COMMON NAME (PARK-SPECIFIC): DRY OAK - HEATH FOREST

SYNONYMS

NVC English Name:	**Chestnut Oak - (Northern Red Oak, Black Oak) / Northern Lowbush Blueberry Forest**
NVC Scientific Name:	***Quercus prinus - Quercus (rubra, velutina) / Vaccinium angustifolium* Forest**
NVC Identifier:	**CEGL006282**

LOCAL INFORMATION

Environmental Description: This common forest association occurs in most high-elevation portions of the park, on ridgetops, high slopes, and high plateaus on both sides of the river. It is the prominent matrix forest community for upper elevations of the Kittatinny Ridge and the Glaciated Low Plateau in Pennsylvania. In areas that have experienced significant tree mortality from fire, storms, or insects, this association may resemble a woodland. This forest occurs on acidic, rapidly or well-drained, extremely rocky or thin soils such as found in the Manlius, Mardin, Arnot, Oquaga, Lackawanna, Lordstown, Hazelton, and Dekalb series. Rock outcrops, boulders and large rocks are frequent on the forest floor. This association occurs on shale, siltstone and sandstone within the park.

Vegetation Description: This forest type is characterized by the presence of ericaceous species that form substantial heath layers under a closed canopy or occasionally an open canopy in disturbed stands. Ericaceous species cover 40-95% of the forest, forming dense tall- and/or short-shrub layers. Mountain laurel (*Kalmia latifolia*) is often the dominant tall shrub, with American witch-hazel (*Hamamelis virginiana*), striped maple (*Acer pensylvanicum*), bear oak (*Quercus ilicifolia*), and sprouts of American chestnut (*Castanea dentata*) as associates. The short ericad layer is dominated by black huckleberry (*Gaylussacia baccata*), Blue Ridge blueberry (*Vaccinium pallidum*), deerberry (*Vaccinium stamineum*), and/or lowbush blueberry (*Vaccinium angustifolium*). The diverse short-shrub layer also includes blue huckleberry (*Gaylussacia frondosa*), eastern teaberry (*Gaultheria procumbens*), sheep laurel (*Kalmia angustifolia*), trailing arbutus (*Epigaea repens*), mountain laurel, and seedlings of the canopy and subcanopy trees. The canopy covers 30 to 90% of the area and is typically dominated or codominated by chestnut oak (*Quercus prinus*). Northern red oak (*Quercus rubra*) and white oak (*Quercus alba*) may also be codominant or dominant. Other common canopy associates include scarlet oak (*Quercus coccinea*), sweet birch (*Betula lenta*), red maple (*Acer rubrum*), pignut hickory (*Carya glabra*), black oak (*Quercus velutina*), pitch pine (*Pinus rigida*), blackgum (*Nyssa sylvatica*), sassafras (*Sassafras albidum*), eastern white pine (*Pinus strobus*), and eastern hemlock (*Tsuga canadensis*). Canopy trees range in height from 15-30 m, while subcanopy trees extend 5-20 m in height. The subcanopy (10-60% cover) is typically dominated by red maple, with sweet birch, pignut hickory, chestnut oak, common serviceberry (*Amelanchier arborea*), black chokeberry (*Photinia melanocarpa*), eastern hemlock, blackgum, white oak, black oak, and scarlet oak. The herbaceous layer is typically extremely sparse, with scattered graminoid or herbaceous species persisting underneath the dense shrubs. The herbaceous layer is denser in open patches in between the dense clumps of ericads. Wavy hairgrass (*Deschampsia flexuosa*) and eastern hayscented fern (*Dennstaedtia punctilobula*) are the most common species, with Pennsylvania sedge (*Carex pensylvanica*), western bracken fern (*Pteridium aquilinum*), Swan's sedge (*Carex swanii*), poverty oatgrass (*Danthonia spicata*), narrowleaf cowwheat (*Melampyrum lineare*),

Indian cucumber (*Medeola virginiana*), running clubmoss (*Lycopodium clavatum*), smooth Solomon's seal (*Polygonatum biflorum*), starflower (*Trientalis borealis*), marginal woodfern (*Dryopteris marginalis*), white snakeroot (*Ageratina altissima* var. *altissima*), and wild sarsaparilla (*Aralia nudicaulis*). Vines are typically sparse or absent and may include Virginia creeper (*Parthenocissus quinquefolia*) and roundleaf greenbrier (*Smilax rotundifolia*).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus alba, Quercus prinus, Quercus rubra*
Tree canopy	Needle-leaved tree	*Pinus rigida*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum, Betula lenta, Carya glabra*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Quercus ilicifolia*
Tall shrub/sapling	Broad-leaved evergreen shrub	*Kalmia latifolia*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata, Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum*
Herb (field)	Graminoid	*Deschampsia flexuosa*
Herb (field)	Fern or fern ally	*Dennstaedtia punctilobula*

Characteristic Species: *Quercus alba, Quercus prinus, Gaylussacia baccata, Kalmia latifolia, Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S3S4	1	Lower New England Slope Chestnut Oak Forest	Walz et al. 2006
PA	S5	1	Dry oak - heath forest	Fike 1999
PA	S3	1	Dry oak - heath woodland	Fike 1999

Local Range: This common forest type occurs in most high-elevation portions of the park.

Classification Comments: This forest is identified by the dense tall- and/or short-shrub layers (40-95% cover) dominated by ericaceous species (*Gaylussacia* spp., *Vaccinium* spp., *Kalmia* spp.). The canopy usually covers 60% of the stand and is often dominated by *Quercus prinus*, although *Quercus alba* and/or *Quercus rubra* can also be dominant or codominant. Stands with a woodland physiognomy (25-60% canopy cover) with similar species composition are included here.

Other Comments: None.

Local Description Authors: S. J. Perles (PNHP).

Plots and Data Sources: DEWA.61, DEWA.64, DEWA.69, DEWA.72, DEWA.75, DEWA.88, DEWA.92, DEWA.97, DEWA.127, DEWA.136, DEWA.144, DEWA.147, DEWA.148, DEWA.195, DEWA.198, DEWA.200, DEWA.207; Fike 1999.

Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	Quercus prinus - (Quercus coccinea, Quercus velutina) Forest Alliance (A.248)
Alliance (English name)	Chestnut Oak - (Scarlet Oak, Black Oak) Forest Alliance
Association	*Quercus prinus - Quercus (rubra, velutina) / Vaccinium angustifolium* Forest
Association (English name)	Chestnut Oak - (Northern Red Oak, Black Oak) / Northern Lowbush Blueberry Forest
Ecological System(s):	Central Appalachian Dry Oak-Pine Forest (CES202.591)

GLOBAL DESCRIPTION

Concept Summary: This dry to xeric oak-heath forest of central and southern New England ranges south to the northern Piedmont and central Appalachian Mountains. It occurs on upper slopes and ridgetops with thin, nutrient-poor, acidic soils. Windthrow, fire and ice damage are common natural disturbances. The canopy is closed to partially open and is dominated by *Quercus prinus*, which can be codominant with *Quercus rubra*. *Quercus alba, Quercus velutina,* and *Acer rubrum* are common associates, with other less frequent trees including *Betula lenta, Quercus coccinea, Amelanchier arborea, Pinus rigida,* and *Pinus strobus*. *Sassafras albidum, Cornus florida,* and *Nyssa sylvatica* can be minor associates at the southern and western portions of the range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata,* or *Kalmia angustifolia*. A tall-shrub layer is often lacking but when present may include *Castanea dentata, Kalmia latifolia, Viburnum acerifolium, Hamamelis virginiana, Quercus ilicifolia,* and *Viburnum prunifolium*. *Ilex montana, Rhododendron prinophyllum,* and *Menziesia pilosa* are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Carex pensylvanica, Deschampsia flexuosa, Danthonia spicata, Ageratina altissima* var. *altissima, Antennaria plantaginifolia, Aralia nudicaulis, Aureolaria laevigata, Gaultheria procumbens, Chimaphila maculata, Carex rosea, Carex swanii, Carex pensylvanica, Corydalis sempervirens, Comandra umbellata, Cypripedium acaule, Dryopteris marginalis, Epigaea repens, Goodyera pubescens, Hieracium venosum, Lycopodium clavatum, Medeola virginiana, Melampyrum lineare, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum,* and *Uvularia sessilifolia*.

Environmental Description: This forest generally occurs on xeric upper slopes and ridgetops and steep sideslopes with shallow, acidic, rocky, infertile soils. Windthrow, fire, and ice storms are common natural disturbances in these habitats.

Vegetation Description: The canopy is closed to partially open and dominated by *Quercus prinus*, which can be codominant with *Quercus rubra*. *Quercus alba, Quercus velutina,* and *Acer rubrum* are common associates, with other less frequent trees including *Betula lenta, Quercus coccinea, Amelanchier arborea, Pinus rigida,* and *Pinus strobus*. *Sassafras albidum, Cornus florida,* and *Nyssa sylvatica* can be minor associates at the southern and western portions of the

range. The low-shrub layer is well-developed and comprised chiefly of ericaceous species, including *Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum, Gaylussacia baccata,* or *Kalmia angustifolia*. A tall-shrub layer is often lacking but when present may include *Castanea dentata, Kalmia latifolia, Viburnum acerifolium, Hamamelis virginiana, Quercus ilicifolia,* and *Viburnum prunifolium*. *Ilex montana, Rhododendron prinophyllum,* and *Menziesia pilosa* are minor shrub associates at the southern end of the range. The herbaceous layer is of sparse to moderate cover, depending on shrub cover, and may include *Carex pensylvanica, Deschampsia flexuosa, Danthonia spicata, Ageratina altissima* var. *altissima, Antennaria plantaginifolia, Aralia nudicaulis, Aureolaria laevigata, Gaultheria procumbens, Chimaphila maculata, Carex rosea, Carex swanii, Carex pensylvanica, Corydalis sempervirens, Comandra umbellata, Cypripedium acaule, Dryopteris marginalis, Epigaea repens, Goodyera pubescens, Hieracium venosum, Lycopodium clavatum, Medeola virginiana, Melampyrum lineare, Monotropa uniflora, Potentilla canadensis, Pteridium aquilinum,* and *Uvularia sessilifolia*.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Quercus prinus, Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Vaccinium angustifolium, Vaccinium pallidum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Gaylussacia baccata, Vaccinium stamineum*
Herb (field)	Forb	*Aralia nudicaulis*
Herb (field)	Graminoid	*Carex pensylvanica*
Herb (field)	Fern or fern ally	*Pteridium aquilinum*

Characteristic Species: *Acer rubrum, Amelanchier arborea, Aralia nudicaulis, Carex pensylvanica, Castanea dentata, Danthonia spicata, Deschampsia flexuosa, Gaultheria procumbens, Gaylussacia baccata, Kalmia latifolia, Nyssa sylvatica, Pteridium aquilinum, Quercus coccinea, Quercus prinus, Quercus rubra, Quercus velutina, Sassafras albidum, Vaccinium angustifolium, Vaccinium pallidum, Vaccinium stamineum.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community ranges from southern Maine through the Central Appalachians to higher elevations in Virginia and West Virginia, and north more locally in the Piedmont.

States/Provinces: CT, DE, MA, MD, ME, NH, NJ:S3S4, NY, PA, RI, VA, VT, WV.

Federal Lands: NPS (Delaware Water Gap, Harpers Ferry, Rock Creek, Valley Forge, Weir Farm); USFS (George Washington, Jefferson).

CONSERVATION STATUS

Rank: G5 (1-Oct-2001).

