COMMON NAME (PARK-SPECIFIC): BIG BLUESTEM - INDIANGRASS RIVERINE GRASSLAND

SYNONYMS

NVC English Name: **Sand Cherry / Big Bluestem - Yellow Indiangrass Herbaceous Vegetation**

NVC Scientific Name: ***Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Herbaceous Vegetation**

NVC Identifier: **CEGL006518**

LOCAL INFORMATION

Environmental Description: This community type occurs on sand/gravel deposits along shorelines and on islands in the Delaware River. These sites are subject to flooding and ice-scour which removes woody vegetation and maintains a graminoid- and herbaceous-dominated vegetation.

Vegetation Description: The typical aspect is that of a tall prairie-like grassland. The dominant species are big bluestem (*Andropogon gerardii*), Indiangrass (*Sorghastrum nutans*), switchgrass (*Panicum virgatum*), and little bluestem (*Schizachyrium scoparium*). Other herbaceous species include Indian-hemp (*Apocynum cannabinum*), hairy lespedeza (*Lespedeza hirta*), reed canarygrass (*Phalaris arundinacea*), wrinkleleaf goldenrod (*Solidago rugosa*), field pennycress (*Thlaspi arvense*), prairie fleabane (*Erigeron strigosus*), and common yarrow (*Achillea millefolium*). The invasive species spotted knapweed (*Centaurea biebersteinii*) can also be present. Woody species may become established within the grassland matrix. Common species include willows (*Salix* spp.), sycamore (*Platanus occidentalis*), ashes (*Fraxinus* spp.), boxelder (*Acer negundo*), and river birch (*Betula nigra*). Vines may also be present, including Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), fox grape (*Vitis labrusca*), and riverbank grape (*Vitis riparia*).

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Apocynum cannabinum, Lespedeza hirta*
Herb (field)	Graminoid	*Andropogon gerardii, Panicum virgatum, Schizachyrium scoparium, Sorghastrum nutans*

Characteristic Species: *Andropogon gerardii, Sorghastrum nutans, Panicum virgatum, Schizachyrium scoparium, Prunus pumila* var. *depressa.*

Other Noteworthy Species: *Prunus pumila* var. *depressa.*

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S2?	2	Riverside Prairie Grassland	Walz et al. 2006
PA	S3	1	Big bluestem - Indian grass river grassland	Fike 1999

Local Range: This vegetation is found occasionally along the Delaware River.

Classification Comments: This type can be distinguished from other riparian types by the dominance of *Andropogon gerardii, Sorghastrum nutans, Panicum virgatum*, and *Schizachyrium scoparium* that form a tall prairie-like grassland.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.107; Fike 1999.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	Andropogon gerardii - (Sorghastrum nutans) Temporarily Flooded Herbaceous Alliance (A.1337)
Alliance (English name)	Big Bluestem - (Yellow Indiangrass) Temporarily Flooded Herbaceous Alliance
Association	*Prunus pumila / Andropogon gerardii - Sorghastrum nutans* Herbaceous Vegetation
Association (English name)	Sand Cherry / Big Bluestem - Yellow Indiangrass Herbaceous Vegetation
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas. Herbaceous plants dominate, and may form a dense cover; scattered shrubs may grow among them, but are generally kept short by the annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Asclepias tuberosa*, and *Lespedeza capitata*. *Spiraea alba, Rosa virginiana*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*. This association differs from more northerly riverside ice meadows in being dominated by prairie grasses (*Andropogon gerardii, Sorghastrum nutans*) rather than by *Calamagrostis canadensis*.
Environmental Description: These are tall alluvial grasslands in the temperate region of the northeastern United States. They are found on sandy point bars and linear deposits along semi-stable rivershores subject to periodic flooding. Ice build-up during the winter can scour the

rivershore in spring, limiting woody growth. The substrate is cobble, gravel or coarse sediment with interstices of alluvial sand and silt. Bare cobble is exposed in some areas.
Vegetation Description: Herbaceous plants dominate and may form a dense cover; scattered shrubs may grow among them but are generally kept short by annual flooding. Bryophytes are absent or at most sparse. The dominant plants are tall grasses such as *Sorghastrum nutans, Andropogon gerardii, Schizachyrium scoparium*, and *Panicum virgatum*. Characteristic herbs include *Helianthemum canadense, Helianthus divaricatus, Apocynum cannabinum, Asclepias tuberosa, Lespedeza hirta*, and *Lespedeza capitata*. *Spiraea alba, Rosa virginiana*, and *Prunus pumila* are common shrubs. Other herbaceous associates include *Anemone virginiana, Calamagrostis canadensis, Eupatorium maculatum, Solidago rugosa, Achillea millefolium, Lycopus uniflorus, Phalaris arundinacea, Scleria triglomerata*, and *Symphyotrichum novi-belgii*.
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Apocynum cannabinum, Lespedeza hirta*
Herb (field)	Graminoid	*Andropogon gerardii, Panicum virgatum, Schizachyrium scoparium, Sorghastrum nutans*

Characteristic Species: *Andropogon gerardii*, *Panicum virgatum*, *Prunus pumila* var. *depressa*, *Sorghastrum nutans.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION
Range: Information not available.
States/Provinces: CT, MA, NH, NJ, NY, PA, VT.
Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS
Rank: GNR (6-Jul-1999).
Reasons: Information not available.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 3 - Weak.
Comments: Information not available.
Similar Associations: Information not available.
Related Concepts:
- Willow - Indian grass riverine shrubland (Perles et al. 2004) B

SOURCES
Description Authors: S. C. Gawler.
References: Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Nichols et al. 2001, Perles et al. 2004, Thompson and Sorenson 2000.

Figure 92. Big Bluestem - Indiangrass Riverine Grassland in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.580). June 2006.

