

**14710**

## **Central Interior and Appalachian Floodplain Systems**

BpS Model/Description Version: Aug. 2020

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### **Vegetation Type**

Mixed Upland and Wetland

### **Map Zones**

51, 62

### **Geographic Range**

This system is found along medium and large river floodplains over much of the eastern United States on both glaciated and unglaciated landscapes. This system is found in all subsections (Cleland et al. 2007) of map zone (MZ) 62 in Ohio, Pennsylvania, and West Virginia: 222Ha, 222Hb, 221Eg, 221Ef, 221Ed, 221Ec, 221Eb, M221Ca, 221Ea, 221Fa, 221Fc, 221Fb, 222Ia, and 211Ga.

### **Biophysical Site Description**

River valleys are linear depressions that contain a river channel and its floodplain, often embedded within a series of higher terraces. The river floodplain is the low-lying area adjacent to the river that was formed under the present drainage system and is subject to periodic flooding and cycles of erosion and deposition. In contrast, terraces are former floodplain surfaces at higher elevations than the floodplain that were abandoned when the river channel incised lower into the valley floor. Within the broader landscape, river valleys represent an unusually diverse mosaic of landforms, physical environmental factors, species, and biological communities because of their abrupt environmental gradients and complex ecological processes (Brinson 1990, Gregory et al. 1991, Naiman et al. 1993). Floodplain forests occur along streams or rivers that are third order or greater (Strahler 1952).

### **Vegetation Description**

The variety of soil properties associated with this system can create a mixture of vegetation. Many examples of this Biophysical Setting (BpS) in map zone (MZ) 62 are dominated by silver maple (*Acer saccharinum*), associated with red maple (*A. rubrum*), box-elder (*Acer negundo*), green ash (*Fraxinus pennsylvanica*), black willow (*Salix nigra*), American elm (*Ulmus americana*), red elm (*U. rubra*), sycamore (*Platanus occidentalis*), black walnut (*Juglans nigra*), cottonwood (*Populus deltoides*), Ohio buckeye (*Aesculus glabra*), and, locally, river birch (*Betula nigra*). Silver maple-dominated occurrences typically occupy broad, well-defined floodplains of large rivers. Understory species can vary across the range of this system but can include shrubs such as silky dogwood (*Cornus amomum*), gray dogwood (*Cornus racemosa*), spicebush (*Lindera benzoin*), poison-ivy (*Toxicodendron radicans*), southern arrow-wood

(*Viburnum recognitum*), trees such as paw-paw (*Asimina triloba*), and numerous sedges, grasses, forbs, and ferns. Oxbows and open swales may be dominated by non-woody vegetation (Andreas 1989, Hardin et al. 1989, Fike 1999).

### BpS Dominant and Indicator Species

| Symbol | Scientific Name               | Common Name        |
|--------|-------------------------------|--------------------|
| ACSA2  | <i>Acer saccharinum</i>       | Silver maple       |
| ACRU   | <i>Acer rubrum</i>            | Red maple          |
| SANI   | <i>Salix nigra</i>            | Black willow       |
| ULRU   | <i>Ulmus rubra</i>            | Slippery elm       |
| PLOC   | <i>Platanus occidentalis</i>  | American sycamore  |
| FRPE   | <i>Fraxinus pennsylvanica</i> | Green ash          |
| PODE3  | <i>Populus deltoides</i>      | Eastern cottonwood |
| ACNE2  | <i>Acer negundo</i>           | Boxelder           |

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

### Disturbance Description

Floodplain systems are produced and maintained by active hydrologic and geomorphic processes such as channel meandering, sedimentation and erosion (Gregory, et al. 1991, Hughes 1994) caused by natural hydrological variation (Richter and Richter 2000). Regeneration of the early successional dominant species (cottonwood, maple, and willow) is dependent on flooding and movement of river channels, which creates bare, moist soil needed for seedling establishment (Noble 1979, Johnson et al. 1976, Scott et al. 1997). Oxbow and slough development also influence the floodplain system and create variability in plant community composition. Deposits of sand and other sediments can create low ridges that influence vegetation establishment (Weaver 1960). The flood frequency in a given area is dependent upon its location on the floodplain, with upper terraces having infrequent flooding and scouring events, while the lower terraces nearest the river flood frequently. Scouring caused by ice jams during the winter, channel meandering, and oxbow and slough development greatly influence this system.