Reasons: This is a very widely distributed oak / ericad forest that covers large areas.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: This community type is closely related to other oak / heath. It is distinguished by the presence of northern species, such as *Pinus strobus* and *Vaccinium angustifolium,* and its

general lack of southern Appalachian species, such as *Gaylussacia ursina, Leucothoe recurva*, and *Galax urceolata*. In comparison to *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023), it lacks *Oxydendrum arboreum, Pinus echinata*, and *Pinus virginiana*. It occupies poorer sites and has a more abundant ericaceous shrub component than *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057) and *Quercus prinus - Quercus velutina / Oxydendrum arboreum - Cornus florida* Forest (CEGL008522). The Chestnut Oak / Low-Elevation Subtype of Virginia intergrades with the more southern *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271) throughout west-central Virginia. A well-developed Piedmont example of the Chestnut Oak / Low-Elevation Subtype is described by Allard and Leonard (1943). The Chestnut Oak - Northern Red Oak / High-Elevation Subtype of Virginia is similar to *Quercus rubra - (Quercus prinus, Quercus velutina) / Rhododendron periclymenoides / Lysimachia quadrifolia - Hieracium paniculatum* Forest (CEGL008523) of high-elevation granitic terrain on the northern Blue Ridge, but lacks *Quercus velutina, Rhododendron periclymenoides*, and the suite of low-cover herbaceous species characteristic of mineral soil microhabitats in that unit. The recognition of global subtypes equivalent to two distinct state community types is well supported by quantitative analysis of compositional and environmental data. Further study may support the elevation of these subtypes to full association-level status in the USNVC.

Similar Associations:

- *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest (CEGL006336)--is similar to the more mesic end of the range of variation found in this type at Valley Forge National Historical Park.
- *Quercus (prinus, coccinea) / Kalmia latifolia / (Galax urceolata, Gaultheria procumbens)* Forest (CEGL006271)--of Southern Appalachians.
- *Quercus prinus - (Quercus coccinea, Quercus velutina) / Kalmia latifolia / Vaccinium pallidum* Forest (CEGL006299).
- *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023)--of Western Alleghenies, Interior Low Plateau, etc.
- *Quercus prinus - Quercus rubra / Hamamelis virginiana* Forest (CEGL006057).
- *Quercus prinus - Quercus* spp. / *Vaccinium arboreum - (Kalmia latifolia, Styrax grandifolius)* Forest (CEGL007700).
- *Quercus prinus - Quercus velutina / Oxydendrum arboreum - Cornus florida* Forest (CEGL008522).
- *Quercus rubra - (Quercus prinus, Quercus velutina) / Rhododendron periclymenoides / Lysimachia quadrifolia - Hieracium paniculatum* Forest (CEGL008523).

Related Concepts:

- *Quercus (prinus, rubra) / Calamagrostis porteri* Ridgetop Forest (Walton et al. 1997) ?
- *Quercus prinus - Quercus rubra / Acer pensylvanicum* Association: *Betula lenta / Ilex montana* Subassociation (Fleming and Moorhead 1996) ?
- *Quercus prinus - Quercus rubra / Kalmia latifolia / Vaccinium angustifolium - Gaultheria procumbens* Forest (Fleming and Coulling 2001) F
- *Quercus velutina - (Quercus prinus)* Forest (Metzler and Barrett 1996) ?
- CNE dry hardwood forest on acidic bedrock or till (Rawinski 1984) ?
- Chestnut Oak Forest (Breden 1989) =
- Chestnut Oak: 44 (Eyre 1980) B

- Dry Oak Woodland (Thompson 1996) B
- SNE dry oak/pine forests on acidic bedrock or till (Rawinski 1984) B
- SNE mesic oak/pine forest on acidic bedrock or till (Rawinski 1984) ?

SOURCES

Description Authors: G. Fleming and P. Coulling, mod. S. L. Neid, L. A. Sneddon, S. C. Gawler.

References: Allard and Leonard 1943, Breden 1989, Breden et al. 2001, Clancy 1996, Collins and Anderson 1994, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Eyre 1980, Fike 1999, Fleming and Coulling 2001, Fleming and Moorhead 1996, Fleming and Moorhead 2000, Fleming et al. 2001, Gawler 2002, Harrison 2004, Harshberger 1919, Hunt 1997, Kasmer et al. 1984, Keever 1973, Metzler and Barrett 1996, Metzler and Barrett 2001, Nerurkar 1974, Overlease 1978, Overlease 1987, Pearson 1963, Pearson 1974, Pearson 1979, Rawinski 1984, Rawinski et al. 1994, Rawinski et al. 1996, Russell and Schuyler 1988, Shreve et al. 1910, Sperduto 1997a, Sperduto 2000a, Sperduto and Nichols 2004, Swain and Kearsley 2000, Thompson 1996, Thompson and Sorenson 2000, Vanderhorst 2000b, Walton et al. 1997.

Figure 30. Dry Oak - Heath Forest in Delaware Water Gap National Recreation Area (plot DEWA.61). July 2003.

Figure 31. Dry Oak - Heath Forest in Delaware Water Gap National Recreation Area (plot DEWA.97). August 2003.

COMMON NAME (PARK-SPECIFIC): NORTHERN RED OAK - MIXED HARDWOOD FOREST

SYNONYMS
NVC English Name: **Northern Red Oak - Sugar Maple - Tuliptree Forest**
NVC Scientific Name: ***Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest**
NVC Identifier: **CEGL006125**

LOCAL INFORMATION

Environmental Description: This association occurs on gentle to moderate slopes with variable aspect. Bedrock tends to be siltstone, sandstone and conglomerate of the Silurian Bloomsburg Formation and limestones and limy shales of the Buttermilk Falls Limestone, Esopus, and Marcellus Shale formations. Soils vary from loamy sand and fine sandy loam to extremely stony silt loams. Soil pH varies from medium acidic (pH = 5.6) to slightly alkaline (pH = 7.3) in most stands, with some stands being much more acidic (pH <5.5). Soils are typically well-drained but not droughty.

Vegetation Description: This association is broadly defined to capture dry-mesic forests that are common throughout the park. The tree canopy is typically closed or nearly so (canopy cover generally 80% or more) and usually more than 25 m in height (occasionally greater than 30 m). Northern red oak (*Quercus rubra*) may be dominant or more often codominant with red maple (*Acer rubrum*), black oak (*Quercus velutina*), hickories (*Carya glabra, Carya cordiformis*), and sweet birch (*Betula lenta*). Other occasional associates include white oak (*Quercus alba*), sugar maple (*Acer saccharum*), tuliptree (*Liriodendron tulipifera*), white ash (*Fraxinus americana*), and scarlet oak (*Quercus coccinea*). A subcanopy is usually discernible with 20 to 40% total cover and ranging from 5 to 20 m in height, depending on the stand. The dominant subcanopy tree is American hornbeam (*Carpinus caroliniana*), often with sweet birch, red maple, and flowering dogwood (*Cornus florida*) as associates or codominants. The tall-shrub layer varies from sparse to moderately abundant (5-30% total cover) and is variable in composition. Height of the tall-shrub layer is usually 2-5 m. The tall-shrub layer often contains one or more of the following as a dominant or codominant: northern spicebush (*Lindera benzoin*), American witch-hazel (*Hamamelis virginiana*), eastern hop-hornbeam (*Ostrya virginiana*), and eastern hemlock (*Tsuga canadensis*). The short-shrub layer varies in total cover from 10 to 30% and is less than 2 m in height. Composition is variable with one or more of the following typically present and/or abundant: Japanese barberry (*Berberis thunbergii*), northern spicebush, Blue Ridge blueberry (*Vaccinium pallidum*), mapleleaf viburnum (*Viburnum acerifolium*), sugar maple, sweet birch, hickory (*Carya* spp.), and multiflora rose (*Rosa multiflora*). The herbaceous layer is highly variable, usually less than 1 m in height and varies from 10 to 50 % total cover. Characteristic herbs include Christmas fern (*Polystichum acrostichoides*), eastern hayscented fern (*Dennstaedtia punctilobula*), garlic mustard (*Alliaria petiolata*), Canada mayflower (*Maianthemum canadense*), clubmosses (*Lycopodium* spp.), and mayapple (*Podophyllum peltatum*).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	Quercus rubra, Quercus velutina, Acer rubrum, Carya glabra
Tree subcanopy	Broad-leaved deciduous tree	Carpinus caroliniana
Tall shrub/sapling	Broad-leaved deciduous shrub	Hamamelis virginiana, Lindera benzoin, Ostrya virginiana
Short shrub/sapling	Broad-leaved deciduous shrub	Berberis thunbergii, Vaccinium pallidum, Viburnum acerifolium
Herb (field)	Forb	Alliaria petiolata, Podophyllum peltatum
Herb (field)	Graminoid	Carex pensylvanica, Carex swanii
Herb (field)	Fern or fern ally	Dennstaedtia punctilobula, Polystichum acrostichoides

Characteristic Species: *Quercus rubra, Quercus velutina, Acer rubrum, Carpinus caroliniana, Carya glabra, Hamamelis virginiana, Lindera benzoin, Ostrya virginiana, Dennstaedtia punctilobula, Polystichum acrostichoides.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	High Allegheny Rich Red Oak - Sugar Maple Forest	Walz et al. 2006
PA	S4	2	Red oak - mixed hardwood forest	Fike 1999

Local Range: This common association occurs throughout the park at mid- to lower slope positions and occasionally on the higher terraces of the Delaware River floodplain.

Classification Comments: This vegetation type is highly variable and is somewhat defined by what it is not. It differs from the drier oak forests in lacking *Quercus prinus*, and while hickories may be present, they are one of several codominants. The herb layer reflects more mesic conditions than occur in drier forests, with *Deschampsia flexuosa*, a typical grass of dry oak and hickory forests, relatively rare or absent. In stands of this association where the oaks (*Quercus* spp.) have been high-graded, the current composition may be more similar to Red Maple - Sweet Birch Hardwood Forest, due to the low cover of oaks (<25% relative cover) and the prominence of *Acer rubrum* and/or *Betula lenta*. The relatively low abundance or absence of *Fagus grandifolia, Acer saccharum, Tilia americana,* and *Liriodendron tulipifera* also differentiate this type from several of other mesic forest types in the park. In general, this forest type represents a transition between Dry Oak - Mixed Hardwood Forest of mid- to upper slopes and the more mesic forests found in the park on low slopes, ravines, and river floodplain terraces. This transitional position is reflected in the variable species composition in this association.

Other Comments: None.

Local Description Authors: G. S. Podniesinski (PNHP).

Plots and Data Sources: DEWA.6, DEWA.17, DEWA.22, DEWA.55, DEWA.84, DEWA.175, DEWA.182, DEWA.190; Fike 1999.

Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Lowland or submontane cold-deciduous forest (I.B.2.N.a.)
Alliance	Quercus rubra - (Acer saccharum) Forest Alliance (A.251)
Alliance (English name)	Northern Red Oak - (Sugar Maple) Forest Alliance
Association	*Quercus rubra - Acer saccharum - Liriodendron tulipifera* Forest
Association (English name)	Northern Red Oak - Sugar Maple - Tuliptree Forest
Ecological System(s):	Laurentian-Acadian Pine-Hemlock-Hardwood Forest (CES201.563
	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)

GLOBAL DESCRIPTION

Concept Summary: This red oak - sugar maple community is found primarily in the Allegheny Plateau and Appalachian Mountains of the United States, as well as on the northern Piedmont north to the Hudson Valley, with possible extensions east and west of those areas. It is typically found in coves, on moist north- and east-facing slopes and on well-drained flats. Soils are slightly acidic and of intermediate fertility. The closed-canopy tree layer is dominated by a mixture of oaks, primarily *Quercus alba* and *Quercus rubra*, with other hardwoods including *Acer saccharum, Acer rubrum*, and *Liriodendron tulipifera*. *Carya ovata, Carya alba (= Carya tomentosa), Nyssa sylvatica*, and *Quercus velutina* are possible associates. *Carya* spp. may share dominance in some stands. Dominance by *Acer rubrum* or *Liriodendron* may indicate a past disturbance history. A wide variety of more mesic associates, such as *Betula alleghaniensis, Betula lenta, Fagus grandifolia*, and *Fraxinus americana*, could occur but are negligible in dominance. In addition to *Acer saccharum* reproduction, some understory species may include *Carpinus caroliniana, Cercis canadensis, Cornus florida*, and *Ostrya virginiana*. Shrub and vine species include *Amelanchier laevis, Amelanchier arborea, Cornus* spp., *Hamamelis virginiana, Lindera benzoin, Viburnum acerifolium, Viburnum dentatum* var. *lucidum*, and *Vitis riparia*. Ericaceous shrubs, such as *Kalmia latifolia, Vaccinium angustifolium* and *Vaccinium pallidum*, may also be present but are not abundant. The ground layer species are highly variable but include *Caulophyllum thalictroides, Ageratina altissima, Dennstaedtia punctilobula, Podophyllum peltatum, Maianthemum racemosum (= Smilacina racemosa), Medeola virginiana, Thelypteris noveboracensis, Dryopteris marginalis, Actaea* spp., and *Uvularia sessilifolia*. Exotic species, including *Rosa multiflora* and *Alliaria petiolata*, may be present in the shrub and herb layers of disturbed stands.