Figure 93. Big Bluestem - Indiangrass Riverine Grassland in Delaware Water Gap National Recreation Area (plot DEWA.107). August 2003.

COMMON NAME (PARK-SPECIFIC): HAIRYFRUIT SEDGE WETLAND

SYNONYMS

NVC English Name:	**Hairy-fruit Sedge - Bulrush species - Giant Goldenrod Herbaceous Vegetation**
NVC Scientific Name:	***Carex trichocarpa* - *Scirpus* spp. - *Solidago gigantea* Herbaceous Vegetation [Provisional]**
NVC Identifier:	**CEGL006447**

LOCAL INFORMATION

Environmental Description: This association is found occasionally in small patches on mainstem islands in the Delaware River, as well as on the floodplains of major tributaries where tree canopy is lacking, especially portions of Flat Brook. Typical soils include the coarse loamy to sandy Fredon-Halsey complex, which are somewhat poorly to very poorly drained glacio-fluvial deposits (characteristic along Flat Brook). This community is routinely flooded during most high-water events and commonly occurs on low flats associated with the active floodplain, either directly adjacent to the channel or in association with backwater depressions and sloughs.
Vegetation Description: Hairyfruit sedge (*Carex trichocarpa*) is the dominant species in this association. Shrubs may be present but at less than 25% cover, including multiflora rose (*Rosa multiflora*), silky dogwood (*Cornus amomum*), and Allegheny blackberry (*Rubus allegheniensis*). Other common herbaceous species include giant goldenrod (*Solidago gigantea*), smallspike false nettle (*Boehmeria cylindrica*), deertongue (*Dichanthelium clandestinum*), reed canarygrass (*Phalaris arundinacea*), stinging nettle (*Urtica dioica*), knotweeds (*Polygonum* spp.), and woolgrass (*Scirpus cyperinus*). Vines may be present at low cover including black bindweed (*Polygonum convolvulus*) and devil's darning needles (*Clematis virginiana*).
Most Abundant Species:

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Cornus amomum, Rosa multiflora*
Herb (field)	Forb	*Boehmeria cylindrica, Solidago gigantea*
Herb (field)	Graminoid	*Carex trichocarpa, Dichanthelium clandestinum*

Characteristic Species: *Carex trichocarpa, Boehmeria cylindrica, Solidago gigantea, Cornus amomum.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	2	Riverside Hairy-fruit Sedge Flat	Walz et al. 2006
PA	S3	1	no crosswalk	Fike 1999

Local Range: This vegetation type is occasional throughout the park on the floodplain of the Delaware River and major tributaries.
Classification Comments: This type is distinguished by the clear dominance of *Carex trichocarpa* and low shrub cover (<25%).
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).

Plots and Data Sources: DEWA.50; Accuracy Assessment Observation Points DEWA.178, DEWA.591, DEWA.551.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Temporarily flooded temperate or subpolar grassland (V.A.5.N.j.)
Alliance	Carex torta Temporarily Flooded Herbaceous Alliance (A.1340)
Alliance (English name)	Twisted Sedge Temporarily Flooded Herbaceous Alliance
Association	*Carex trichocarpa* - *Scirpus* spp. - *Solidago gigantea* Herbaceous Vegetation [Provisional]
Association (English name)	Hairy-fruit Sedge - Bulrush species - Giant Goldenrod Herbaceous Vegetation
Ecological System(s):	Central Appalachian Floodplain (CES202.608)

GLOBAL DESCRIPTION

Concept Summary: This linear association occurs in small patches on floodplain edges and islands where tree canopy is lacking, on mid-Atlantic medium- to large-sized rivers. This community is routinely flooded during most high-water events and commonly occurs on low flats associated with the active floodplain, either directly adjacent to the channel or in association with backwater depressions and sloughs. *Carex trichocarpa* is the dominant species in this association. It typically forms a band 5-10 m wide and about 50 m long. Shrubs may be present but at less than 25% cover, including *Rosa multiflora, Cornus amomum*, and *Rubus allegheniensis*. Other common herbaceous species include *Solidago gigantea, Boehmeria cylindrica, Dichanthelium clandestinum, Phalaris arundinacea, Urtica dioica, Polygonum* spp., and *Scirpus cyperinus*. Vines may be present at low cover, including *Polygonum convolvulus* and *Clematis virginiana*.
Environmental Description: This association is found occasionally in small patches on floodplain edges and islands where tree canopy is lacking. Typical soils include the coarse loamy to sandy somewhat poorly to very poorly drained glacio-fluvial deposits. This community is routinely flooded during most high-water events and commonly occurs on low flats associated with the active floodplain, either directly adjacent to the channel or in association with backwater depressions and sloughs.
Vegetation Description: *Carex trichocarpa* is the dominant species in this association. Shrubs may be present but at less than 25% cover, including *Rosa multiflora, Cornus amomum*, and *Rubus allegheniensis*. Other common herbaceous species include *Solidago gigantea, Boehmeria cylindrica, Dichanthelium clandestinum, Phalaris arundinacea, Urtica dioica, Polygonum* spp., and *Scirpus cyperinus*. Vines may be present at low cover, including *Polygonum convolvulus* and *Clematis virginiana*.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex trichocarpa*

Characteristic Species: *Boehmeria cylindrica, Carex trichocarpa, Cornus amomum, Dichanthelium clandestinum, Solidago gigantea.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community occurs in northern New Jersey and northeastern Pennsylvania and possibly elsewhere.
States/Provinces: NJ, PA.
Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS

Rank: GNR (7-Feb-2006).
Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Provisional.
Confidence: 2 – Moderate.
Comments: Described from Delaware Water Gap, where distinct although narrow and linear; occurrence elsewhere in the northeastern U.S. needs to be documented.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES

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

Figure 94. Hairyfruit Sedge Wetland in Delaware Water Gap National Recreation Area (plot DEWA.50). July 2003.