### Fire Frequency

| Severity         | Avg FI | Percent of All Fires | Min FI | Max FI |
|------------------|--------|----------------------|--------|--------|
| Replacement      |        |                      |        |        |
| Moderate (Mixed) | 430    | 14                   |        |        |
| Low (Surface)    | 68     | 86                   |        |        |
| All Fires        | 58     | 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 Considerations

Patches must be adequate in size to contain natural variation in vegetation and disturbance regime. This system is often widespread on medium or larger rivers and should be at least 0.5 miles long and 100m wide.

### Adjacency or Identification Concerns

Today, bank stabilization, dams, and water diversion have significantly altered these floodplains.

Pollution and heavy metals may be an issue in this BpS due modern waste water issues and the flooding nature of this system.

## Issues or Problems

Assumptions: This system is most affected by flooding, scouring, and channel movement. We modeled the floodplain valley including forested and non-forested areas. The model does include wetlands, sloughs or oxbows. We used two flooding regimes in the model: Option 1 – minor flooding/scouring; and Option 2 – major flooding/scouring. Flood frequency for a class is based on location on the floodplain, with higher terraces being subject to longer flood cycles. We modeled attributes such as channel migration, oxbow and slough development, and sedimentation. Fire activity had a minor impact, due to low intensity, infrequent intervals, small size, and low fuel loads.

## Current Conditions

## Comments

This model adapted from Model 5114710 by Jim Drake (jim\_drake@natureserve.org) and Alan Tepley (tepleya@onid.orst.edu) on 10/15/2007, which was adapted from Rapid Assessment (RA) model R6FPFOgl Great Lakes Floodplain Forest by Robert Mayer (rmayer@fs.fed.us) and Rick Miller (rick.miller@dnr.state.oh.us) on 09/30/2005. Material from the Michigan Natural Features Inventory community abstract for Floodplains (Tepley et al. 2004) is also incorporated.

## Succession Classes

### Mapping Rules

| Upper<br>Layer<br>Lifeform | Height<br>(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         | UN               | UN    | UN    | UN    | UN      | UN    | UN    | UN    | UN    | UN     |
| Herb                       | 0.5-1.0       | UN               | UN    | UN    | UN    | UN      | UN    | UN    | UN    | UN    | UN     |
| Herb                       | >1.0          | UN               | UN    | UN    | UN    | UN      | UN    | UN    | UN    | UN    | UN     |
| Shrub                      | 0-0.5         | UN               | UN    | UN    | UN    | UN      | UN    | UN    | A     | A     | A      |
| Shrub                      | 0.5-1.0       | UN               | UN    | UN    | UN    | UN      | UN    | UN    | A     | A     | A      |
| Shrub                      | 1.0-3.0       | UN               | UN    | UN    | UN    | UN      | UN    | UN    | A     | A     | A      |
| Shrub                      | >3.0          | UN               | UN    | UN    | UN    | UN      | UN    | UN    | A     | A     | A      |
| Tree                       | 0-5           | A                | A     | A     | A     | A       | A     | A     | A     | A     | A      |
| Tree                       | 5-10          | B                | B     | B     | B     | B       | B     | C     | C     | C     | C      |
| Tree                       | 10-25         | UN               | UN    | UN    | UN    | UN      | UN    | C     | C     | C     | C      |
| Tree                       | 25-50         | UN               | UN    | UN    | UN    | UN      | UN    | D     | D     | D     | D      |
| Tree                       | >50           | UN               | UN    | UN    | UN    | UN      | UN    | D     | D     | 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

|                |           |                                             |
|----------------|-----------|---------------------------------------------|
| <b>Class A</b> | <b>15</b> | <b>Early Development 1 - All Structures</b> |
|----------------|-----------|---------------------------------------------|

Indicator Species

| Symbol | Scientific Name   | Common Name        | Canopy Position |
|--------|-------------------|--------------------|-----------------|
| PODE3  | Populus deltoides | Eastern cottonwood | Upper           |
| SALIX  | Salix             | Willow             | Upper           |

Description

Early successional stage created by scouring and deposition following seasonal flooding and stream meander changes (Optional 1 in model). A mix of pioneer tree seedlings, shrubs (often willows), and herbaceous primary succession. Rare surface fires.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

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|                |           |                                 |
|----------------|-----------|---------------------------------|
| <b>Class B</b> | <b>23</b> | <b>Mid Development 1 - Open</b> |
|----------------|-----------|---------------------------------|

Indicator Species

| Symbol | Scientific Name       | Common Name        | Canopy Position |
|--------|-----------------------|--------------------|-----------------|
| SALIX  | Salix                 | Willow             | Mid-Upper       |
| PLOC   | Platanus occidentalis | American sycamore  | Upper           |
| PODE3  | Populus deltoides     | Eastern cottonwood | Upper           |

Description

This stage develops as the stand starts to mature. These are low diversity stands dominated by cottonwood, willow (sandbar, peach-leaved, black), and sycamore.