Environmental Description: Stands are typically found in coves, on moist north- and east-facing slopes, and on well-drained flats. Soils are slightly acid and of intermediate fertility (Anderson 1982, Reschke 1990, Fike 1999).

Vegetation Description: Stands of this red oak - sugar maple forest feature a closed-canopy tree layer dominated by a mixture of oaks, primarily *Quercus alba* and *Quercus rubra*, with

other hardwoods including *Acer saccharum, Acer rubrum*, and *Liriodendron tulipifera*. *Carya ovata, Carya alba (= Carya tomentosa), Nyssa sylvatica*, and *Quercus velutina* are possible associates. *Carya* spp. may share dominance in some stands. Dominance by *Acer rubrum* or *Liriodendron* may indicate a past disturbance history. A wide variety of more mesic associates, such as *Betula alleghaniensis, Betula lenta, Fagus grandifolia*, and *Fraxinus americana*, could occur but are negligible in dominance. In addition to *Acer saccharum* reproduction, some understory species may include *Carpinus caroliniana, Cercis canadensis, Cornus florida*, and *Ostrya virginiana*. Shrub and vine species include *Amelanchier laevis, Amelanchier arborea, Cornus* spp., *Hamamelis virginiana, Lindera benzoin, Viburnum acerifolium, Viburnum dentatum* var. *lucidum*, and *Vitis riparia*. Ericaceous shrubs, such as *Kalmia latifolia, Vaccinium angustifolium* and *Vaccinium pallidum*, may also be present but are not abundant. The ground layer species are highly variable but include *Caulophyllum thalictroides, Ageratina altissima, Dennstaedtia punctilobula, Podophyllum peltatum, Maianthemum racemosum (= Smilacina racemosa), Medeola virginiana, Thelypteris noveboracensis, Dryopteris marginalis, Actaea* spp., and *Uvularia sessilifolia*. Exotic species, including *Rosa multiflora* and *Alliaria petiolata*, may be present in the shrub and herb layers of disturbed stands.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum, Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Quercus alba, Quercus rubra*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Viburnum acerifolium*
Short shrub/sapling	Broad-leaved deciduous shrub	*Vaccinium pallidum*
Herb (field)	Forb	*Podophyllum peltatum*
Herb (field)	Fern or fern ally	*Dennstaedtia punctilobula*

Characteristic Species: *Acer saccharum, Carex pensylvanica, Carpinus caroliniana, Caulophyllum thalictroides, Liriodendron tulipifera, Vaccinium angustifolium, Vaccinium pallidum.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This red oak - sugar maple community is found primarily in the Allegheny Plateau and Appalachian Mountains of the United States, with possible extensions east and west of those areas, ranging from New Jersey and southeastern New York west to Pennsylvania, West Virginia, and southeastern Ohio.

States/Provinces: CT, NJ, NY, OH, PA, WV?

Federal Lands: NPS (Allegheny Portage Railroad, Delaware Water Gap, Fort Necessity, Friendship Hill).

CONSERVATION STATUS

Rank: GNR (31-Dec-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: According to Anderson (1982) in Ohio, where this community is found in the southeastern unglaciated plateau region, it is differentiated from the oak-maple type, *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059), and the Appalachian oak forest type, *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023), by the substantial presence (over 20% canopy or basal area) of *Liriodendron tulipifera* and insignificant amounts of *Fagus grandifolia* or other mesic tree species. This type concept may overlap considerably with that of the oak-maple type, *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059). Braun (1950, e.g., p. 140) reports stands similar to this type in the Shawnee Hills and Mammoth Cave area of Kentucky, as well as other Interior Low Plateau sites. In New York, this type is reported primarily from the southeastern part of the State (Reschke 1990). In the mid-Atlantic states, this type is differentiated from *Quercus (alba, rubra, velutina) / Cornus florida / Viburnum acerifolium* Forest (CEGL006336) by somewhat more mesic conditions, a higher non-oak canopy component, and the absence of *Quercus prinus*.

Similar Associations:

- *Acer saccharum - Quercus rubra - Carya (glabra, ovata) / Ageratina altissima - Bromus pubescens* Forest (CEGL008517)--for similar vegetation in Virginia.
- *Fagus grandifolia - Quercus alba - Quercus rubra* Forest (CEGL006377).
- *Quercus alba - (Quercus rubra, Acer saccharum, Fagus grandifolia) / Aesculus flava* Forest (CEGL007233)--is a related type to the south and west.
- *Quercus alba - Quercus rubra - Quercus prinus - Acer saccharum / Lindera benzoin* Forest (CEGL002059).
- *Quercus prinus - Quercus (alba, coccinea, velutina) / Viburnum acerifolium - (Kalmia latifolia)* Forest (CEGL005023).
- *Quercus rubra - Acer saccharum - Tilia americana* var. *heterophylla - Aesculus flava - (Cladrastis kentukea)* Forest (CEGL007698).
- *Quercus rubra - Tsuga canadensis - Liriodendron tulipifera / Hamamelis virginiana* Forest (CEGL006566).

Related Concepts:

- Dry-Mesic Inland Mixed Oak Forest, mixed oak-hardwood type (Breden 1989) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. E. Largay and S. C. Gawler.

References: Anderson 1982, Braun 1950, Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Fike 1999, Fleming 1999, Lundgren 2001, Metzler and Barrett 2001, Reschke 1990.

Figure 32. Northern Red Oak - Mixed Hardwood Forest in Delaware Water Gap National Recreation Area (plot DEWA.6). May 2003.

Figure 33. Northern Red Oak - Mixed Hardwood Forest in Delaware Water Gap National Recreation Area (plot DEWA.84). August 2003.

COMMON NAME (PARK-SPECIFIC): SILVER MAPLE FLOODPLAIN FOREST

SYNONYMS
NVC English Name: **Silver Maple - American Elm Forest**
NVC Scientific Name: ***Acer saccharinum* - *Ulmus americana* Forest**
NVC Identifier: **CEGL002586**

LOCAL INFORMATION

Environmental Description: This floodplain forest occurs on the downstream ends of islands and on high terraces along the shoreline of the Delaware River. The substrate is typically silt loam or sandy loam, as in Delaware fine sandy loam or Pope fine sandy loam. The forest floor frequently has numerous parallel swales created by flood scour. These forests are inundated only during larger flood events.

Vegetation Description: This floodplain forest is dominated by silver maple (*Acer saccharinum*), covering 40-75% of the canopy. Sugar maple (*Acer saccharum*) can be a canopy codominant, with sycamore (*Platanus occidentalis*) and river birch (*Betula nigra*) as occasional associates. The canopy trees typically extend 20-30 m in height, while subcanopy trees range in height from 5-10 m. The sparse subcanopy can contain sugar maple, bitternut hickory (*Carya cordiformis*), silver maple, boxelder (*Acer negundo*), white ash (*Fraxinus americana*), eastern hop-hornbeam (*Ostrya virginiana*), black cherry (*Prunus serotina*), and black walnut (*Juglans nigra*). The sparse short-shrub layer includes black raspberry (*Rubus occidentalis*) and is often dominated by the invasive species Japanese barberry (*Berberis thunbergii*) and multiflora rose (*Rosa multiflora*). The dense herbaceous layer contains reed canarygrass (*Phalaris arundinacea*), ground ivy (*Glechoma hederacea*), whitegrass (*Leersia virginica*), ostrich fern (*Matteuccia struthiopteris*), hedge false bindweed (*Calystegia sepium* ssp. *sepium*), dogtooth violet (*Erythronium americanum*), Jack in the pulpit (*Arisaema triphyllum*), spotted ladysthumb (*Polygonum persicaria*), giant goldenrod (*Solidago gigantea*), sensitive fern (*Onoclea sensibilis*), and sweet woodreed (*Cinna arundinacea*). The invasive species Japanese knotweed (*Polygonum cuspidatum*) can form dense thickets on the forest floor. Garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*) are other common herbaceous invasive species in this forest. Vines such as eastern poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) can also be common.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia, Toxicodendron radicans*
Herb (field)	Forb	*Calystegia sepium* ssp. *sepium, Glechoma hederacea, Polygonum cuspidatum*
Herb (field)	Graminoid	*Leersia virginica, Phalaris arundinacea*
Herb (field)	Fern or fern ally	*Matteuccia struthiopteris*

Characteristic Species: *Acer saccharinum, Acer saccharum, Matteuccia struthiopteris*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	Silver Maple - American Elm Floodplain Forest	Walz et al. 2006
PA	S5	1	Silver maple floodplain forest	Fike 1999

Local Range: This forest occurs on island and terrace shorelines associated with the Delaware River in the park.
Classification Comments: Silver Maple Floodplain Forest can be distinguished from other floodplain forests by the dominance of *Acer saccharinum* (40-75% cover), often with *Acer saccharum* as codominant in the canopy or subcanopy.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.108, DEWA.112, DEWA.124; Fike 1999, Podniesinski and Wagner 2002.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Acer saccharinum Temporarily Flooded Forest Alliance (A.279)
Alliance (English name)	Silver Maple Temporarily Flooded Forest Alliance
Association	*Acer saccharinum* - *Ulmus americana* Forest
Association (English name)	Silver Maple - American Elm Forest
Ecological System(s):	Laurentian-Acadian Floodplain Forest (CES201.587)
	Central Appalachian Floodplain (CES202.608)
	Mississippi River Riparian Forest (CES203.190)
	North-Central Interior Floodplain (CES202.694)
	South-Central Interior Large Floodplain (CES202.705)

GLOBAL DESCRIPTION

Concept Summary: This silver maple - elm - cottonwood forest community is found throughout the midwestern United States and parts of the eastern United States. Stands occur on large, regularly flooded floodplains. The canopy cover is more-or-less closed and dominated by *Acer saccharinum*. Codominants may include *Platanus occidentalis, Betula nigra,* and rarely *Acer saccharum*. Associated species may include *Ulmus americana, Ulmus rubra, Acer negundo, Salix nigra, Celtis occidentalis, Carya cordiformis, Juglans nigra,* and *Fraxinus pennsylvanica*. The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus nigra* spp. *canadensis, Rubus occidentalis,* or *Lindera benzoin*. Woody and herbaceous vines can be prominent, including among the woody vines *Parthenocissus quinquefolia, Toxicodendron radicans,* and *Vitis riparia*. Herbaceous vine

species include *Apios americana, Amphicarpaea bracteata*, and *Echinocystis lobata*. Herbaceous grasses, forbs, and ferns dominate the ground layer, including *Symphyotrichum lateriflorum (= Aster lateriflorus), Boehmeria cylindrica, Erythronium americanum, Solidago gigantea, Cinna arundinacea, Leersia virginica, Elymus virginicus, Impatiens pallida, Laportea canadensis, Matteuccia struthiopteris, Onoclea sensibilis, Pilea pumila, Urtica dioica*, and others. A variety of exotics may be present, including *Lysimachia* spp., *Microstegium vimineum, Polygonum cuspidatum, Rosa multiflora*, and *Lonicera japonica*.

Environmental Description: This community occurs on temporarily flooded soils along major rivers and smaller perennial streams. Soils may be well-drained and sandy, more loamy on infrequently flooded bottomlands and levees, or deep silts on stabilized sites along larger rivers. The structure and composition of the type is influenced by the flooding regime. Floods leave river-deposited debris on the forest floor, ice scars on trees, and abandoned channels that retain water at or above the level of the main river channel.

