated conifers.

Geographic Range

This is typically found in Nevada, Utah, California, Arizona, New Mexico, Colorado, Idaho, Wyoming, Montana and eastern Oregon.

Biophysical Site Description

This type typically occurs on flat to steep terrain (<80%) on all aspects. Elevation generally ranges from 6000-9000ft. Within the Utah High Plateaus (map zone [MZ]16) elevations range from 6000-8000ft north of U.S. Highway 6; south of U.S. Highway 6 elevations typically range from 7000-9000ft. Soils are highly variable, but generally cool. This type occurs above the pinyon/juniper and/or sagebrush but below the spruce-fir.

Vegetation Description

This highly variable ecological system is comprised of pure aspen or primarily aspen with few to several conifer species at lower montane elevations throughout Nevada, Urah, southern Idaho, western Colorado and Wyoming. These conifers include: *Pseudotstuga menziesii*, *Abies concolor*, and *Pinus ponderosa*. Other locally important species may include: *Pinus flexilis*, *Abies lasiocarpa*, *Juniperus scopulorum*, and *Pinus contorta*. Without regular fire and with high levels of herbivory, conifers may replace the aspen community wherever aspen is present. The presence of even a single aspen tree in a stand provides strong evidence that the area historically supported aspen clones.

As a species, aspen is adapted to a much broader range of environments than most plants found associated with it. Aspen exists in single-storied or multi-storied stands. Historically ponderosa pine and Douglas-fir were the fire adapted species that occurred in open savannahs with old trees on the ridges or rocky outcrops that provided some protection from periodic fire. Aspen could function as a tall shrub rather than an overstory tree because of fire's frequent return.

A wide variety of shrubs and herbaceous species comprise the understory of this type. Common shrubs include: *Amelanchier alnifolia*, *Prunus virginiana*, *Acer grandidentatum*, *Symphoricarpos oreophilus*, *Juniperus communis*, *Paxistima myrsinites*, *Rosa woodsii*, *Spiraea betulifolia*, *Symphoricarpos albus*, or *Mahonia repens*. Herbaceous species include: *Bromus carinatus*, *Calamagrostis rubescens*, *Carex geyeri*, *Elymus glaucus*, *Poa* spp., *Achnatherum*, *Hesperostipa*, *Nassella*, and/or *Piptochaetium* spp. (=*Stipa* spp.), *Achillea millefolium*, *Arnica cordifolia*, *Asteraceae* spp., *Erigeron* spp., *Galium boreale*, *Geranium viscosissimum*, *Lathyrus* spp., *Lupinus argenteus*, *Mertensia arizonica*, *Mertensia lanceolata*, *Maianthemum stellatum*, *Osmorhiza berteroi* (=*Osmorhiza chilensis*), and *Thalictrum fendleri*.

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| POTR5 | *Populus tremuloides* | Quaking aspen |
| PIPO | *Pinus ponderosa* | Ponderosa pine |
| PICO | *Pinus contorta* | Lodgepole pine |
| PSME | *Pseudotsuga menziesii* | Douglas-fir |

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

Disturbance Description

This is a strongly fire adapted forest type with mean fire intervals ranging from 10-30yrs based on biophysical variation. According to Baker (1925), who most closely studied the historic condition, the Fire Return Interval (FRI) for replacement fire was 20-40yrs. Baker's (1925) mean FRI for mixed severity fire was 10-20yrs (min-max). Studies by Bartos and Campbell (1998) support these findings. Indian burning was the primary source of fire, especially mixed severity fire. It is important to understand that aspen is considered a fire-proof vegetation type that does not burn during the normal lightning 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.

Secondary disturbances may include: insects and pathogens, snowslides, mudslides and rotational slumping. Flooding may also operate in these systems.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 44 | 24 |  |  |
| Moderate (Mixed) | 14 | 76 | 10 | 20 |
| Low (Surface) |  |  |  |  |
| All Fires | 10 | 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

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

Adjacency or Identification Concerns

This type is significantly altered today and is very difficult to identify because of conifer encroachment and fire suppression.

BpS 10611 is lower elevation and exhibits more frequent fire than 10612. This BpS (10611) is characterized by a shorter FRI and lower elevations than Rocky Mountain Aspen Forest and Woodland (1011). Rocky Mountain Mesic Montane Mixed Conifer Forest and Woodland (1052) is adjacent to this BpS along the riparian systems. This BpS includes low elevation lodgepole, not the subalpine-fir mix. If subalpine fir or spruce are present, the Rocky Mountain Aspen Forest and Woodland BpS (1011) should be considered.

Issues or Problems

There is uncertainty about the role of mixed severity fire. We assumed that native burning in aspen stands invaded by young conifers resulted in mixed severity fire, whereas the same source of fire would cause low severity fire (surface fire) in same age stands that were more open. 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 were used for the oldest development states, and 2) the maximum FRI of Baker (1925) was used for stands <80yrs that were being encroached by lower elevation conifers.