Figure 95. Hairyfruit Sedge Wetland in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.549). June 2006.

COMMON NAME (PARK-SPECIFIC): TUSSOCK SEDGE MARSH

SYNONYMS
NVC English Name: **Tussock Sedge - Inflated Sedge Herbaceous Vegetation**
NVC Scientific Name: ***Carex stricta* - *Carex vesicaria* Herbaceous Vegetation**
NVC Identifier: **CEGL006412**

LOCAL INFORMATION

Environmental Description: These wetlands are associated with impounded drainages, ponded areas near streams, or saturated areas surrounding drainages. Tussock sedge marshes often form in areas previously influenced by beaver impoundments. The substrate may be peat, muck, Alden mucky silt loam or soils in the Fredon-Halsey complex. There is generally standing water between the tussocks for much of the year.
Vegetation Description: Tussock sedge (*Carex stricta*) dominates these wetlands, covering 30-75% of the area. Associated species are woolgrass (*Scirpus cyperinus*), swamp smartweed (*Polygonum hydropiperoides*), branched bur-reed (*Sparganium androcladum*), rice cutgrass (*Leersia oryzoides*), a variety of sedges (*Carex hystericina, Carex bebbii, Carex scoparia, Carex lurida, Carex stipata*), northern bugleweed (*Lycopus uniflorus*), arrowleaf tearthumb (*Polygonum sagittatum*), stiff marsh bedstraw (*Galium tinctorium*), eastern marsh fern (*Thelypteris palustris*), and rushes (*Juncus* spp.). The invasive species Japanese stiltgrass (*Microstegium vimineum*) and purple loosestrife (*Lythrum salicaria*) can be abundant in these wetlands. Scattered tall or short shrubs may cover up to 10% of the area; common species include white meadowsweet (*Spiraea alba*), silky dogwood (*Cornus amomum*), and gray alder (*Alnus incana*). Scattered dead or dying red maple (*Acer rubrum*) or pin oak (*Quercus palustris*) trees may also be present.
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Carex stricta*

Characteristic Species: *Carex stricta, Carex* spp., *Leersia oryzoides, Polygonum hydropiperoides, Polygonum sagittatum.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	Eastern Tussock Sedge Meadow	Walz et al. 2006
PA	S4	1	Tussock sedge marsh	Fike 1999

Local Range: This wetland is found throughout the park associated with impounded and saturated drainages and streams.
Classification Comments: Tussock Sedge Marsh is distinguished from other palustrine types by the dominance of *Carex stricta* and often evidence of impounded hydrology.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.165, DEWA.239; Fike 1999.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	Carex stricta Seasonally Flooded Herbaceous Alliance (A.1397)
Alliance (English name)	Tussock Sedge Seasonally Flooded Herbaceous Alliance
Association	*Carex stricta* - *Carex vesicaria* Herbaceous Vegetation
Association (English name)	Tussock Sedge - Inflated Sedge Herbaceous Vegetation
Ecological System(s):	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

GLOBAL DESCRIPTION

Concept Summary: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended. The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta*, in its tussock form, is the usual dominant. *Carex vesicaria, Carex utriculata*, and *Calamagrostis canadensis* may also be locally abundant. Associated graminoids include *Carex canescens, Carex comosa, Carex scoparia, Carex stipata, Carex vulpinoidea, Glyceria canadensis, Dulichium arundinaceum, Leersia oryzoides*, and *Scirpus cyperinus*; forbs and ferns include *Asclepias incarnata, Thelypteris palustris, Eupatorium maculatum, Campanula aparinoides, Osmunda regalis, Comarum palustre (= Potentilla palustris), Lysimachia terrestris, Angelica atropurpurea, Eupatorium perfoliatum, Lycopus americanus, Polygonum hydropiperoides, Galium obtusum*, and others. *Lythrum salicaria* may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana, Myrica gale, Ilex verticillata, Chamaedaphne calyculata*, and *Spiraea alba* are often present. Bryophytes, where present, include *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum palustre, Drepanocladus aduncus*, and others. This association is differentiated from other wet meadows by the strong dominance of *Carex stricta*.

Environmental Description: These tussock sedge meadows are distributed across the northeastern United States. They occur in seasonally flooded basins or on stream or lake margins. The substrate is peat or muck of variable depth overlying mineral soil. Standing water may be present only at the beginning of, or through much of, the growing season depending on the site and the year's precipitation; even when the water drops, the soils remain saturated. Microtopography is characterized by large tussocks, particularly when the hydroperiod is extended.

Vegetation Description: The physiognomy is strongly herbaceous, or in some cases herbs mixed with shrubs (up to 25% shrub cover); trees are absent. Bryophyte cover is usually sparse but may occasionally reach over 50%. *Carex stricta*, in its tussock form, is the usual dominant. *Carex vesicaria, Carex utriculata*, and *Calamagrostis canadensis* may also be locally abundant.

Associated graminoids include *Carex canescens, Carex comosa, Carex scoparia, Carex stipata, Carex lurida, Carex vulpinoidea, Glyceria canadensis, Dulichium arundinaceum, Leersia oryzoides*, and *Scirpus cyperinus*; forbs and ferns include *Asclepias incarnata, Thelypteris palustris, Eupatorium maculatum, Campanula aparinoides, Osmunda regalis, Comarum palustre (= Potentilla palustris), Lysimachia terrestris, Angelica atropurpurea, Eupatorium perfoliatum, Lycopus americanus, Polygonum hydropiperoides, Polygonum sagittatum, Galium obtusum*, and others. *Lythrum salicaria* may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana, Myrica gale, Ilex verticillata, Chamaedaphne calyculata*, and *Spiraea alba* are often present. Bryophytes, where present, include *Sphagnum magellanicum, Sphagnum girgensohnii, Sphagnum palustre, Drepanocladus aduncus*, and others.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Calamagrostis canadensis, Carex stricta, Carex utriculata, Carex vesicaria*

Characteristic Species: *Carex stricta, Leersia oryzoides.*
Other Noteworthy Species: *Scirpus ancistrochaetus.*
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This tussock sedge meadow is found in northern New England, the Adirondack Mountains, and parts of the Appalachians.
States/Provinces: CT, DE, MA, MD, ME:S3, NH, NJ, NY:S4, PA, RI, VT:S4, WV.
Federal Lands: NPS (Acadia, Delaware Water Gap, Fort Necessity, Minute Man); USFWS (Aroostook?, Assabet River?, Carlton Pond?, Great Meadows?, Great Swamp, Moosehorn?, Oxbow, Parker River?).