Vegetation Description: The canopy cover is more-or-less closed and dominated by *Acer saccharinum*. Codominants may include *Platanus occidentalis, Betula nigra*, and rarely *Acer saccharum*. Associated species may include *Ulmus americana, Ulmus rubra, Acer negundo, Salix nigra, Celtis occidentalis, Carya cordiformis, Juglans nigra*, and *Fraxinus pennsylvanica*. The shrub and sapling layer is often open (<25% cover). Species that may be present include *Sambucus nigra* spp. *canadensis, Rubus occidentalis*, or *Lindera benzoin*. Woody and herbaceous vines can be prominent, including among the woody vines *Parthenocissus quinquefolia, Toxicodendron radicans*, and *Vitis riparia*. Herbaceous vine species include *Apios americana, Amphicarpaea bracteata*, and *Echinocystis lobata*. Herbaceous grasses, forbs, and ferns dominate the ground layer, including *Symphyotrichum lateriflorum (= Aster lateriflorus), Boehmeria cylindrica, Erythronium americanum, Solidago gigantea, Cinna arundinacea, Leersia virginica, Elymus virginicus, Impatiens pallida, Laportea canadensis, Matteuccia struthiopteris, Onoclea sensibilis, Pilea pumila, Urtica dioica*, and others. A variety of exotics may be present, including *Lysimachia* spp., *Microstegium vimineum, Polygonum cuspidatum, Rosa multiflora*, and *Lonicera japonica* (MNNHP 1993, Anderson 1996, Central Appalachian Ecoregional Team pers. comm. 1998).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharinum*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia, Toxicodendron radicans*
Herb (field)	Graminoid	*Leersia virginica*

Characteristic Species: *Acer negundo, Acer saccharinum, Alliaria petiolata, Conium maculatum, Elymus virginicus, Glechoma hederacea, Humulus japonicus, Populus deltoides, Urtica dioica* ssp. *Gracilis.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is found throughout the midwestern United States and in the mid-Atlantic region of the eastern United States, ranging from Delaware, New Jersey, and Pennsylvania west to Minnesota, and south to Arkansas.

States/Provinces: AR, DE, IA:SU, IL, IN, KY, MI, MN, MO, NJ, OH, ON, PA, TN, WI:S3.

Federal Lands: NPS (Delaware Water Gap, Effigy Mounds, New River Gorge); USFS (Ozark?).

CONSERVATION STATUS
Rank: G4? (3-Oct-1996).
Reasons: There has been significant conversion of stands to agriculture, hydrologic modifications due to river dams, etc., and siltation caused by modified flooding regimes.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 2 – Moderate.
Comments: This type includes stands where *Acer saccharinum* represents the majority of trees (>50% cover or basal area?). This type is most clearly expressed on larger rivers. To some degree this type is more northern, separable from the more southern type *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Forest (CEGL002431), but this distinction is not yet well resolved. In the southern parts of its range, this type may overlap with *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334), but that type is generally a higher terrace, small stream type. Compare this type with SAF cover type 62 (Eyre 1980). In Minnesota stands with less than either 50% cottonwood or silver maple and not in northwestern Minnesota tend to occur here (i.e., a mixed floodplain forest), as do silver maple stands with a supercanopy of cottonwoods. In southwestern Minnesota, stands with only some swamp white oak go here. If swamp white oak is dominant the stands probably belong with either an association in the *Quercus palustris - (Quercus bicolor)* Seasonally Flooded Forest Alliance (A.329), or *Quercus macrocarpa - Quercus bicolor - Carya laciniosa / Leersia* spp. - *Cinna* spp. Forest (CEGL002098), at least in the Midwest. *Fraxinus pennsylvanica* is a typical codominant in this type. In Wisconsin, this type may better be named *Acer saccharinum - Fraxinus pennsylvanica - Betula nigra* Forest (E. Epstein pers. comm. 1999).
Similar Associations:
- *Acer (rubrum, saccharinum) - Fraxinus* spp. - *Ulmus americana* Forest (CEGL005038)--grades into this community in backwater swamps.
- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147)--is somewhat more northern, lacking *Platanus* and *Betula nigra*.
- *Acer saccharinum - Acer negundo / Ageratina altissima - Laportea canadensis - (Elymus virginicus)* Forest (CEGL006217).
- *Acer saccharinum - Betula nigra / Cephalanthus occidentalis* Forest (CEGL007810).
- *Acer saccharinum - Celtis laevigata - Carya illinoinensis* Forest (CEGL002431)--is more southern.
- *Acer saccharinum* Temporarily Flooded Forest [Placeholder] (CEGL007304)
- *Fagus grandifolia - Quercus* spp. - *Acer rubrum - Juglans nigra* Forest (CEGL005014)--in the eastern part of its range on the mesic side.
- *Fraxinus pennsylvanica - Ulmus americana - (Acer negundo, Tilia americana)* Northern Forest (CEGL002089)--in the western part of its range on the mesic side.
- *Fraxinus pennsylvanica - Ulmus* spp. - *Celtis occidentalis* Forest (CEGL002014).
- *Platanus occidentalis - Acer saccharinum - Juglans nigra - Ulmus rubra* Forest (CEGL007334)--may overlap in southern parts of the range of CEGL002586.
- *Populus deltoides - Salix nigra* Forest (CEGL002018)--grades into this community on the wetter side.

- *Quercus macrocarpa* - *Quercus bicolor* - *Carya laciniosa / Leersia* spp. - *Cinna* spp. Forest (CEGL002098).

Related Concepts:

- Silver Maple - American Elm: 62 (Eyre 1980) B
- Silver maple-American elm-cottonwood floodplain forest (CAP pers. comm. 1998) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. L. A. Sneddon, E. Largay, S. C. Gawler.
References: Anderson 1996, CAP pers. comm. 1998, Eyre 1980, Fike 1999, INAI unpubl. data, MNNHP 1993, Midwestern Ecology Working Group n.d., Podniesinski and Wagner 2002, TDNH unpubl. data, WINHIP unpubl. data.

Figure 34. Silver Maple Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.112). August 2003.

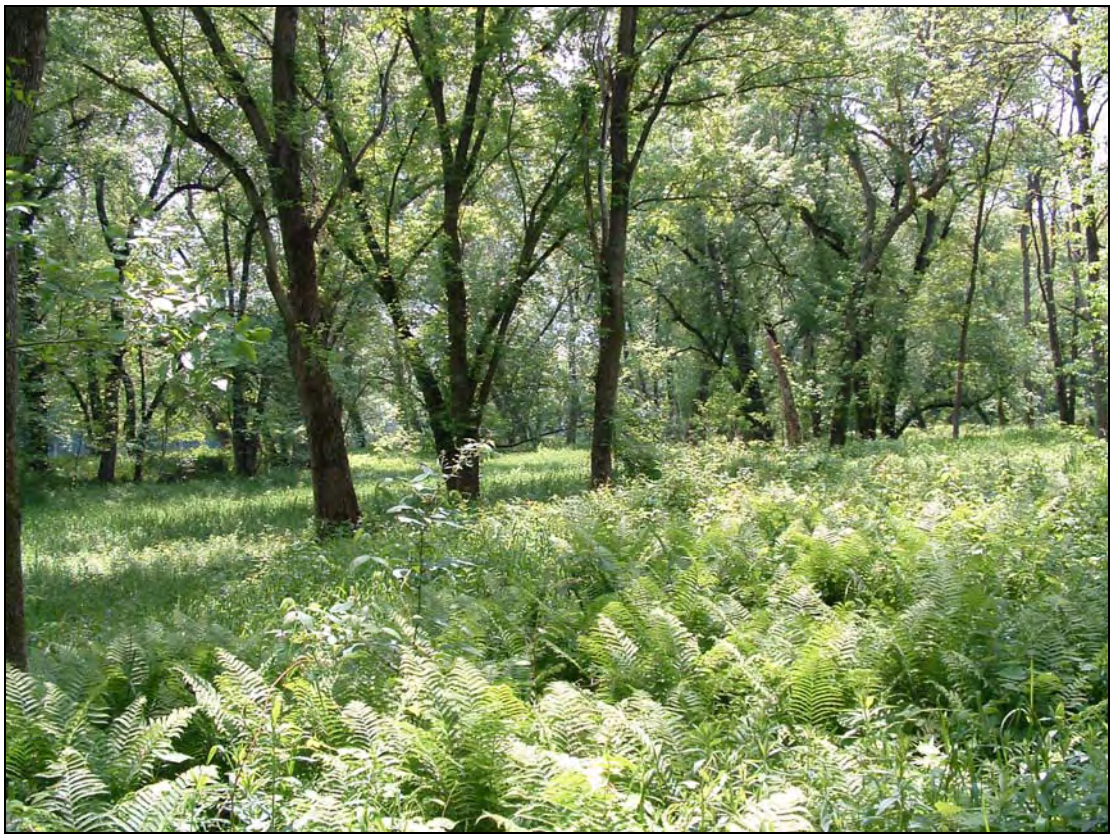

Figure 35. Silver Maple Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.124). May 2003.

COMMON NAME (PARK-SPECIFIC): SUGAR MAPLE FLOODPLAIN FOREST

SYNONYMS

NVC English Name:	**Sugar Maple - White Ash / American Hornbeam / Mayapple Forest**
NVC Scientific Name:	***Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest**
NVC Identifier:	**CEGL006459**

LOCAL INFORMATION

Environmental Description: This association occurs on low to mid terraces of the Delaware River and its tributaries. The soils appear to be alluvial in origin for the most part and include Barbour fine sandy loam, Galway loam, Pope silt loam and undifferentiated alluvium. These soils tend to be slightly acidic to alkaline. Stands on lower terraces may flood occasionally, but the period of inundation is short. The underlying bedrock is a variety of calcareous shale and siltstone, limestone and dolomite.

Vegetation Description: The canopy height varies from 20 to 35 m with total cover 70 to 90%. The dominant canopy tree is sugar maple (*Acer saccharum*). White ash (*Fraxinus americana*) is a common associate and may be codominant in some stands. Other minor associate species include American beech (*Fagus grandifolia*), pignut hickory (*Carya glabra*), black cherry (*Prunus serotina*), black oak (*Quercus velutina*), and American elm (*Ulmus americana*). The subcanopy can vary from 5 to 25 m in height with total cover ranging from sparse (5%) up to 30%. Sugar maple is often the only species in the subcanopy, or sometimes with American hornbeam (*Carpinus caroliniana*) as a minor associate. The tall-shrub layer is 2-5 m in height and is usually sparse (<10% cover) or absent. The most characteristic tall shrubs/saplings are northern spicebush (*Lindera benzoin*) and sugar maple. The short-shrub layer, less than 2 m in height, may also be sparse (under 5% total cover) or have up to 30% cover. Common short-shrub/sapling species include Japanese barberry (*Berberis thunbergii*), northern spicebush, and sugar maple. The herbaceous layer can be quite variable with respect to cover, ranging from as little as 20% to over 80%. The herbaceous layer is usually under 1 m in height. The herbaceous layer is often diverse but is often dominated by invasive herbs, especially garlic mustard (*Alliaria petiolata*), ground ivy (*Glechoma hederacea*), Japanese stiltgrass (*Microstegium vimineum*), and oriental ladysthumb (*Polygonum caespitosum*). Common native herbs include silver false spleenwort (*Deparia acrostichoides*), Christmas fern (*Polystichum acrostichoides*), cleavers (*Galium aparine*), sensitive fern (*Onoclea sensibilis*), whitegrass (*Leersia virginica*), and mayapple (*Podophyllum peltatum*).

