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

Potential Natural Vegetation Group (PNVG)

R5SOFPif Southern Floodplain

General Information

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

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Vegetation Type

Forested

Dominant Species*

QUNU	QUMI
CELA	CAIL
QUPH	ULAM
QUNI	FRPE

General Model Sources

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

LANDFIRE Mapping Zones

42 39 41 40

Rapid AssessmentModel Zones

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

Geographic Range

Missouri, Arkansas, Tennessee, Mississippi, and Louisiana. The vast majority of this PNV occurs in floodplains and on terraces of large streams within the Mississippi Alluvial Plain from southern Illinois to the Gulf of Mexico. Smaller units occur along other large streams in the Gulf Coastal Plain and along the Arkansas River in the Interior Highlands.

Biophysical Site Description

This PNV occurs on floodplain terraces of large streams in the Mississippi Alluvial Plain, Gulf Coastal Plain, and Arkansas Valley. It excludes the open water, baldcypress-tupelo, and overcup oak dominated communities (Wharton zones I, II, and III) that occur in deepwater alluvial swamps, sloughs, and depressions that are flooded most or all of a given year. Synonyms for this PNVG and its subdivisions include alluvial forest, southern bottomland hardwood forest, and willow oak flatwoods.

Vegetation Description

This PNV is dominated by closed canopy forest but is dynamic and driven by disturbance events including flooding, wind events, and to a lesser degree, fire. Treefall gaps are typically scattered and small but may occur continuously over a large area following major wind events. Herbaceous marshes are created when blockages of stream channels occur. Drift jams and the activities of beavers are the primary causes of these anomalous herbaceous marsh patch communities (Heineke, 1987). Canebrakes, dominated by giant cane (Arundinaria gigantea), occur on natural levees or low ridges within the bottoms. The role of fire in maintaining canebrakes is well documented (Wharton, 1984).

Apart from treefall gaps, marshes, and non-forested canebrakes, there is a continuous canopy of deciduous broadleaved species. Relative dominance of canopy tree species may vary according to regional location and hydrology. The tree canopy ranges from approximately 80-150 feet tall. The understory is less than 80 feet tall and is usually composed of the canopy species and deciduous broad-leaved understory species. Understory shrub density is generally low but may be dense on ridges within the bottoms that are less

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subject to inundation. The herbaceous layer is generally sparse due to shade and/or frequent inundation, although there may be relatively thick herbaceous vegetation in treefall gaps and early seral stages. There are usually more than ten species of canopy trees and over thirty tree and shrub species total. Canopy tree density is within 15-30 trees per acre and canopy tree basal area is within 100-210 ft2 per acre. Many canopy trees exceed 20 inches in diameter.

River banks and flat, poorly drained areas within the floodplain are often dominated by Populus deltoides (cottonwood), Betula nigra (river birch), Acer rubrum (red maple), Acer saccharinum (silver maple), Acer negundo (box elder), Platanus occidentalis (sycamore), Ulmus americana (American elm), Fraxinus pennsylvanica (green ash), Fraxinus caroliniana (Carolina ash), Celtis laevigata (sugarberry), Celtis occidentalis (hackberry), Carya aquatica (water hickory), Diospyros virginiana (persimmon), Magnolia virginiana (sweet bay), Quercus laurifolia (diamond leaf oak), and Quercus lyrata (overcup oak). Ridges and levees in low areas and higher areas near the edges of floodplains may be dominated by Liquidambar styraciflua (sweet gum), Quercus nigra (water oak), Quercus phellos (willow oak), Quercus michauxii (swamp chestnut oak), Quercus nuttallii (Nuttall's red oak), Quercus shumardii (Shumard's red oak), Quercus virginiana (live oak), Prunus serotina (black cherry), Ulmus alata (winged elm), Pinus taeda (loblolly pine), Carya illinoensis (pecan), Carya glabra (pignut hickory), Carya cordiformis (bitternut hickory), and Carya ovata (shagbark hickory). Comprehensive species lists for these communities can be found in Heineke (1987).