CONSERVATION STATUS

Rank: G4G5 (12-Dec-2005).
Reasons: This association is widely distributed throughout New England and northern New York in its small-patch setting and extends sporadically southward.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 – Moderate.
Comments: Information not available.
Similar Associations:

- *Calamagrostis canadensis* - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation (CEGL006519).
- *Carex stricta* - *Carex* spp. Herbaceous Vegetation (CEGL002258).

Related Concepts:

- *Carex stricta* wet meadow (CAP pers. comm. 1998) ?
- Coastal Plain Intermittent Pond (Breden 1989) B
- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979) ?
- Sedge Meadow (Thompson 1996) ?
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984) ?
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984) ?

- Tussock sedge meadow (NAP pers. comm. 1998) ?

SOURCES

Description Authors: S. C. Gawler.

References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Curtis 1959, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto 2000b, Swain and Kearsley 2001, Thompson 1996, Thompson and Jenkins 1992, Thompson and Sorenson 2000.

Figure 96. Tussock Sedge Marsh in Delaware Water Gap National Recreation Area (plot DEWA.165). August 2003.

Figure 97. Tussock Sedge Marsh in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation point DEWA.541). April 2006.

COMMON NAME (PARK-SPECIFIC): CALCAREOUS RIVERSIDE SEEP

SYNONYMS
NVC English Name: **Tufted Hairgrass - Little Green Sedge Herbaceous Vegetation**
NVC Scientific Name: ***Deschampsia caespitosa - Carex viridula* Herbaceous Vegetation**
NVC Identifier: **CEGL006969**

LOCAL INFORMATION

Environmental Description: This vegetation type occurs along the shoreline of the Delaware River where winter ice-scouring, limestone bedrock, and natural seepage co-occur. This association occurs on alluvial deposits combined with cobble substrate in which weathered bedrock has been broken into distinct rocks of various sizes. The seeps are generated in areas where groundwater flows out and over the cobble substrate, supporting many calciphiles and rare species. Winter ice-scour that removes tall vegetation and woody plants maintains predominantly herbaceous vegetation. The early-successional floristic assemblages include species able to regenerate from buried rootstocks or from seeds dispersed along the shoreline. Seasonal and annual variation in water levels is another important process affecting the vegetation. Calcareous Riverside Seep is often found interspersed with Calcareous Riverside Outcrop along the shoreline of the Delaware River.

Vegetation Description: Vegetation can be dense, robust, and diverse. These sites are dominated by grasses, including tufted hairgrass (*Deschampsia caespitosa*), slender wedgescale (*Sphenopholis intermedia*), and big bluestem (*Andropogon gerardii*). Numerous sedges may be present, such as little green sedge (*Carex viridula*), blister sedge (*Carex vesicaria*), bottlebrush sedge (*Carex hystericina*), woolly sedge (*Carex pellita*), limestone meadow sedge (*Carex granularis*), owlfruit sedge (*Carex stipata*), broom sedge (*Carex scoparia*) and fox sedge (*Carex vulpinoidea*). Characteristic rare species include little green sedge, rough bentgrass (*Agrostis scabra*), flatstem spikerush (*Eleocharis compressa*), muskflower (*Mimulus moschatus*), panicled bulrush (*Scirpus microcarpus*), crookedstem aster (*Symphyotrichum prenanthoides*), smallhead rush (*Juncus brachycephalus*), and shining ladies'-tresses (*Spiranthes lucida*). A wide variety of associated species may be present, including annual agricultural weeds, old-field species, and plants common in Riverine Scour Vegetation. Some of the numerous common associates include spreading dogbane (*Apocynum androsaemifolium*), garden yellowrocket (*Barbarea vulgaris*), horsetails (*Equisetum* spp.), American water horehound (*Lycopus americanus*), ragged robin (*Lychnis flos-cuculi*), true forget-me-not (*Myosotis scorpioides*), sensitive fern (*Onoclea sensibilis*), fen grass of Parnassus (*Parnassia glauca*), common plantain (*Plantago major*), creeping buttercup (*Ranunculus repens*), watercress (*Rorippa nasturtium-aquaticum*), and common threesquare (*Schoenoplectus pungens*). Scattered shrubs may be present, such as smooth rose (*Rosa blanda*), sycamore (*Platanus occidentalis*), common ninebark (*Physocarpus opulifolius*), river birch (*Betula nigra*), silver maple (*Acer saccharinum*), red maple (*Acer rubrum*), willows (*Salix* spp.), and alders (*Alnus* spp.). These sites are susceptible to invasion by purple loosestrife (*Lythrum salicaria*) and Japanese stiltgrass (*Microstegium vimineum*).