As this type has a fairly short fire return interval compared to other aspen types, it should be noted that aspen can act as a tall shrub. Bradley et al (1992a, 1992b) state that Loope & Gruell estimated a fire frequency of 25-100yrs for a Douglas-fir forest with seral aspen in Grand Teton National Park (p39). They later state that fire frequencies of 100-300yrs appear to be appropriate for maintaining most seral aspen stands. In the Fontenelle Creek, Wyoming drainage, the mean fire-free interval was estimated to be 40yrs. Fires in this area burned in a mosaic pattern of severities, from stand-replacement to low fires that scarred but did not kill the relatively thin-barked lodgepole pine on the site (p. 46).

Native Uncharacteristic Conditions

Comments

The split for BpS 1061 into low elevation (10611) and high elevation (10612) was at the request of the Missoula Fire Sciences Laboratory based on plot data for MZ16.

Additional authors include Beth Corbin (ecorbin@fs.fed.us) and Bob Campbell (rbcampbell@fs.fed.us).

Mapping: if any aspen is present, this is probably the correct BpS (or 1011 at higher elevations).

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 | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf |
| Tree | 5-10 | C con | C con | C con | C con | C con | C con | C con | C con | C con | C con |
| Tree | 5-10 | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix | B mix |
| Tree | 10-25 | D mix | D mix | D mix | D mix | E mix | E mix | E mix | E mix | E mix | E mix |
| Tree | 10-25 | D con | D con | D con | D con | E con | E con | E con | E con | E con | E con |
| Tree | 10-25 | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf |
| Tree | 25-50 | D con | D con | D con | D con | E con | E con | E con | E con | E con | E con |
| Tree | 25-50 | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf | C brdlf |
| Tree | 25-50 | D mix | D mix | D mix | D mix | E mix | E mix | E mix | E mix | E mix | E mix |
| Tree | >50 | D | D | D | D | E | E | E | E | E | E |

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 58 Early Development 1 - All Structures

Upper Layer Lifeform: Tree

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |

Description

Grass and forb and aspen suckers <6ft feet tall and saplings.

Class B 21 Mid Development 1 - Closed

Upper Layer Lifeform: Tree

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |

Description

Aspen saplings dominate. Canopy cover is highly variable. Conifers can invade. The stand is composed of 80% aspen and up to 10% conifers.

Class C 6 Mid Development 2 - Closed

Upper Layer Lifeform: Tree

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |

Description

Aspen 5-16in DBH. This is a pure aspen stage. Mixed aspen overstory dominance. Insect/disease disturbances kill the larger stems.

Class D 14 Late Development 1 - All Structures

Upper Layer Lifeform: Tree

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| POTR5 | Populus tremuloides | Quaking aspen | Upper |
| ABCO | Abies concolor | White fir | Mid-Upper |
| PSEUD7 | Pseudotsuga | Douglas-fir | Mid-Upper |

Description

Aspen 5-16in DBH. Aspen with conifer understory up to co-dominance: 80% aspen overstory. Conifers (e.g., ponderosa pine) are assumed more resistant to fire than aspen and will likely cause the progressive suppression of aspen.

Class E 1 Late Development 1 - Closed

Upper Layer Lifeform: Tree

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| PIPO | Pinus ponderosa | Ponderosa pine | Upper |
| PICO | Pinus contorta | Lodgepole pine | Upper |
| PSME | Pseudotsuga menziesii | Douglas-fir | Upper |
| POTR5 | Populus tremuloides | Quaking aspen | Mid-Upper |

Description

Conifers dominate. Aspen over 16in DBH, mixed conifer in mixed sizes. Main overstory is conifers. Greater than 50% conifer in the overstory.

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 39 |
| Mid1:CLS | 40 | Late1:ALL | 79 |
| Mid2:CLS | 80 | Mid2:CLS | 999 |
| Late1:ALL | 80 | Late1:CLS | 149 |
| Late1:CLS | 150 | Late1:CLS | 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 | Early1:ALL | Early1:ALL | 0.025 | 40 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.075 | 13 | No | 0 |
| Alternative Succession | Mid1:CLS | Mid2:CLS | 0.00625 | 160 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.025 | 40 | Yes | 0 |
| Mixed Fire | Mid1:CLS | Mid1:CLS | 0.075 | 13 | No | 0 |
| Insects or Disease | Mid2:CLS | Mid1:CLS | 0.005 | 200 | Yes | 0 |
| Replacement Fire | Mid2:CLS | Early1:ALL | 0.017 | 59 | Yes | 0 |
| Mixed Fire | Mid2:CLS | Mid2:CLS | 0.075 | 13 | No | 0 |
| Replacement Fire | Late1:ALL | Early1:ALL | 0.017 | 59 | Yes | 0 |
| Mixed Fire | Late1:ALL | Late1:ALL | 0.075 | 13 | No | 0 |
| Insects or Disease | Late1:CLS | Late1:ALL | 0.003 | 333 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.017 | 59 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:ALL | 0.075 | 13 | Yes | 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. 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. 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., 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. 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. 2001. 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. 2001. 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. 2001. 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., L. Floyd-Hanna, D.D. Hanna and E. Bartlett. 2001. Aspen's ecological role in the west. Pages 243-259 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. 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. 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 S.A. Mata. 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.