Disturbance Description

The dominant ecological processes in bottomland hardwood forests are windfall gaps and periodic flooding. Windfall gaps occur on the local (a single mature canopy tree) and the landscape (tornadoes or hurricanes) scale. When canopy trees fall seedlings in the understory are released and compete for a spot in the canopy. This leads to dense areas of herbaceous and woody vegetation in windfall gaps of all sizes. This is a major process in forest regeneration in bottomland hardwood forests. Flooding is more frequent on the lower terraces but frequently floods higher terraces (Wharton zones IV & V). Duration of flooding varies with the placement of a site in the landscape and is a dominant process affecting vegetation on a given site. Flooding can deposit alluvium or scour the ground, depending on the landscape position of a site and the severity of the flood event. Fire is infrequent on the lower terraces, but was frequent historically on older terraces outside the floodplain and crept into the floodplains. Wharton et al. (1982) mention that a serious fire season occurs on an average of about every 5 to 8 years in the bottomland hardwood forests of the Mississippi Alluvial Plain. It is conjectured that Native Americans maintained canebrakes by deliberate fall burning. Infrequent, mild surface fires would occur in the system; however, they would not alter species composition or structure. Changes in hydrology due to the activities of beaver are also an important ecological process in bottomland hardwood forests. Beaver impoundments kill trees (sometimes over large areas) and may create open water habitat, cypress-tupelo stands, or cause stand replacement. Meandering streams in this PNV are dynamic and frequently change course, eroding into the floodplain and depositing new point bars, thus creating new habitat for early seral plant communities. Insect outbreaks would occur infrequently in closed canopy states.

Adjacency or Identification Concerns

This PNV grades into the Southern Floodplain Rare Fire type (R5SOFPrf) which occurs on the lowest, wettest areas of the bottomlands. It also is bordered by a number of upland communities from which fire would have occasionally burned down into the bottoms, especially in drought years.

Scale Description

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

Landscape adequate in size to contain natural variation in vegetation and disturbance regime. This PNV occurred in patches of millions of acres in the Mississippi Alluvial Plain, with smaller areas covered in larger streams in the coastal plain and Arkansas Valley. This PNV contains many inclusions of the Southern Floodplain Rare Fire type (R5SOFPrf).

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Issues/Problems

The fire history of this PNV is poorly understood, in part because there has been the widespread assumption that it didn't burn, but the fact that it had extensive cane understory and canebrakes indicates that fire was much more common than is generally believed. These canebrakes exist as a patch community maintained by wind & fire. The effects of beaver ponds on forest dynamics in this system are also poorly understood at the landscape level, especially in the presettlement context. Note that the model assumes that a single pixel represents the area occupied by a single very mature canopy tree. This accounts for the treefall gap ecological process.

Model Evolution and Comments

Thomas Heineke, Chuck Klimas, Paul Hamel, Jim Baker. Insect/disease was added as a disturbance in closed classes after peer review.

*Succession Classes***

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

Class A 20 %

Early1 All Struct

Description

This class includes small scale windfall gaps (the principal method of regeneration in mature bottomland hardwood forests in the absence of larger scale disturbance), large scale catastrophic wind disturbance (tornado & hurricane), water impoundment and inundation caused by channel blockage), catastrophic stand replacement during major flood events, and following clearcutting, or succession following the abandonment of agricultural fields. This class includes the fire maintained canebrake community (nonforested type).

Dominant Species* and Canopy Position

QUNU	Lower
QUPH	Lower
LIST	Lower
FRPE	Lower

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 3

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	0 %	75 %
Height	Shrub Medium 1.0-2.9m	Tree Short 5-9m
Tree Size Class	Sapling >4.5ft; <5"DBH	

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

Class B 30 %

Mid1 Closed

Description

This class is a mid seral stage bottomland hardwood forest with a closed canopy.

Dominant Species* and Canopy Position

QUNU	Upper
QUPH	Upper
CELA	Upper
FRPE	Upper

Upper Layer Lifeform

- ☐ Herbaceous
- ☐ Shrub
- ☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	*Max*
Cover	70 %	100 %
Height	Tree Medium 10-24m	Tree Medium 10-24m
Tree Size Class	Large 21-33"DBH	

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

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Class C 50 %

Late1 Closed

Description

This class is a mature, late seral closed canopy bottomland hardwood forest.

Dominant Species* and Canopy Position

QUNU Upper
QUPH Upper
ULAM Upper
QUPA Upper

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☑ Tree

Fuel Model 8

Structure Data (for upper layer lifeform)

	Min	Max
Cover	50 %	100 %
Height	Tree Tall 25-49m	Tree Giant >50m
Tree Size Class	Very Large >33"DBH	

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

Class D 0 %

Late1 All Structu

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	0 %	0 %
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 0 %

Late1 All Structu

Description

Dominant Species* and Canopy Position

Upper Layer Lifeform

☐ Herbaceous
☐ Shrub
☐ Tree

Fuel Model no data

Structure Data (for upper layer lifeform)

	Min	Max
Cover	%	%
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

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Disturbances Modeled

- [x] Fire
- [x] Insects/Disease
- [x] Wind/Weather/Stress
- [ ] Native Grazing
- [ ] Competition
- [x] Other: Flooding
- [ ] Other

Historical Fire Size (acres)

Avg: no data
Min: no data
Max: no data

Sources of Fire Regime Data

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

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 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.

	Avg FI	*Min FI*	*Max FI*	*Probability*	*Percent of All Fires*
Replacement	140			0.00714	42
Mixed					
Surface	100			0.01	58
All Fires	58			0.01715	

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