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii, Carex viridula, Deschampsia caespitosa, Sphenopholis intermedia, Carex spp.*

Characteristic Species: *Deschampsia caespitosa, Carex viridula.*
Other Noteworthy Species: *Agrostis scabra, Carex viridula, Eleocharis compressa, Juncus brachycephalus, Mimulus moschatus, Scirpus microcarpus, Spiranthes lucida, Symphyotrichum prenanthoides.*
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S1	1	Calcareous Riverside Seep	Walz et al. 2006

Local Range: There are three locations of this type of river shoreline along the New Jersey side of the Delaware River within the park.
Classification Comments: Calcareous Riverside Seep occurs interspersed with Calcareous Riverside Outcrop, however, it is restricted to areas of groundwater seepage and contains plants that are dependent on the groundwater seepage. By contrast, the Calcareous Riverside Outcrop does not contain groundwater seepage and its plants are generally xerophilic. The Calcareous Riverside Seep is distinguished from Riverine Scour Vegetation by the groundwater flowing out and over cobbled limestone substrate and the presence of numerous rare species (may be ephemeral).
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: Accuracy Assessment Observation Point DEWA.616; Shank and Shreiner 1999, Breden 1989.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	Deschampsia caespitosa Seasonally Flooded Herbaceous Alliance (A.1408)
Alliance (English name)	Tufted Hairgrass Seasonally Flooded Herbaceous Alliance
Association	*Deschampsia caespitosa* - *Carex viridula* Herbaceous Vegetation
Association (English name)	Tufted Hairgrass - Little Green Sedge Herbaceous Vegetation
Ecological System(s):	Central Appalachian Riparian (CES202.609)

GLOBAL DESCRIPTION

Concept Summary: This calcareous riverside seep community occurs along sections of river shoreline where winter ice-scouring, limestone outcrops, and natural seepage co-occur. The community is typically characterized by open, sparsely vegetated sections of smooth limestone

outcrops that extend for variable lengths from the woodland edge to the river edge or areas of fractured ("latticed") limestone supporting denser vegetation in the crevices. Typically, sites have a north-northwest exposure and are fully exposed to late-day sun. The slope of the outcrops ranges from a gentle incline rising from the river shoreline to a 28-degree incline at the most steeply sloped sites. Species composition is variable and diverse, but the most frequent species are *Symphyotrichum lanceolatum (= Aster lanceolatus), Deschampsia caespitosa, Carex viridula, Lythrum salicaria*, and *Phalaris arundinacea*. Other characteristic species include *Apios americana, Apocynum cannabinum (= Apocynum sibiricum), Artemisia vulgaris, Barbarea vulgaris, Doellingeria umbellata, Eleocharis* spp., *Eupatorium perfoliatum, Galium boreale, Hypericum mutilum, Juncus canadensis, Juncus dudleyi, Lobelia siphilitica, Lychnis flos-cuculi, Lycopus americanus, Lysimachia ciliata, Myosotis scorpioides, Parnassia glauca, Plantago major, Poa* spp., *Prunella vulgaris, Ranunculus repens, Rubus odoratus, Scirpus microcarpus, Spiranthes lucida, Viola* spp., and *Zizia aurea*. Several species of *Carex* are often present, including *Carex granularis, Carex hystericina, Carex pellita (= Carex lanuginosa), Carex scoparia, Carex stipata, Carex vesicaria, Carex viridula*, and *Carex vulpinoidea*. Sparse shrubs may be present, mostly at the upslope end near the forest transition; they include *Alnus incana, Platanus occidentalis, Salix* spp., *Ulmus rubra, Cornus amomum, Rosa palustris*, and *Spiraea alba*.

Environmental Description: This calcareous riverside seep community occurs along sections of river shoreline where winter ice-scouring, limestone outcrops, and natural seepage co-occur. The substrate is alluvial deposits combined with cobbled substrate in which weathered bedrock has been broken into distinct rocks of various sizes. The seeps are generated in areas where groundwater flows out and over the cobbled substrate, supporting many calciphiles and rare species. Winter ice-scour that removes tall vegetation and woody plants maintains predominantly herbaceous vegetation. The early-successional floristic assemblages include species able to regenerate from buried rootstocks or from seeds dispersed along the shoreline. Seasonal and annual variation in water levels is another important process affecting the vegetation. Typically, sites have a north-northwest exposure and are fully exposed to late-day sun. The slope of the outcrops ranges from a gentle incline rising from the river shoreline to a 28-degree incline at the most steeply sloped sites.

Vegetation Description: Species composition is variable and diverse, but the most frequent species are *Deschampsia caespitosa, Andropogon gerardii, Sphenopholis intermedia, Symphyotrichum lanceolatum (= Aster lanceolatus), Carex viridula*, and *Phalaris arundinacea*. Other characteristic species include *Agrostis scabra, Apios americana, Apocynum cannabinum (= Apocynum sibiricum), Artemisia vulgaris, Barbarea vulgaris, Doellingeria umbellata, Eleocharis compressa, Eupatorium perfoliatum, Galium boreale, Hypericum mutilum, Juncus canadensis, Juncus brachycephalus, Juncus dudleyi, Lobelia siphilitica, Lychnis flos-cuculi, Lycopus americanus, Lysimachia ciliata, Myosotis scorpioides, Parnassia glauca, Plantago major, Poa* spp., *Prunella vulgaris, Ranunculus repens, Salix interior, Scirpus microcarpus, Spiranthes lucida, Symphyotrichum prenanthoides, Viola* spp., and *Zizia aurea*. Several species of *Carex* are often present, including *Carex granularis, Carex hystericina, Carex pellita (= Carex lanuginosa), Carex scoparia, Carex stipata, Carex vesicaria, Carex viridula*, and *Carex vulpinoidea*. Scattered shrubs may be present, such as *Rosa blanda, Platanus occidentalis, Ulmus rubra, Physocarpus opulifolius, Betula nigra, Acer saccharinum, Acer rubrum, Spiraea alba, Salix* spp., and *Alnus* spp. These sites are susceptible to invasion by *Lythrum salicaria* and *Microstegium vimineum*.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Andropogon gerardii, Carex viridula, Deschampsia caespitosa, Sphenopholis intermedia*

Characteristic Species: *Carex viridula, Doellingeria umbellata, Parnassia glauca, Spiranthes lucida.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION
Range: Information not available.
States/Provinces: NJ.
Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS
Rank: GNR (8-Nov-2000).
Reasons: Information not available.

