15090

Mississippi River Alluvial Plain Dry-Mesic Loess Slope Forest

BpS Model/Description Version: Aug. 2020

Update: 6/7/2018

|  |  |  |  |
| --- | --- | --- | --- |
| **Modelers** |  | **Reviewers** |  |
| Roger Mangham | rmangham@tnc.org |  |  |
| Doug Zollner | dzollner@tnc.org |  |  |
| Maria Melnechuk | maria\_melnechuk@tnc.org |  |  |

Vegetation Type

Forest and Woodland

Map Zones

45, 47

Model Splits or Lumps

None. The original information about a model split was removed. See the original BpS description for details.

Geographic Range

This system of mesic upland forests is confined to a sheltered eastern, northern or cove aspects on Crowley's Ridge and Macon Ridge along the western margin of the lower Mississippi River.

Biophysical Site Description

This system is located on remnant loess-capped features rising from 30-60m+ (100-200ft) above the alluvial plain surface, to about 150m (50ft) above sea level. These are generally mesic and dry-mesic forests that occupy sheltered slopes and coves (usually north and east facing) in a highly dissected landscape. In many cases, these slopes and ravines provide habitat for plant species that are rare or absent from other parts of the alluvial plain (e.g., tulip tree [*Liriodendron tulipifera*]).

Vegetation Description

A diverse closed-canopy forest with dominant species including beech (*Fagus grandifolia*), tulip tree (*Liriodendron tulipifera*), Carolina basswood (*Tilia caroliniana*), southern sugar maple (*Acer barbatum*), red oak (*Quercus rubra*), and white oak (*Q. alba*).

BpS Dominant and Indicator Species

|  |  |  |
| --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** |
| FAGR | *Fagus grandifolia* | American beech |
| LITU | *Liriodendron tulipifera* | Tuliptree |
| ACBA3 | *Acer barbatum* | Southern sugar maple |
| QURU | *Quercus rubra* | Northern red oak |
| QUAL | *Quercus alba* | White oak |
| TIAMC | *Tilia americana var. caroliniana* | Carolina basswood |

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

Disturbance Description

The mesic loess forest type fire regime is characterized by surface fires with return in intervals 30-100yrs+. Mixed severity fires will occur approximately every 100yrs opening the canopy with increased mortality. This effect may also be achieved by recurrent, severe insect defoliations or droughts. Straight-line winds or microbursts may cause blow-downs on a scale of 1-100ac. Stand replacement fires happen very infrequently.

Fire Frequency

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Severity** | **Avg FI** | **Percent of All Fires** | **Min FI** | **Max FI** |
| Replacement | 473 | 9 |  |  |
| Moderate (Mixed) | 104 | 41 |  |  |
| Low (Surface) | 87 | 50 |  |  |
| All Fires | 43 | 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

Limited to two loess outcrops in the Mississippi River Alluvial Valley.

Adjacency or Identification Concerns

Mapping loess mesic slope forests would likely focus on specific topographic positions, such as coves, valley bottoms typically v-shaped (excluding broad u-shaped floodplains), lower north and east facing slopes; sometimes west and south facing lower slopes where moisture permits; wet-mesic to mesic conditions on the landscape; rich fertile conditions/sites; and shaded topographic positions.

Issues or Problems

Native Uncharacteristic Conditions

Comments

MZ45 BpS 1509 is identical to VDDT model and description for MZ45 BpS 1322. A separate model was not developed for BpS 1509 and because it was mapped adjacent to BpS 1322, the BpS 1322 model and description were applied to it.

MZ45 BpS 1322 was adapted from Rapid Assessment model R8MMHW -- Mixed Mesophytic Hardwood by April Moore, Greg Nowacki, and Aaron Burk, and reviewed by Carl Nordman. Significant changes to the model resulted in a change in modelership.