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Acer saccharum, Fraxinus americana*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer saccharum, Lindera benzoin*
Short shrub/sapling	Broad-leaved deciduous shrub	*Berberis thunbergii, Lindera benzoin*

Herb (field)	Forb	*Alliaria petiolata, Galium aparine, Glechoma hederacea, Polygonum caespitosum*
Herb (field)	Graminoid	*Leersia virginica, Microstegium vimineum*
Herb (field)	Fern or fern ally	*Deparia acrostichoides, Polystichum acrostichoides*

Characteristic Species: *Acer saccharum, Fraxinus americana, Lindera benzoin, Caulophyllum thalictroides, Deparia acrostichoides, Galium aparine, Onoclea sensibilis, Podophyllum peltatum, Polystichum acrostichoides.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNA	3	Rich Sugar Maple - Hardwood Floodplain Terrace Forest	Walz et al. 2006
PA	S4	1	no crosswalk	Fike 1999

Local Range: This association appears to be restricted primarily to floodplain terraces of the Delaware River and its tributaries and may also occur on low steps-in-slope over calcareous bedrock.

Classification Comments: This association is characterized by the dominance of *Acer saccharum* in nearly all strata. It differs from Sugar Maple - American Beech - Sweet Birch Forest in that the latter does not occur on floodplain terraces. It differs from Sugar Maple - American Basswood Forest in that *Tilia americana* is usually absent and it rarely occurs on steep slopes. It differs from other floodplain forest communities in that *Platanus occidentalis, Betula nigra,* and *Acer saccharinum* are rare or absent.

Other Comments: The correct crosswalk to the NVCS and the New Jersey state classification for this association is questionable. This association is also similar to NVCS CEGL006114 [*Acer saccharum - Fraxinus* spp. - *Tilia americana* / *Matteuccia struthiopteris - Ageratina altissima* Forest] and to CEGL006914 [*Acer saccharinum* - (*Acer saccharum, Juglans cinerea, Juglans nigra, Ulmus rubra, Ulmus americana, Prunus serotina, Celtis occidentalis*) Forest].

Local Description Authors: G. S. Podniesinski (PNHP).

Plots and Data Sources: DEWA.28, DEWA.158, DEWA.173, DEWA.249.

Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Acer saccharum - Carya cordiformis Temporarily Flooded Forest Alliance (A.302)
Alliance (English name)	Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance

Association	*Acer saccharum - Fraxinus americana / Carpinus caroliniana / Podophyllum peltatum* Forest
Association (English name)	Sugar Maple - White Ash / American Hornbeam / Mayapple Forest
Ecological System(s):	Central Appalachian Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: These rich floodplain forests are found on slightly elevated alluvial terraces and active floodplains of larger rivers in the mid-Atlantic states, interior to the Coastal Plain. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well-entrenched. The alluvial soils are slightly acidic to alkaline and less regularly inundated than the soils supporting floodplain forests dominated by silver maple or sycamore. Stands on lower terraces may flood occasionally, but the period of inundation is short. The canopy is closed to somewhat open, and a subcanopy is often present. Shrubs are typically sparse but may range up to about 30% cover. The herb layer is well-developed, fairly diverse, and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants are usually some combination of *Acer saccharum, Fraxinus americana*, and sometimes *Carya cordiformis*. Canopy associates include *Quercus rubra, Juglans nigra, Prunus serotina, Fraxinus nigra, Liriodendron tulipifera, Ulmus americana, Tilia americana*, and *Fagus grandifolia*. *Carpinus caroliniana* is often present as a small tree, along with *Acer saccharum*. *Lindera benzoin* is the most common shrub; *Asimina triloba* is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* and *Parthenocissus quinquefolia* are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica, Dicentra canadensis*, and *Erythronium americanum*, followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum, Caulophyllum thalictroides, Carex laxiculmis, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Galium aparine, Onoclea sensibilis*, and *Podophyllum peltatum*. Exotic species, such as *Microstegium vimineum, Glechoma hederacea*, and *Alliaria petiolata*, may be abundant, especially in disturbed areas. These terrace forests are related to lower floodplain forests, e.g. *Platanus occidentalis - Acer negundo - Juglans nigra / Asimina triloba / Mertensia virginica* Forest (CEGL004073), but distinguished by the reduced importance of *Acer saccharinum* and *Platanus occidentalis*; they differ from enriched upland hardwood forests, e.g., *Acer (nigrum, saccharum) - Tilia americana / Asimina triloba / Jeffersonia diphylla - Hydrophyllum canadense* Forest (CEGL008412), in their alluvial soils and flooding regime.

Environmental Description: These rich floodplain forests are found on slightly elevated alluvial terraces of mid-sized to larger rivers. The setting is a raised river terrace; however, this forest may occur very close to the riverbank if the water channel is well-entrenched. The alluvial soils are slightly acidic to alkaline. Stands on lower terraces may flood occasionally, but the period of inundation is short.

Vegetation Description: The canopy is closed to somewhat open, and a subcanopy is often present. Shrubs are typically sparse but may range up to about 30% cover. The herb layer is well-developed, fairly diverse, and seasonally variable, with spring ephemerals giving way to taller ferns, graminoids and forbs. Bryoids are very minor. The canopy dominants are usually some combination of *Acer saccharum, Fraxinus americana*, and sometimes *Carya cordiformis*. Canopy associates include *Quercus rubra,, Juglans nigra, Prunus serotina, Fraxinus nigra, Liriodendron tulipifera, Ulmus americana, Tilia americana*, and *Fagus grandifolia*. *Carpinus*

caroliniana is often present as a small tree, along with *Acer saccharum*. *Lindera benzoin* is the most common shrub; *Asimina triloba* is characteristic in the southern portion of this type's range. Vines such as *Toxicodendron radicans* and *Parthenocissus quinquefolia* are frequent but usually at low cover. The herb layer usually features spring ephemerals, including *Claytonia virginica, Dicentra canadensis*, and *Erythronium americanum*, followed by a mixture of ferns, forbs and graminoids. Characteristic species include *Arisaema triphyllum, Caulophyllum thalictroides, Carex laxiculmis, Deparia acrostichoides, Elymus virginicus, Elymus riparius, Galium aparine, Onoclea sensibilis*, and *Podophyllum peltatum*. Exotic species, such as *Microstegium vimineum, Glechoma hederacea*, and *Alliaria petiolata*, may be abundant, especially in disturbed areas.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer saccharum*
Tree canopy	Broad-leaved deciduous tree	*Fraxinus americana*
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	*Lindera benzoin*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Acer saccharum*
Herb (field)	Graminoid	*Microstegium vimineum*

Characteristic Species: *Acer saccharum, Arisaema triphyllum, Fraxinus americana, Lindera benzoin, Onoclea sensibilis, Podophyllum peltatum.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is known from the mid-Atlantic states from Pennsylvania and New Jersey to Virginia.

States/Provinces: MD, NJ:S2S3, PA, VA.

Federal Lands: NPS (C&O Canal, Delaware Water Gap).

CONSERVATION STATUS

Rank: G3G4? (20-Jun-2006).

Reasons: Type is fairly widely distributed but occurs in settings typically cleared for agriculture, and intact examples are not well-documented.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: This community has been drastically reduced from its original extent, as it makes excellent fertile farmland. Originally it was probably a large-patch type.

Similar Associations:

- *Acer saccharum - Fraxinus* spp. - *Tilia americana / Matteuccia struthiopteris - Ageratina altissima* Forest (CEGL006114).
- *Acer saccharum - Juglans cinerea / Carpinus caroliniana / Matteuccia struthiopteris* Forest (CEGL006430).
- *Liriodendron tulipifera - Fraxinus* spp. / *Lindera benzoin - Viburnum prunifolium / Podophyllum peltatum* Forest (CEGL006314).
- *Tilia americana - Acer saccharum - Acer nigrum / Laportea canadensis* Forest (CEGL006405).

Related Concepts:

- Palustrine Broad-leaved Deciduous Forested Wetland, Seasonally Flooded (PFO1C) (Cowardin et al. 1979) ?
- Sugar Maple - Basswood: 26 (Eyre 1980) B

SOURCES

Description Authors: S. C. Gawler.

References: Cowardin et al. 1979, Eastern Ecology Working Group n.d., Eyre 1980, Harrison 2004, Harrison and Stango 2003, Lea 2000, Thomson et al. 1999.

Figure 36. Sugar Maple Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.28). June 2003.

Figure 37. Sugar Maple Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.158). July 2003.

COMMON NAME (PARK-SPECIFIC): BITTERNUT HICKORY LOWLAND FOREST

SYNONYMS
NVC English Name: **Bitternut Hickory - Black Cherry / White Snakeroot Forest**
NVC Scientific Name: ***Carya cordiformis - Prunus serotina / Ageratina altissima* Forest**
NVC Identifier: **CEGL006445**

LOCAL INFORMATION

Environmental Description: This association typically occurs on mid to high floodplain terraces of the Delaware River within the park and has been observed on the upper Delaware River (Butternut Island near Callicoon, New York) in a similar setting. Flood frequency is unknown, but it is likely flooded less often than sycamore- (*Platanus occidentalis*) and silver maple- (*Acer saccharinum*) dominated forests found on lower floodplain terraces. Soils are derived from alluvial deposits and consist of fine sandy loams and loamy fine sand.
Vegetation Description: This association is characterized by the dominance or codominance of bitternut hickory (*Carya cordiformis*). Other potential codominant or associate canopy species include northern red oak (*Quercus rubra*), butternut (*Juglans cinerea*), black cherry (*Prunus serotina*), American elm (*Ulmus americana*), white ash (*Fraxinus americana*), and silver maple (*Acer saccharinum*). The canopy is usually somewhat open to closed (total cover 70 to 90%) and 20 to 25 m in height. The subcanopy height ranges from 5 to 18 m with total cover of about 20 to 30%. Composition of the subcanopy is similar to the canopy layer and may also include red maple (*Acer rubrum*) and sugar maple (*Acer saccharum*). The tall-shrub and short-shrub layers are usually sparse and may include occasional saplings of canopy and subcanopy species as well as scattered individuals of multiflora rose (*Rosa multiflora*), Morrow's honeysuckle (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), black raspberry (*Rubus occidentalis*), and northern dewberry (*Rubus flagellaris*). The herbaceous layer is weedy with invasive exotic species common or dominant, including Japanese stiltgrass (*Microstegium vimineum*), garlic mustard (*Alliaria petiolata*), and ground ivy (*Glechoma hederacea*). Common native species include white snakeroot (*Ageratina altissima* var. *altissima*), Shawnee salad (*Hydrophyllum virginianum*), and sedges (*Carex* spp.).
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Carya cordiformis, Prunus serotina*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum, Ulmus americana, Carya cordiformis, Prunus serotina*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Carya cordiformis, Lonicera morrowii, Prunus serotina*
Short shrub/sapling	Broad-leaved deciduous shrub	*Berberis thunbergii, Rosa multiflora*
Herb (field)	Forb	*Ageratina altissima* var. *altissima, Alliaria petiolata, Glechoma hederacea, Hydrophyllum virginianum*
Herb (field)	Graminoid	*Microstegium vimineum*

Characteristic Species: *Carya cordiformis, Prunus serotina, Ulmus americana, Ageratina altissima* var. *altissima.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	2	Bitternut Hickory Floodplain Terrace Forest	Walz et al. 2006
PA	S3?	2	no crosswalk	Fike 1999

Local Range: This association likely occurs throughout the park on mid to high floodplain terraces of the Delaware River. It appears to be restricted to small patches of well-drained loamy fine sand to fine sandy loam.
Classification Comments: This association differs from other mesic forest types in the dominance of *Carya cordiformis* in the canopy.
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).
Plots and Data Sources: DEWA.79, DEWA.126, DEWA.243.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Acer saccharum - Carya cordiformis Temporarily Flooded Forest Alliance (A.302)
Alliance (English name)	Sugar Maple - Bitternut Hickory Temporarily Flooded Forest Alliance
Association	*Carya cordiformis - Prunus serotina / Ageratina altissima* Forest
Association (English name)	Bitternut Hickory - Black Cherry / White Snakeroot Forest
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: This association is characterized by the dominance or codominance of *Carya cordiformis* on mid to high floodplain terraces. Soils are derived from alluvial deposits and consist of fine sandy loams and loamy fine sand. Codominant or associate canopy species include *Quercus rubra, Juglans cinerea, Prunus serotina, Ulmus americana, Fraxinus americana*, and *Acer saccharinum*. The canopy is usually somewhat open, occasionally closed, and about 20 m in height. The subcanopy cover is usually 20 to 30%. Composition of the subcanopy is similar to the canopy layer and may also include *Acer rubrum* and *Acer saccharum*. The tall-shrub and short-shrub layers are usually sparse and include occasional saplings of canopy and subcanopy species, as well as scattered individuals of *Rosa multiflora, Lonicera morrowii, Berberis thunbergii, Rubus occidentalis*, and *Rubus flagellaris*. The herbaceous layer is weedy, with invasive exotic species common or dominant, including *Microstegium vimineum,*

Alliaria petiolata, and *Glechoma hederacea*. Common native species include *Ageratina altissima* var. *altissima*, *Hydrophyllum virginianum*, and *Carex* spp.