CLASSIFICATION INFORMATION
Status: Standard.
Confidence: 3 – Weak.
Comments: Community description based on report completed by Leslie Shank in 1999. All study sites were located in New Jersey along the Delaware River. This is community encompasses a wide range of species assemblages. The classification of this type is based on information from a very limited area and must be treated of low confidence pending further inventory and data collection.
Similar Associations:
- *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Sparse Vegetation (CEGL006284)--occurring on alluvial ledges rather than seeps.

Related Concepts: Information not available.

SOURCES
Description Authors: S. C. Gawler.
References: Breden 1989, Eastern Ecology Working Group n.d., Shank and Shreiner 1999.

Figure 98. Calcareous Riverside Seep in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation point DEWA.616). June 2006.

COMMON NAME (PARK-SPECIFIC): REED CANARYGRASS RIVERINE GRASSLAND

SYNONYMS
NVC English Name: **Reed Canarygrass Eastern Herbaceous Vegetation**
NVC Scientific Name: ***Phalaris arundinacea* Eastern Herbaceous Vegetation**
NVC Identifier: **CEGL006044**

LOCAL INFORMATION

Environmental Description: This association is typically found on bars, shorelines, or islands in the Delaware River and smaller tributaries. These areas are exposed to frequent floods, high stream velocity and ice-scour. The substrate is typically coarse, composed of sand, gravel, and cobbles.

Vegetation Description: This association is characterized by thick herbaceous and graminoid vegetation dominated by reed canarygrass (*Phalaris arundinacea*). A diverse mix of other herbaceous and graminoid species also persists. Some common species are marshpepper knotweed (*Polygonum hydropiper*), stinging nettle (*Urtica dioica*), Canadian clearweed (*Pilea pumila*), watercress (*Rorippa nasturtium-aquaticum*), whitegrass (*Leersia virginica*), smallspike false nettle (*Boehmeria cylindrica*), fowl bluegrass (*Poa palustris*), wild mint (*Mentha arvensis*), and wingstem (*Verbesina alternifolia*). A few scattered willows (*Salix* spp.), sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), and silky dogwood (*Cornus amomum*) may be present as short shrubs; however, their relative cover does not exceed 25%. Vines may also be present; common species include Virginia creeper (*Parthenocissus quinquefolia*), eastern poison ivy (*Toxicodendron radicans*), fox grape (*Vitis labrusca*), and riverbank grape (*Vitis riparia*).

Most Abundant Species:

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Rubus allegheniensis*, *Spiraea tomentosa*
Herb (field)	Vine/Liana	*Toxicodendron radicans*, *Vitis riparia*
Herb (field)	Forb	*Pilea pumila*, *Polygonum hydropiper*, *Urtica dioica*
Herb (field)	Graminoid	*Phalaris arundinacea*

Characteristic Species: *Phalaris arundinacea*.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	Reed Canarygrass Eastern Marsh	Walz et al. 2006
PA	S5	1	Bluejoint - reed canary grass marsh	Fike 1999

Local Range: This association is typically found on bars, shorelines, or islands in the Delaware River and smaller tributaries in the park.

Classification Comments: Reed Canarygrass Riverine Grassland is distinguished from other riparian types by the clear dominance of *Phalaris arundinacea*.

Other Comments: None.

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

Plots and Data Sources: DEWA.109, DEWA.111; Fike 1999, Perles et al 2004.

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

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Seasonally flooded temperate or subpolar grassland (V.A.5.N.k.)
Alliance	Phalaris arundinacea Seasonally Flooded Herbaceous Alliance (A.1381)
Alliance (English name)	Reed Canarygrass Seasonally Flooded Herbaceous Alliance
Association	*Phalaris arundinacea* Eastern Herbaceous Vegetation
Association (English name)	Reed Canarygrass Eastern Herbaceous Vegetation
Ecological System(s):	Central Interior Highlands and Appalachian Sinkhole and Depression Pond (CES202.018)
	North-Central Interior Floodplain (CES202.694)
	Laurentian-Acadian Wet Meadow-Shrub Swamp (CES201.582)

GLOBAL DESCRIPTION

Concept Summary: This association is found throughout the northeastern United States and Canada, but its distribution as a natural type is complicated elsewhere. It is native to the United States and Canada but is now more widely distributed and abundant because of local introductions from both local and European populations. The introduced strains may be more aggressive ecotypes than native strains. Stands are found in both minerotrophic basin wetlands as well as rivershores. *Phalaris arundinacea* has been widely used as a forage and hay crop, especially in marshes and floodplains, and it is used for wildlife food and for shoreline and ditch stabilization. Stands are dominated by *Phalaris arundinacea*, a 0.5- to 2-m tall perennial grass, which tends to occur in monocultures or associated with *Calamagrostis canadensis*. Other associates in the Northeast include *Viburnum nudum, Alnus incana* or *Alnus serrulata, Viburnum dentatum*, and *Agrostis gigantea*. Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* can displace native species over time. Further work is required to resolve the natural versus introduced nature of this type in the Southeast before a description can be completed.

Environmental Description: Stands are found in both minerotrophic basin wetlands as well as rivershores. The dominant species has been widely used as a forage and hay crop, especially in marshes and floodplains, and it is used for wildlife food and for shoreline and ditch stabilization (Barnes 1999).