Maximum Tree Size Class

Sapling >4.5ft; <5"DBH

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|                |           |                                   |
|----------------|-----------|-----------------------------------|
| <b>Class C</b> | <b>44</b> | <b>Mid Development 1 - Closed</b> |
|----------------|-----------|-----------------------------------|

Indicator Species

| Symbol | Scientific Name       | Common Name        | Canopy Position |
|--------|-----------------------|--------------------|-----------------|
| PLOC   | Platanus occidentalis | American sycamore  | Upper           |
| PODE3  | Populus deltoides     | Eastern cottonwood | Upper           |
| ACNE2  | Acer negundo          | Boxelder           | Upper           |
| ACSA2  | Acer saccharinum      | Silver maple       | Upper           |

Description

Mixed canopy. Overstory is dominated by a mix of cottonwood, American elm, silver maple, box elder, red maple, and sycamore. Vines and poison ivy are abundant in the understory.

Maximum Tree Size Class

Medium 9-21"DBH

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|                |           |                                    |
|----------------|-----------|------------------------------------|
| <b>Class D</b> | <b>18</b> | <b>Late Development 1 - Closed</b> |
|----------------|-----------|------------------------------------|

### Indicator Species

| Symbol | Scientific Name        | Common Name  | Canopy Position |
|--------|------------------------|--------------|-----------------|
| ACSA2  | Acer saccharinum       | Silver maple | Upper           |
| JUNI   | Juglans nigra          | Black walnut | Upper           |
| FRPE   | Fraxinus pennsylvanica | Green ash    | Upper           |
| QUPA2  | Quercus palustris      | Pin oak      | Upper           |

### Description

Found along upper terraces or areas protected from frequent flooding. Species diversity increases towards the south and east within the region. Overstory species include hackberry, American elm, ash (green and black), sycamore, black walnut, shagbark hickory, oak (bur, swamp, white), basswood, tulip poplar, and maple (red & silver). Understory cover is often higher than in other classes in this model. Shrubs and small trees such as *Lindera benzoin*, *Carpinus caroliniana*, *Cercis canadensis*, *Cornus* spp. And *Prunus virginiana* are typical.

### Maximum Tree Size Class

Large 21-33"DBH

## **Model Parameters**

### **Deterministic Transitions**

| From Class | Begins at (yr) | Succeeds to | After (years) |
|------------|----------------|-------------|---------------|
| Early1:ALL | 0              | Mid1:OPN    | 9             |
| Mid1:OPN   | 10             | Mid1:CLS    | 29            |
| Mid1:CLS   | 30             | 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 |
|------------------|-----------------------|---------------------|-------------------------|-----------------------|-----------------------------------------------------|------------------------------|
| Surface Fire     | Early1:ALL            | Early1:ALL          | 0.01                    | 100                   | No                                                  | 0                            |
| Optional 1       | Early1:ALL            | Early1:ALL          | 0.2                     | 5                     | Yes                                                 | 0                            |
| Mixed Fire       | Mid1:OPN              | Mid1:OPN            | 0.01                    | 100                   | No                                                  | 0                            |
| Optional 2       | Mid1:OPN              | Early1:ALL          | 0.02                    | 50                    | Yes                                                 | 0                            |
| Optional 1       | Mid1:OPN              | Mid1:OPN            | 0.25                    | 4                     | No                                                  | 0                            |
| Optional 2       | Mid1:CLS              | Mid1:OPN            | 0.02                    | 50                    | Yes                                                 | 0                            |
| Surface Fire     | Mid1:CLS              | Mid1:CLS            | 0.022                   | 45                    | No                                                  | 0                            |
| Optional 1       | Mid1:CLS              | Mid1:CLS            | 0.25                    | 4                     | No                                                  | 0                            |
| Optional 2       | Late1:CLS             | Mid1:OPN            | 0.005                   | 200                   | Yes                                                 | 0                            |
| Surface Fire     | Late1:CLS             | Late1:CLS           | 0.02                    | 50                    | No                                                  | 0                            |

### **Optional Disturbances**

Optional 1: Minor Flooding

## Optional 2: Major Flooding

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