Environmental Description: This association occurs on mid to high floodplain terraces of the Delaware and Upper Delaware rivers and probably other rivers within the region. Flood frequency is unknown, but it is likely flooded less often than Platanus occidentalis and Acer saccharinum forests found on lower floodplain terraces. Soils are derived from alluvial deposits and consist of fine sandy loams and loamy fine sand.

Vegetation Description: This association is characterized by the dominance or codominance of *Carya cordiformis*. Codominant or associate canopy species include *Quercus rubra*, *Juglans cinerea*, *Prunus serotina*, *Ulmus americana*, *Fraxinus americana*, and *Acer saccharinum*. The canopy is usually somewhat open, occasionally closed, and about 20 m in height. The subcanopy cover is usually 20 to 30%. Composition of the subcanopy is similar to the canopy layer and may also include *Acer rubrum* and *Acer saccharum*. The tall-shrub and short-shrub layers are usually sparse and include occasional saplings of canopy and subcanopy species, as well as scattered individuals of *Rosa multiflora*, *Lonicera morrowii*, *Berberis thunbergii*, *Rubus occidentalis*, and *Rubus flagellaris*. The herbaceous layer is weedy, with invasive exotic species common or dominant, including *Microstegium vimineum*, *Alliaria petiolata*, and *Glechoma hederacea*. Common native species include *Ageratina altissima* var. *altissima*, *Hydrophyllum virginianum*, and *Carex* spp.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Carya cordiformis*, *Prunus serotina*
Tree subcanopy	Broad-leaved deciduous tree	*Acer saccharum*, *Ulmus americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Carya cordiformis*, *Lonicera morrowii*, *Prunus serotina*
Short shrub/sapling	Broad-leaved deciduous shrub	*Berberis thunbergii*, *Rosa multiflora*
Herb (field)	Forb	*Ageratina altissima* var. *altissima*, *Alliaria petiolata*, *Glechoma hederacea*, *Hydrophyllum virginianum*
Herb (field)	Graminoid	*Microstegium vimineum*

Characteristic Species: *Acer saccharum*, *Ageratina altissima* var. *altissima*, *Carya cordiformis*, *Hydrophyllum virginianum*, *Prunus serotina*, *Ulmus americana*.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This type is currently documented from northern New Jersey and Pennsylvania.

States/Provinces: NJ, NY?, PA.

Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS

Rank: GNR (7-Feb-2006).

Reasons: Information not available.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 3 – Weak.
Comments: Information not available.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES
Description Authors: S. C. Gawler.
References: Eastern Ecology Working Group n.d.

Figure 38. Bitternut Hickory Lowland Forest in Delaware Water Gap National Recreation Area (plot DEWA.76). August 2003.

Figure 39. Bitternut Hickory Lowland Forest in Delaware Water Gap National Recreation Area (plot DEWA.243). May 2004.

COMMON NAME (PARK-SPECIFIC): SYCAMORE FLOODPLAIN FOREST

SYNONYMS
NVC English Name: **Sycamore - Green Ash Forest**
NVC Scientific Name: ***Platanus occidentalis - Fraxinus pennsylvanica* Forest**
NVC Identifier: **CEGL006036**

LOCAL INFORMATION

Environmental Description: This association typically occurs on low terrace floodplains of major tributaries to the Delaware River, such as Bushkill Creek and Flat Brook. It also can occur on islands, bars, and low terrace shorelines of the Delaware River. The low terraces are usually immediately adjacent to the river channel and subject to frequent flooding. The substrate is typically somewhat poorly drained sand, silt and/or loam.
Vegetation Description: The characteristic vegetation for this floodplain forest is a canopy clearly dominated by sycamore (*Platanus occidentalis*). Sycamore composes 50-90% of the canopy, with occasional associates of green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), common hackberry (*Celtis occidentalis*), eastern cottonwood (*Populus deltoides*), and American elm (*Ulmus americana*). The canopy trees typically extend 20-25 m in height, while subcanopy trees range in height from 8-12 m. The sparse to moderately dense subcanopy contains red maple (*Acer rubrum*), white ash, green ash, American elm, and river birch (*Betula nigra*). The tall- and short-shrub layers often contain northern spicebush (*Lindera benzoin*); however, they are highly susceptible to invasion by the exotic species multiflora rose (*Rosa multiflora*), Morrow's honeysuckle (*Lonicera morrowii*), and Japanese barberry (*Berberis thunbergii*). The herbaceous layer is typically moderately dense; common species include smallspike false nettle (*Boehmeria cylindrica*), arrowleaf tearthumb (*Polygonum sagittatum*), Virginia wildrye (*Elymus virginicus*), ostrich fern (*Matteuccia struthiopteris*), wild garlic (*Allium vineale*), Shawnee salad (*Hydrophyllum virginianum*), Jack in the pulpit (*Arisaema triphyllum*), white snakeroot (*Ageratina altissima* var. *altissima*), spotted ladysthumb (*Polygonum persicaria*), broadleaf enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), bromelike sedge (*Carex bromoides*), and sensitive fern (*Onoclea sensibilis*). The herbaceous layer can be dominated by the invasive species garlic mustard (*Alliaria petiolata*) and Japanese stiltgrass (*Microstegium vimineum*). Vines such as eastern poison ivy (*Toxicodendron radicans*) and Virginia creeper (*Parthenocissus quinquefolia*) are also common.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Platanus occidentalis*
Tree subcanopy	Broad-leaved deciduous tree	*Acer rubrum, Fraxinus pennsylvanica*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia*
Herb (field)	Forb	*Alliaria petiolata, Boehmeria cylindrica, Polygonum sagittatum*
Herb (field)	Graminoid	*Elymus virginicus, Microstegium vimineum*
Herb (field)	Fern or fern ally	*Onoclea sensibilis*

Characteristic Species: *Platanus occidentalis, Fraxinus pennsylvanica, Acer rubrum, Circaea lutetiana* ssp. *canadensis, Onoclea sensibilis.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	2	Riverine Floodplain Forest (Early-Successional Type)	Walz et al. 2006
PA	S4	1	Sycamore (river birch) - box-elder floodplain forest	Fike 1999

Local Range: This forest type is found in the floodplain of Bushkill Creek, Flat Brook, other major tributaries and the Delaware River.
Classification Comments: Sycamore Floodplain Forest is distinguished from Sycamore - Mixed Hardwood Floodplain Forest by the clear dominance of *Platanus occidentalis* covering 50-90% of the canopy in the former. In Sycamore - Mixed Hardwood Floodplain Forest, *Platanus occidentalis* is only codominant, sharing the canopy with a mix of other species. Also, Sycamore Floodplain Forest occurs on lower elevation terraces, typically immediately adjacent to the water's channel, with somewhat poorly drained finer textured substrate and a higher flood frequency. Sycamore - Mixed Hardwood Floodplain Forest occurs on slightly higher elevation mid terraces, with moderately well-drained coarser substrates and less frequent flood events.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.237, DEWA.242; Fike 1999, Podniesinski and Wagner 2002.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Platanus occidentalis - (Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum) Temporarily Flooded Forest Alliance (A.288)
Alliance (English name)	Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance
Association	*Platanus occidentalis - Fraxinus pennsylvanica* Forest
Association (English name)	Sycamore - Green Ash Forest
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: This floodplain forest of the northeastern United States, primarily in the northern Piedmont, is a broadly defined successional or young version of medium-gradient river floodplain forest occurring on coarse alluvial substrates. The canopy is closed to somewhat open and usually dominated by *Platanus occidentalis*. *Populus deltoides, Acer saccharinum,* and *Ulmus americana* are usually present but not common; occasional associates include *Acer*

negundo, Fraxinus pennsylvanica, Juglans cinerea, Carya cordiformis, Celtis occidentalis, and *Acer rubrum*. Shrubs or subcanopy are variable depending on geography and can include *Betula nigra, Carpinus caroliniana, Salix nigra, Lindera benzoin*, or *Alnus serrulata*, plus exotic invasives such as *Rosa multiflora, Berberis thunbergii*, and *Lonicera morrowii*. The herbaceous layer tends to be sparse to locally abundant and can include *Matteuccia struthiopteris, Osmunda cinnamomea, Onoclea sensibilis, Geum canadense, Impatiens pallida, Boehmeria cylindrica, Urtica dioica, Solidago rugosa, Hydrophyllum virginianum, Carex bromoides, Ageratina altissima (= Eupatorium rugosum)*, plus vine species *Toxicodendron radicans* and *Parthenocissus quinquefolia*. There is typically a very high component of disturbance-tolerant exotic species such as *Lysimachia nummularia, Glechoma hederacea, Microstegium vimineum, Hesperis matronalis, Aegopodium podagraria, Polygonum cuspidatum*, and *Alliaria petiolata*.
Environmental Description: Early- to-mid successional forest occurs on cobble or sand substrates of floodplain islands or cobble shores of moderate- to high-energy rivers.
Vegetation Description: The canopy is closed to somewhat open and usually dominated by *Platanus occidentalis*. *Populus deltoides, Acer saccharinum*, and *Ulmus americana* are usually present but not common; occasional associates include *Acer negundo, Fraxinus pennsylvanica, Juglans cinerea, Carya cordiformis, Celtis occidentalis*, and *Acer rubrum*. Shrubs or subcanopy are variable depending on geography and can include *Betula nigra, Carpinus caroliniana, Salix nigra, Lindera benzoin*, or *Alnus serrulata*, plus exotic invasives such as *Rosa multiflora, Berberis thunbergii*, and *Lonicera morrowii*. The herbaceous layer tends to be sparse to locally abundant and can include *Matteuccia struthiopteris, Osmunda cinnamomea, Onoclea sensibilis, Geum canadense, Impatiens pallida, Boehmeria cylindrica, Urtica dioica, Solidago rugosa, Hydrophyllum virginianum, Carex bromoides, Ageratina altissima (= Eupatorium rugosum)*, plus vine species *Toxicodendron radicans* and *Parthenocissus quinquefolia*. There is typically a very high component of disturbance-tolerant exotic species such as *Lysimachia nummularia, Glechoma hederacea, Microstegium vimineum, Hesperis matronalis, Aegopodium podagraria, Polygonum cuspidatum*, and *Alliaria petiolata*.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Platanus occidentalis*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Forb	*Boehmeria cylindrica*
Herb (field)	Fern or fern ally	*Onoclea sensibilis, Osmunda cinnamomea*

Characteristic Species: *Acer saccharinum, Circaea lutetiana* ssp. *canadensis, Elymus virginicus, Onoclea sensibilis, Osmunda cinnamomea, Parthenocissus quinquefolia, Platanus occidentalis, Polygonum sagittatum, Populus deltoides, Ulmus americana.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION
Range: This association ranges from New England south to Pennsylvania.
States/Provinces: CT, DC, DE:S3S4, MA, NH, NJ, NY, PA, RI, VA?, VT.
Federal Lands: NPS (Delaware Water Gap, Rock Creek, Valley Forge).

CONSERVATION STATUS
Rank: G4? (20-Jun-2006).