Vegetation Description: Stands are dominated by *Phalaris arundinacea*, a 0.5- to 2-m tall perennial grass that is native to the United States and Canada, but which has also been introduced from European strains. The introduced strains may be more aggressive ecotypes than native strains (Barnes 1999). It tends to occur in monocultures or associated with *Calamagrostis canadensis*. Other associates in the Northeast include *Viburnum nudum, Salix* spp., *Alnus incana* or *Alnus serrulata, Viburnum dentatum, Poa palustris, Mentha arvensis, Leersia virginica*, and *Agrostis gigantea*. Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* can displace native species over time (Apfelbaum and Sams 1987, Barnes 1999, and references therein). Further work is required to resolve the natural versus introduced nature of this type in the Southeast before a description can be completed.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Phalaris arundinacea*

Characteristic Species: *Phalaris arundinacea.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association is found throughout the northeastern United States and Canada, but its distribution as a natural type is complicated elsewhere. It currently ranges from Virginia north to Vermont, east to Minnesota and south to Tennessee.
States/Provinces: CT, DE, IA, MA, MD, ME, MN, NH, NJ, NY, OH, ON, PA, RI, TN, VA, VT, WV.
Federal Lands: NPS (Allegheny Portage Railroad, Delaware Water Gap, Effigy Mounds, Eisenhower, Gettysburg); USFWS (Assabet River?, Great Meadows?, Great Swamp, Oxbow, Parker River).

CONSERVATION STATUS

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

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 – Moderate.
Comments: Type has a broad distribution; in fact, it is widespread throughout temperate areas of the northern hemisphere. It is native to the United States and Canada, but is now more widely distributed and abundant because of local introductions from both local and European populations (Apfelbaum and Sams 1987). It can invade a variety of habitats, suggesting that little unites these stands apart from the dominance of *Phalaris arundinacea*. However, that may be the only reasonable way to describe this type. This vegetation is documented from Shady Valley TNC Preserve, Johnson County, Tennessee, where it occupies channelized streams, impoundments, and fen restoration sites. In these examples, characteristic associates include *Juncus effusus, Carex lurida, Carex gynandra*, and *Alnus serrulata*.
Similar Associations:

- *Calamagrostis canadensis - Phalaris arundinacea* Herbaceous Vegetation (CEGL005174).
- *Phalaris arundinacea* Western Herbaceous Vegetation (CEGL001474).

Related Concepts:

- Palustrine Persistent Emergent Wetland (PEM1) (Cowardin et al. 1979) ?
- Reed canary grass riverine grassland (Perles et al. 2004) ?
- SNE low-energy riverbank community (Rawinski 1984) ?
- Shallow Emergent Marsh (Thompson 1996) ?
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984) ?
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984) ?

SOURCES

Description Authors: D. Faber-Langendoen, mod. S. C. Gawler.
References: Apfelbaum and Sams 1987, Barnes 1999, Cowardin et al. 1979, Edinger et al. 2002, Fike 1999, Metzler and Barrett 2001, Midwestern Ecology Working Group n.d., Perles et

al. 2004, Rawinski 1984, Sperduto 2000a, Swain and Kearsley 2001, TDNH unpubl. data, Thompson 1996, Thompson and Sorenson 2000.

Figure 99. Reed Canarygrass Riverine Grassland in Delaware Water Gap National Recreation Area (plot DEWA.109). August 2003.

Figure 100. Reed Canarygrass Riverine Grassland in Delaware Water Gap National Recreation Area (plot DEWA.111). August 2003.

COMMON NAME (PARK-SPECIFIC): CATTAIL MARSH

SYNONYMS

NVC English Name: **(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Eastern Herbaceous Vegetation**

NVC Scientific Name: ***Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Herbaceous Vegetation**

NVC Identifier: **CEGL006153**

LOCAL INFORMATION

Environmental Description: This variable wetland type occurs in depressions and basins that contain ponded water nearly year round. In general, waterflow out of the sites is restricted, either due to naturally occurring depressions, or from beaver activity, roads, or berms. These wetlands typically occur on very poorly drained soils such as Alden mucky silt loam and shallow mucky peat.

Vegetation Description: These wetlands are strongly dominated by broadleaf cattail (*Typha latifolia*) or narrowleaf cattail (*Typha angustifolia*), that cover >50% of the area. Associated species vary widely, including tussock sedge (*Carex stricta*), bulrushes (*Scirpus* spp.), knotweeds (*Polygonum* spp.), horsetails (*Equisetum* spp.), sedges (*Carex* spp.), spikerushes (*Eleocharis* spp.), common marsh bedstraw (*Galium palustre*), sensitive fern (*Onoclea sensibilis*), and blue skullcap (*Scutellaria lateriflora*). The invasive species purple loosestrife (*Lythrum salicaria*) can form monocultures in this association.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	*Typha* spp.

Characteristic Species: *Typha angustifolia, Typha latifolia, Galium palustre, Onoclea sensibilis, Scirpus* spp., *Polygonum* spp., *Equisetum* spp., *Carex* spp., *Eleocharis* spp.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S5	1	Eastern Cattail Marsh	Walz et al. 2006
PA	S5	1	Cattail Marsh	Fike 1999

Local Range: These wetlands occur in depressions and basins that contain ponded water throughout the park.

Classification Comments: This association is identified by clear dominance (>50% cover) of *Typha* spp.

Other Comments: None.

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

Plots and Data Sources: Accuracy Assessment Observation Point DEWA.1006; Fike 1999.