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 | C | C | C | C | C | C | C | B | B |
| Tree | 10-25 | C | C | C | C | C | C | C | C | D | D |
| Tree | 25-50 | C | C | C | C | C | C | C | C | D | D |
| Tree | >50 | C | C | C | C | C | C | C | C | D | D |

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 9 Early Development 1 - All Structures

DBH

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |
| ACBA3 | Acer barbatum | Southern sugar maple | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |

Description

Regenerating stands established after catastrophic disturbance, primarily wind and ice storms and fire following regional drought. Replacement and mixed fires occur.

*Maximum Tree Size Class*  
Sapling >4.5ft; <5" DBH

Class B 19 Mid Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |
| ACBA3 | Acer barbatum | Southern sugar maple | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |

Description

Mid-seral closed overstory. Intense competition begins after canopy closure and lasts until trees are large enough to form, upon their death, canopy gaps that are not captured by lateral growth of neighboring trees. Alternative succession is this trajectory where an old open canopy forest will develop. This released growing space is captured by tree and shrub regeneration. Replacement fire and surface fire occur. Blowdowns and drought also have a replacement effect.

*Maximum Tree Size Class*  
Medium 9-21"DBH

Class C 16 Late Development 1 - Open

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |
| FAGR | Fagus grandifolia | American beech | Upper |
| ACBA3 | Acer barbatum | Southern sugar maple | Upper |
| QURU | Quercus rubra | Northern red oak | Upper |

Description

Mature forest with gaps created by wind, ice storms, insect and disease, and to a lesser extent by fire leading to open overstory conditions. Partial canopy disturbances from moderate-level wind events and ice storms are common and lead to multi-cohort stands. Blowdowns and drought also have a replacement effect. Rare replacement fires occur.

*Maximum Tree Size Class*  
Very Large >33" DBH

Class D 56 Late Development 1 - Closed

Indicator Species

|  |  |  |  |
| --- | --- | --- | --- |
| **Symbol** | **Scientific Name** | **Common Name** | **Canopy Position** |
| FAGR | Fagus grandifolia | American beech | Upper |
| LITU | Liriodendron tulipifera | Tuliptree | Upper |
| ACBA3 | Acer barbatum | Southern sugar maple | Upper |
| QURU | Quercus rubra | Northern red oak | Middle |

Description

Closed-canopy mixed-mesophytic forests that develop on mesic landscape positions. Dominant species include *Fagus grandifolia*, *Acer barbatum*, and *Liriodendron tulipifera*. Also, *Tilia americana* var. *caroliniana*, *Quercus alba*, and *Quercus rubra*. Insects and disease, blowdowns and drought, and mixed fire open this canopy. Less frequently, fire, blowdowns and drought also have a replacement effect. Surface fire maintains this class.

*Maximum Tree Size Class*  
Very Large >33" DBH

Model Parameters

Deterministic Transitions

|  |  |  |  |
| --- | --- | --- | --- |
| **From Class** | **Begins at (yr)** | **Succeeds to** | **After (years)** |
| Early1:ALL | 0 | Mid1:CLS | 9 |
| Mid1:CLS | 10 | Late1:CLS | 59 |
| Late1:OPN | 60 | Late1:CLS | 80 |
| Late1:CLS | 60 | 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 | 0.003 | 333 | Yes | 0 |
| Wind or Weather or Stress | Early1:ALL | Early1:ALL | 0.07 | 14 | Yes | 0 |
| Mixed Fire | Early1:ALL | Early1:ALL | 0.07 | 14 | Yes | 0 |
| Alternative Succession | Mid1:CLS | Late1:OPN | 0.001 | 1000 | Yes | 0 |
| Replacement Fire | Mid1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Mid1:CLS | Early1:ALL | 0.004 | 250 | Yes | 0 |
| Surface Fire | Mid1:CLS | Mid1:CLS | 0.0125 | 80 | No | 0 |
| Replacement Fire | Late1:OPN | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:OPN | Early1:ALL | 0.005 | 200 | Yes | 0 |
| Surface Fire | Late1:OPN | Late1:OPN | 0.0125 | 80 | No | 0 |
| Wind or Weather or Stress | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Replacement Fire | Late1:CLS | Early1:ALL | 0.002 | 500 | Yes | 0 |
| Wind or Weather or Stress | Late1:CLS | Late1:OPN | 0.005 | 200 | Yes | 0 |
| Mixed Fire | Late1:CLS | Late1:OPN | 0.005 | 200 | Yes | 0 |
| Insects or Disease | Late1:CLS | Late1:OPN | 0.005 | 200 | Yes | 0 |
| Surface Fire | Late1:CLS | Late1:CLS | 0.0125 | 80 | No | 0 |