Reasons: Total acreage (rangewide) is limited. Good-quality examples are uncommon. Threats include development and filling, alteration in flooding regimes, excessive beaver activity, and encroachment by aggressive non-native plant species. Further data are needed to define the rank.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 – Moderate.
Comments: This type is not tracked as a separate floodplain element in Vermont.
Similar Associations:

- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147)--is characterized by a stronger dominance of both *Acer saccharinum* and *Matteuccia struthiopteris* and has fewer early-successional species.
- *Betula nigra - Platanus occidentalis / Impatiens capensis* Forest (CEGL006184)--southern species present, plus canopy with *Betula nigra*.

Related Concepts: Information not available.

SOURCES

Description Authors: S. L. Neid, mod. S. C. Gawler.
References: Clancy 1996, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Frye and Quinn 1979, Kearsley 1999b, Metzler and Barrett 2001, Newbold 1994, Newbold et al. 1988, Nichols et al. 2001, Overlease 1978, Overlease 1987, Podniesinski and Wagner 2002, Russell and Schuyler 1988, Sperduto 2000a, Sperduto 2000b, Swain and Kearsley 2000, Thompson and Sorenson 2000, Wistendahl 1958.

Figure 40. Sycamore Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.242). May 2004.

COMMON NAME (PARK-SPECIFIC): SYCAMORE - MIXED HARDWOOD FLOODPLAIN FOREST

SYNONYMS
NVC English Name: **Sycamore - Green Ash Forest**
NVC Scientific Name: ***Platanus occidentalis - Fraxinus pennsylvanica* Forest**
NVC Identifier: **CEGL006036**

LOCAL INFORMATION

Environmental Description: This association typically occurs on floodplain mid terraces of major tributaries to the Delaware River, such as Bushkill Creek and Flat Brook. It also occurs on islands, bars, and mid terrace shorelines of the Delaware River. These mid terraces are often slightly elevated above the water's channel and consequently flood less frequently than Sycamore Floodplain Forest. The substrate is typically moderately well-drained sandy loam.
Vegetation Description: The canopy of this floodplain forest contains a mixture of species, including sycamore (*Platanus occidentalis*), sugar maple (*Acer saccharum*), red maple (*Acer rubrum*), silver maple (*Acer saccharinum*), white ash (*Fraxinus americana*), and river birch (*Betula nigra*). Sycamore covers only 25-50% of the canopy and shares dominance with the other species. Black locust (*Robinia pseudoacacia*) and tuliptree (*Liriodendron tulipifera*) may also be scattered in the canopy. The canopy trees typically extend 20-25 m in height, while subcanopy trees range in height from 6-15 m. The subcanopy can be sparse to moderately dense and contains American hornbeam (*Carpinus caroliniana*), sugar maple, bitternut hickory (*Carya cordiformis*), red maple, and silver maple. The sparse tall- and short-shrub layers can include species from the canopy and subcanopy, as well as silky dogwood (*Cornus amomum*), northern spicebush (*Lindera benzoin*), common winterberry (*Ilex verticillata*), and smooth alder (*Alnus serrulata*). Invasive shrubs may be prominent in the tall- and short-shrub layers, including multiflora rose (*Rosa multiflora*), Morrow's honeysuckle (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), and winged burning bush (*Euonymus alata*). The herbaceous layer is typically moderately dense to dense; common species include ostrich fern (*Matteuccia struthiopteris*), mayapple (*Podophyllum peltatum*), cleavers (*Galium aparine*), white snakeroot (*Ageratina altissima* var. *altissima*), skunk-cabbage (*Symplocarpus foetidus*), king of the meadow (*Thalictrum pubescens*), broadleaf enchanter's nightshade (*Circaea lutetiana* ssp. *canadensis*), water knotweed (*Polygonum amphibium*), Canada goldenrod (*Solidago canadensis*), common ladyfern (*Athyrium filix-femina*), Shawnee salad (*Hydrophyllum virginianum*), sensitive fern (*Onoclea sensibilis*), and touch-me-nots (*Impatiens* spp.). The herbaceous layer can be dominated by the invasive species garlic mustard (*Alliaria petiolata*), oriental bittersweet (*Celastrus orbiculatus*), and Japanese stiltgrass (*Microstegium vimineum*). Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*) and grapes (*Vitis* spp.) are also common.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	Platanus occidentalis, Acer saccharum, Acer rubrum, Acer saccharinum, Betula nigra, Fraxinus americana

Tree subcanopy	Broad-leaved deciduous tree	Carpinus caroliniana, Platanus occidentalis
Tall shrub/sapling	Broad-leaved deciduous shrub	Cornus amomum, Lonicera morrowii,
Short shrub/sapling	Broad-leaved deciduous shrub	Lindera benzoin, Lonicera morrowii, Rosa multiflora
Herb (field)	Vine/Liana	Parthenocissus quinquefolia, Toxicodendron radicans
Herb (field)	Forb	Ageratina altissima var. altissima, Alliaria petiolata, Galium aparine, Podophyllum peltatum
Herb (field)	Fern or fern ally	Matteuccia struthiopteris

Characteristic Species: *Platanus occidentalis, Acer rubrum, Acer saccharinum, Acer saccharum, Betula nigra, Carpinus caroliniana, Fraxinus americana, Matteuccia struthiopteris, Polygonum amphibium, Symplocarpus foetidus.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	2	Mixed Hardwood Floodplain Terrace Forest	Walz et al. 2006
PA	S4	1	Sycamore - (river birch) - box-elder floodplain forest	Fike 1999

Local Range: This forest type is found in the floodplain of Bushkill Creek, Flat Brook, other major tributaries, and the Delaware River.

Classification Comments: Sycamore - Mixed Hardwood Floodplain Forest is distinguished from Sycamore Floodplain Forest by the codominance of *Platanus occidentalis* (25-50% cover) with *Acer saccharum, Acer rubrum, Acer saccharinum, Fraxinus americana,* and/or *Betula nigra*. In Sycamore Floodplain Forest, *Platanus occidentalis* is clearly dominant, covering 50-90% of the canopy. Also, Sycamore Floodplain Forest occurs on lower elevation terraces, typically immediately adjacent to the water's channel, with somewhat poorly drained finer textured substrate and a higher flood frequency. Sycamore - Mixed Hardwood Floodplain Forest occurs on slightly higher elevation mid terraces, with moderately well-drained coarser substrates and less frequent flood events.

Other Comments: The crosswalks to the NVCS and the New Jersey state classification system are uncertain. Other possible crosswalks may include NVCS CEGL006914 [*Acer saccharinum* - (*Acer saccharum, Juglans cinerea, Juglans nigra, Ulmus rubra, Ulmus americana, Prunus serotina, Celtis occidentalis*) Forest], CEGL006917 [*Acer rubrum - Platanus occidentalis - Ulmus americana* / *Lindera benzoin* Forest] or CEGL006944 [*Acer saccharinum - Liriodendron tulipifera - Platanus occidentalis* / *Lindera benzoin - Acer negundo* Forest].

Local Description Authors: S. J. Perles (PNHP).

Plots and Data Sources: DEWA.54, DEWA.241, DEWA.251; Fike 1999, Podniesinski and Wagner 2002.

Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Platanus occidentalis - (Fraxinus pennsylvanica, Celtis laevigata, Acer saccharinum) Temporarily Flooded Forest Alliance (A.288)
Alliance (English name)	Sycamore - (Green Ash, Sugarberry, Silver Maple) Temporarily Flooded Forest Alliance
Association	*Platanus occidentalis - Fraxinus pennsylvanica* Forest
Association (English name)	Sycamore - Green Ash Forest
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: This floodplain forest of the northeastern United States, primarily in the northern Piedmont, is a broadly defined successional or young version of medium-gradient river floodplain forest occurring on coarse alluvial substrates. The canopy is closed to somewhat open and usually dominated by *Platanus occidentalis*. *Populus deltoides, Acer saccharinum,* and *Ulmus americana* are usually present but not common; occasional associates include *Acer negundo, Fraxinus pennsylvanica, Juglans cinerea, Carya cordiformis, Celtis occidentalis,* and *Acer rubrum*. Shrubs or subcanopy are variable depending on geography and can include *Betula nigra, Carpinus caroliniana, Salix nigra, Lindera benzoin,* or *Alnus serrulata,* plus exotic invasives such as *Rosa multiflora, Berberis thunbergii,* and *Lonicera morrowii*. The herbaceous layer tends to be sparse to locally abundant and can include *Matteuccia struthiopteris, Osmunda cinnamomea, Onoclea sensibilis, Geum canadense, Impatiens pallida, Boehmeria cylindrica, Urtica dioica, Solidago rugosa, Hydrophyllum virginianum, Carex bromoides, Ageratina altissima (= Eupatorium rugosum),* plus vine species *Toxicodendron radicans* and *Parthenocissus quinquefolia*. There is typically a very high component of disturbance-tolerant exotic species such as *Lysimachia nummularia, Glechoma hederacea, Microstegium vimineum, Hesperis matronalis, Aegopodium podagraria, Polygonum cuspidatum,* and *Alliaria petiolata*.

Environmental Description: Early- to-mid successional forest occurs on cobble or sand substrates of floodplain islands or cobble shores of moderate- to high-energy rivers.

Vegetation Description: The canopy is closed to somewhat open and usually dominated by *Platanus occidentalis*. *Populus deltoides, Acer saccharinum,* and *Ulmus americana* are usually present but not common; occasional associates include *Acer negundo, Fraxinus pennsylvanica, Juglans cinerea, Carya cordiformis, Celtis occidentalis,* and *Acer rubrum*. Shrubs or subcanopy are variable depending on geography and can include *Betula nigra, Carpinus caroliniana, Salix nigra, Lindera benzoin,* or *Alnus serrulata,* plus exotic invasives such as *Rosa multiflora, Berberis thunbergii,* and *Lonicera morrowii*. The herbaceous layer tends to be sparse to locally abundant and can include *Matteuccia struthiopteris, Osmunda cinnamomea, Onoclea sensibilis, Geum canadense, Impatiens pallida, Boehmeria cylindrica, Urtica dioica, Solidago rugosa, Hydrophyllum virginianum, Carex bromoides, Ageratina altissima (= Eupatorium rugosum),* plus vine species *Toxicodendron radicans* and *Parthenocissus quinquefolia*. There is typically a

very high component of disturbance-tolerant exotic species such as *Lysimachia nummularia, Glechoma hederacea, Microstegium vimineum, Hesperis matronalis, Aegopodium podagraria, Polygonum cuspidatum*, and *Alliaria petiolata*.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Platanus occidentalis*
Short shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Forb	*Boehmeria cylindrica*
Herb (field)	Fern or fern ally	*Onoclea sensibilis*, *Osmunda cinnamomea*

Characteristic Species: *Acer saccharinum*, *Circaea lutetiana* ssp. *canadensis*, *Elymus virginicus*, *Onoclea sensibilis*, *Osmunda cinnamomea*, *Parthenocissus quinquefolia*, *Platanus occidentalis*, *Polygonum sagittatum*, *Populus deltoides*, *Ulmus americana*.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association ranges from New England south to Pennsylvania.

States/Provinces: CT, DC, DE:S3S4, MA, NH, NJ, NY, PA, RI, VA?, VT.

Federal Lands: NPS (Delaware Water Gap, Rock Creek, Valley Forge).

CONSERVATION STATUS

Rank: G4? (20-Jun-2006).

Reasons: Total acreage (rangewide) is limited. Good-quality examples are uncommon. Threats include development and filling, alteration in flooding regimes, excessive beaver activity, and encroachment by aggressive non-native plant species. Further data are needed to define the rank.

CLASSIFICATION INFORMATION

Status: Nonstandard.

Confidence: 2 – Moderate.

Comments: This type is not tracked as a separate floodplain element in Vermont.

Similar Associations:

- *Acer saccharinum - (Populus deltoides) / Matteuccia struthiopteris - Laportea canadensis* Forest (CEGL006147)--is characterized by a stronger dominance of both *Acer saccharinum* and *Matteuccia struthiopteris* and has fewer early-successional species.
- *Betula nigra - Platanus occidentalis / Impatiens capensis* Forest (CEGL006184)--southern species present, plus canopy with *Betula nigra*.