References

Beatley, J.C. 1959. The primeval forests of a periglacial area in the Allegheny Plateau (Vinton and Jackson Counties, Ohio). Bulletin of the Ohio Biological Survey 1: 1-166.

Braun, E.L. 1950. Deciduous forests of eastern North America. Blakiston Co., Philadelphia, PA.

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.

Delcourt, P.A., H.R. Delcourt, C.R. Ison, W.E. Sharp and K.J. Gremillion. 1998. Prehistoric human use of fire, the eastern agricultural complex, and Appalachian oak-chestnut forests: paleoecology of Cliff Palace Pond, Kentucky. American Antiquity 63: 263-278.

Dyer, J.M. 2001. Using witness trees to assess forest change in southeastern Ohio. Canadian Journal of Forest Research 31: 1708-1718.

Frost, C.C. 1998. Presettlement fire frequency regimes of the United States: a first approximation. Pages 70-81 in: T.L. Pruden and L.A. Brennan, eds. Fire in ecosystem management: shifting the paradigm from suppression to prescription. Tall Timbers Fire Ecology Conference Proceedings, No. 20. Tall Timbers Research Station, Tallahassee, FL.

Guyette, R.P., D.C. Dey and M.C. Stambaugh. 2003. Fire and human history of a barren-forest mosaic in southern Indiana. American Midland Naturalist 149: 21-34.

Hutchins, R.B., R.L. Blevins, J.D. Hill and E.H. White. 1976. The influence of soils and microclimate on vegetation of forested slopes in eastern Kentucky. Soil Science 121: 234-241.

Iverson, L.R., M.E. Dale, C.T. Scott and A. Prasad. 1997. A GIS-derived integrated moisture index to predict forest composition and productivity of Ohio forests (U.S.A.). Landscape Ecology 12: 331-348.

Küchler, A.W. 1964. Potential natural vegetation of the conterminous United States (map). Special Publication 36. American Geographic Society, New York, NY.

McCarthy, B.C., C.J. Small and D.L. Rubino. 2001. Composition, structure and dynamics of Dysart Woods, an old-growth mixed mesophytic forest of southeastern Ohio. Forest Ecology and Management 140: 193-213.

McNab, W.H. and P.E. Avers. 1994. Ecological subregions of the United States: section descriptions. USDA Forest Service Administrative Publication WO-WSA-5.

Morris, S.J. and R.E.J. Boerner. 1998. Landscape patterns of nitrogen mineralization and nitrification in southern Ohio hardwood forests. Landscape Ecology 13: 215-224.

Muller, R.N. 1982. Vegetation patterns in the mixed mesophytic forest of eastern Kentucky. Ecology 63: 1901-1917.

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

Rentch, J.S., M.A. Fajvan and R.R. Hicks Jr. 2003. Spatial and temporal disturbance characteristics of oak-dominated old-growth stands in the central hardwood forest region. Forest Science 49: 778-789.

Schmidt, K.M., J.P. Menakis, C.C. Hardy, W.J. Hann and D.L. Bunnell. 2002. Development of coarse-scale spatial data for wildland fire and fuel management. Gen. Tech. Rep. RMRS-GTR-87. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station. 41 pp. + CD.

Wade, D.D., B.L. Brock, P.H. Brose, J.B. Grace, G.A. Hoch and W.A. Patterson III. 2000. Fire in eastern ecosystems. Pages 53-96 in: J.K. Brown and J. Kapler-Smith, eds. 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.