Related Concepts: Information not available.

SOURCES

Description Authors: S. L. Neid, mod. S. C. Gawler.

References: Clancy 1996, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Fike 1999, Frye and Quinn 1979, Kearsley 1999b, Metzler and Barrett 2001, NatureServe n.d., Newbold 1994, Newbold et al. 1988, Nichols et al. 2001, Overlease 1978, Overlease 1987, Podniesinski and Wagner 2002, Russell and Schuyler 1988, Sperduto 2000a, Sperduto 2000b, Swain and Kearsley 2000, Thompson and Sorenson 2000, Wistendahl 1958.

Figure 41. Sycamore - Mixed Hardwood Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.54). July 2003.

Figure 42. Sycamore - Mixed Hardwood Floodplain Forest in Delaware Water Gap National Recreation Area (plot DEWA.241). May 2004.

COMMON NAME (PARK-SPECIFIC): BOTTOMLAND OAK PALUSTRINE FOREST

SYNONYMS

NVC English Name:	**Pin Oak - Red Maple / Gray's Sedge - White Avens Forest**
NVC Scientific Name:	***Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Forest**
NVC Identifier:	**CEGL006185**

LOCAL INFORMATION

Environmental Description: This forest type occurs on high terraces above the Delaware River, low terrace floodplains of small creeks, or any broad flat area with diffuse or braided drainage. The substrate is variable, ranging from moderately well-drained Delaware fine sandy loam to poorly drained soils of the Fredon-Halsey complex. These areas can be seasonally, temporarily, or intermittently flooded, often with networks of small drainages and pools throughout. Many of these areas were previously used as pasture.

Vegetation Description: The canopy of this palustrine forest is dominated by pin oak (*Quercus palustris*) and/or swamp white oak (*Quercus bicolor*) that cover 25-50% of the canopy. Numerous canopy associates may be present, including red maple (*Acer rubrum*), American hornbeam (*Carpinus caroliniana*), white ash (*Fraxinus americana*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), and American elm (*Ulmus americana*). Other occasional canopy associates are eastern white pine (*Pinus strobus*), yellow birch (*Betula alleghaniensis*), tuliptree (*Liriodendron tulipifera*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), river birch (*Betula nigra*), silver maple (*Acer saccharinum*), bitternut hickory (*Carya cordiformis*), and blackgum (*Nyssa sylvatica*). Canopy trees are typically 20-35 m in height, while subcanopy trees are 10-20 m in height. The subcanopy (20-50% cover) contains a variety of canopy tree species listed above. The tall-shrub layer is variable (15-60% cover) and can include northern spicebush (*Lindera benzoin*), American hornbeam, common winterberry (*Ilex verticillata*), southern arrowwood (*Viburnum dentatum* var. *lucidum*), common serviceberry (*Amelanchier arborea*), American witch-hazel (*Hamamelis virginiana*), highbush blueberry (*Vaccinium corymbosum*), and blackhaw (*Viburnum prunifolium*). The short-shrub layer (25-50% cover) contains northern spicebush, black raspberry (*Rubus occidentalis*), northern dewberry (*Rubus flagellaris*), Allegheny blackberry (*Rubus allegheniensis*), lowbush blueberry (*Vaccinium angustifolium*), and species from the canopy, subcanopy and tall-shrub layers. The variable herbaceous layer is typically dense and can contain a diverse flora. Common species are Canada mayflower (*Maianthemum canadense*), wrinkleleaf goldenrod (*Solidago rugosa*), sensitive fern (*Onoclea sensibilis*), common cinquefoil (*Potentilla simplex*), rosy sedge (*Carex rosea*), touch-me-not (*Impatiens* spp.), ostrich fern (*Matteuccia struthiopteris*), marsh blue violet (*Viola cucullata*), Jack in the pulpit (*Arisaema triphyllum*), greater bladder sedge (*Carex intumescens*), drooping sedge (*Carex prasina*), eastern hayscented fern (*Dennstaedtia punctilobula*), Indian strawberry (*Duchesnea indica*), bog willowherb (*Epilobium leptophyllum*), rough bedstraw (*Galium asprellum*), whitegrass (*Leersia virginica*), partridgeberry (*Mitchella repens*), cinnamon fern (*Osmunda cinnamomea*), dwarf ginseng (*Panax trifolius*), spotted ladysthumb (*Polygonum persicaria*), and skunk-cabbage (*Symplocarpus foetidus*). Numerous other species may be present. This forest is susceptible to invasion by the exotic species Japanese stiltgrass (*Microstegium vimineum*) and Japanese barberry (*Berberis thunbergii*). Vines such as Virginia creeper (*Parthenocissus quinquefolia*) and eastern poison ivy (*Toxicodendron radicans*)

can be abundant, while roundleaf greenbrier (*Smilax rotundifolia*) is typically sparsely distributed.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	Quercus palustris, Quercus bicolor, Acer rubrum
Tree subcanopy	Broad-leaved deciduous tree	Carpinus caroliniana, Quercus palustris
Tall shrub/sapling	Broad-leaved deciduous shrub	Lindera benzoin
Short shrub/sapling	Broad-leaved deciduous shrub	Berberis thunbergii, Lindera benzoin
Herb (field)	Vine/Liana	Parthenocissus quinquefolia
Herb (field)	Forb and Graminoid	highly variable

Characteristic Species: *Quercus bicolor, Quercus palustris, Acer rubrum, Carpinus caroliniana, Arisaema triphyllum, Carex rosea, Onoclea sensibilis, Potentilla simplex, Solidago rugosa, Viola cucullata.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	Pin Oak Small River Floodplain Forest	Walz et al. 2006
PA	S3	2	Bottomland oak - hardwood palustrine forest	Fike 1999

Local Range: This forest occurs in a variety of palustrine settings throughout the park.

Classification Comments: Bottomland Oak Palustrine Forest can be distinguished from other palustrine forests by the dominance of *Quercus palustris* and/or *Quercus bicolor* that cover >25% of the canopy.

Other Comments: None.

Local Description Authors: S. J. Perles (PNHP).

Plots and Data Sources: DEWA.185, DEWA.238; and Fike 1999.

Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Forest (I)
Physiognomic Subclass	Deciduous forest (I.B.)
Physiognomic Group	Cold-deciduous forest (I.B.2.)
Physiognomic Subgroup	Natural/Semi-natural cold-deciduous forest (I.B.2.N.)
Formation	Temporarily flooded cold-deciduous forest (I.B.2.N.d.)
Alliance	Quercus palustris - Acer rubrum Temporarily Flooded Forest Alliance (A.301)
Alliance (English name)	Pin Oak - Red Maple Temporarily Flooded Forest Alliance
Association	*Quercus palustris - Acer rubrum / Carex grayi - Geum canadense* Forest
Association (English name)	Pin Oak - Red Maple / Gray's Sedge - White Avens Forest
Ecological System(s):	Central Appalachian Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This freely drained floodplain forest occurs along smaller rivers in southern New England and the northern Piedmont. The setting can range from high terraces to any broad flat area with diffuse or braided drainage. The canopy is comprised of *Quercus palustris, Fraxinus pennsylvanica, Acer rubrum, Ulmus americana*, and occasionally *Quercus bicolor, Fraxinus americana, Fraxinus nigra, Carya cordiformis, Nyssa sylvatica*, and/or *Platanus occidentalis*. More typically upland trees sometimes found on these terraces include *Quercus alba, Liriodendron tulipifera, Betula alleghaniensis, Pinus strobus*, and *Acer saccharum*. *Carpinus caroliniana* may be present as a small tree. The shrub layer includes *Lindera benzoin, Viburnum dentatum* var. *lucidum, Cornus amomum, Cornus obliqua*, or *Sambucus nigra* spp. *canadensis*. The herbaceous layer is variable in composition and usually dense. It can have abundant sedges, including *Carex lurida, Carex crinita, Carex intumescens, Carex rosea, Carex prasina, Carex lupulina*, or *Carex grayi*, with additional species such as *Cinna arundinacea, Leersia virginica, Panax trifolius, Symplocarpus foetidus, Geum canadense, Polygonum virginianum (= Tovara virginiana), Impatiens* spp., *Onoclea sensibilis, Athyrium filix-femina, Arisaema triphyllum, Iris versicolor, Viola sororia*, and *Toxicodendron radicans*. *Berberis thunbergii* and *Microstegium vimineum* are common invasive species in these forests.

Environmental Description: This forest occurs on alluvial deposits in the floodplain of small rivers. Flooding occurs during local events, especially during winter months. These areas can be seasonally, temporarily or intermittently flooded, often with networks of small drainages and pools throughout. Many of these areas were previously used as pasture.

Vegetation Description: The canopy is comprised of *Quercus palustris, Fraxinus pennsylvanica, Acer rubrum, Ulmus americana*, and occasionally *Quercus bicolor, Fraxinus americana, Fraxinus nigra, Carya cordiformis, Nyssa sylvatica*, and/or *Platanus occidentalis*. More typically upland trees sometimes found on these terraces include *Quercus alba, Liriodendron tulipifera, Betula alleghaniensis, Pinus strobus*, and *Acer saccharum*. *Carpinus caroliniana* may be present as a small tree. The shrub layer includes *Lindera benzoin, Viburnum dentatum* var. *lucidum, Cornus amomum, Cornus obliqua*, or *Sambucus nigra* spp. *canadensis*. The herbaceous layer is variable in composition and usually dense. It can have abundant sedges, including *Carex lurida, Carex crinita, Carex intumescens, Carex rosea, Carex prasina, Carex lupulina*, or *Carex grayi*, with additional species such as *Cinna arundinacea, Leersia virginica, Panax trifolius, Symplocarpus foetidus, Geum canadense, Polygonum virginianum (= Tovara virginiana), Impatiens* spp., *Onoclea sensibilis, Athyrium filix-femina, Arisaema triphyllum, Iris versicolor, Viola sororia*, and *Toxicodendron radicans*. *Berberis thunbergii* and *Microstegium vimineum* are common invasive species in these forests.

Most Abundant Species:

Stratum	Lifeform	Species
Tree (canopy & subcanopy)	Broad-leaved deciduous tree	*Acer rubrum, Fraxinus pennsylvanica, Quercus palustris, Ulmus americana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Lindera benzoin*
Herb (field)	Graminoid	*Carex crinita, Carex intumescens, Carex lurida, Cinna arundinacea*
Herb (field)	Fern or fern ally	*Onoclea sensibilis*

Characteristic Species: *Carex grayi*, *Fraxinus pennsylvanica*, *Geum canadense*, *Lindera benzoin*, *Quercus bicolor*, *Quercus palustris.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is currently known from southern New England to New Jersey and Pennsylvania.
States/Provinces: CT, MA, NJ, NY, PA, RI.
Federal Lands: NPS (Delaware Water Gap, Eisenhower, Gettysburg); USFWS (Great Swamp).

CONSERVATION STATUS

Rank: GNR (1-Dec-1997).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 – Moderate.
Comments: This type is currently described from Connecticut. Silvics manual (Burns and Honkala 1990b) notes *Quercus palustris* as reaching into the eastern United States through Pennsylvania and northern New Jersey extending northward in the Hudson and Connecticut river valleys. It also occurs along the coast in Rhode Island.
Similar Associations:

- *Quercus palustris - (Quercus bicolor) - Acer rubrum / Osmunda cinnamomea* Forest (CEGL006240)--basin swamp with *Quercus palustris* and *Acer rubrum*.

Related Concepts:

- Southern New England floodplain forest (Rawinski 1984) ?

SOURCES

Description Authors: S. L. Neid, mod. L. A. Sneddon and S. C. Gawler.
References: Barrett and Enser 1997, Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Enser 1999, Metzler and Barrett 2001, Rawinski 1984, Swain and Kearsley 2001.

Figure 43. Bottomland Oak Palustrine Forest in Delaware Water Gap National Recreation Area (plot DEWA.185). May 2004.

Figure 44. Bottomland Oak Palustrine Forest in Delaware Water Gap National Recreation Area (plot DEWA.238). September 2004.