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

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)

Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Semipermanently flooded temperate or subpolar grassland (V.A.5.N.l.)
Alliance	Typha (angustifolia, latifolia) - (Schoenoplectus spp.) Semipermanently Flooded Herbaceous Alliance (A.1436)
Alliance (English name)	(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Semipermanently Flooded Herbaceous Alliance
Association	*Typha (angustifolia, latifolia) - (Schoenoplectus* spp.) Eastern Herbaceous Vegetation
Association (English name)	(Narrowleaf Cattail, Broadleaf Cattail) - (Clubrush species) Eastern Herbaceous Vegetation
Ecological System(s):	Laurentian-Acadian Freshwater Marsh (CES201.594)

GLOBAL DESCRIPTION

Concept Summary: These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover) and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies and is rarely extensive; bryophytes are mostly confined to the hummocks. *Typha angustifolia, Typha latifolia*, or their hybrid *Typha X glauca* dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis, Carex lurida, Carex rostrata, Carex pellita (= Carex lanuginosa), Carex stricta, Scirpus cyperinus*, and bulrushes, such as *Schoenoplectus americanus (= Scirpus americanus)* and *Schoenoplectus acutus (= Scirpus acutus)*, occur along with patchy grasses, such as *Calamagrostis canadensis*. Broad-leaved herbs include *Thelypteris palustris, Asclepias incarnata, Onoclea sensibilis, Symplocarpus foetidus, Calla palustris, Impatiens capensis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum*, and *Verbena hastata*. Floating aquatics, such as *Lemna minor*, may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale, Ilex verticillata*, and *Spiraea alba* are common. The invasive exotic plants *Lythrum salicaria* and *Phragmites australis* may be abundant in parts of some occurrences. This association is distinguished from other northeastern freshwater marshes by the strong dominance of *Typha* spp.

Environmental Description: These tall emergent marshes are common throughout the northeastern United States and adjacent Canadian provinces. They occur in permanently flooded basins, often as part of a larger wetland mosaic and associated with lakes, ponds, or slow-moving streams. The substrate is muck over mineral soil. Lacustrine cattail marshes typically have a muck-bottom zone bordering the shoreline, where cattails are rooted in the bottom substrate, and a floating mat zone, where the roots grow suspended in a buoyant peaty mat. This association is often found in impounded waters.

Vegetation Description: Tall graminoids dominate the vegetation; scattered shrubs are often present (usually totaling less than 25% cover) and are frequently shorter than the graminoids. Trees are absent. Bryophyte cover varies and is rarely extensive; bryophytes are mostly confined

to the hummocks. *Typha angustifolia, Typha latifolia*, or their hybrid *Typha X glauca* dominate, either alone or in combination with other tall emergent marsh species. Associated species vary widely; sedges, such as *Carex aquatilis, Carex lurida, Carex rostrata, Carex pellita (= Carex lanuginosa), Carex stricta, Scirpus cyperinus*, and bulrushes, such as *Schoenoplectus americanus (= Scirpus americanus)* and *Schoenoplectus acutus (= Scirpus acutus)*, occur along with patchy grasses, such as *Calamagrostis canadensis*. Broad-leaved herbs include *Thelypteris palustris, Asclepias incarnata, Onoclea sensibilis, Symplocarpus foetidus, Calla palustris, Impatiens capensis, Sagittaria latifolia, Scutellaria lateriflora, Sparganium eurycarpum*, and *Verbena hastata*. Floating aquatics, such as *Lemna minor*, may be common in deeper zones. Shrub species vary across the geographic range of this type; in the northern part of its range, *Myrica gale, Ilex verticillata*, and *Spiraea alba* are common. The invasive exotic plants *Lythrum salicaria* and *Phragmites australis* may be abundant in parts of some occurrences.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Graminoid	Typha angustifolia, Typha latifolia, Typha x glauca

Characteristic Species: *Onoclea sensibilis, Schoenoplectus acutus, Schoenoplectus americanus, Typha angustifolia, Typha latifolia.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association occurs throughout the northeastern U.S. from Maine to North Carolina.

States/Provinces: CT, DE, MA, MD, ME:S5, NC, NH:S4?, NJ:S5, NY, PA, RI, VA, VT, WV.

Federal Lands: NPS (Acadia, Blue Ridge Parkway?, Cape Cod, Delaware Water Gap, Johnstown Flood, Minute Man, Saint-Gaudens); USFWS (Aroostook, Assabet River, Carlton Pond?, Great Meadows, Great Swamp, Moosehorn, Nomans Land Island, Nulhegan Basin, Oxbow, Pondicherry?).

CONSERVATION STATUS

Rank: G5 (1-Dec-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: *Typha angustifolia* can grow in deeper water compared to *Typha latifolia*, although both species reach maximum growth at a water depth of 50 cm (Grace and Wetzel 1981). *Typha* often occurs in pure stands and can colonize areas recently exposed by either natural or human causes.

Similar Associations:

- *Typha latifolia* Southern Herbaceous Vegetation (CEGL004150).
- *Typha* spp. - *Schoenoplectus acutus* - Mixed Herbs Midwest Herbaceous Vegetation (CEGL002229).
- *Typha* spp. - *Schoenoplectus tabernaemontani* - Mixed Herbs Southern Great Lakes Shore Herbaceous Vegetation (CEGL005112).
- *Typha* spp. Midwest Herbaceous Vegetation (CEGL002233).

Related Concepts:

- Cattail Marsh (Thompson 1996) ?
- Cattail marsh (CAP pers. comm. 1998) ?
- Palustrine Narrow-leaved Persistent Emergent Wetland, Permanently Flooded (PEM5H) (Cowardin et al. 1979) ?
- Robust Emergent Marsh (Breden 1989) ?
- Southern New England nutrient-poor streamside/lakeside marsh (Rawinski 1984) ?
- Southern New England nutrient-rich streamside/lakeside marsh (Rawinski 1984) ?

SOURCES

Description Authors: S. C. Gawler.

References: Breden 1989, Breden et al. 2001, CAP pers. comm. 1998, Clancy 1996, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Gawler 2002, Grace and Wetzel 1981, Harrison 2004, Metzler and Barrett 2001, Northern Appalachian Ecology Working Group 2000, Rawinski 1984, Sperduto and Nichols 2004, Swain and Kearsley 2001, Thompson 1996, Thompson and Sorenson 2000.

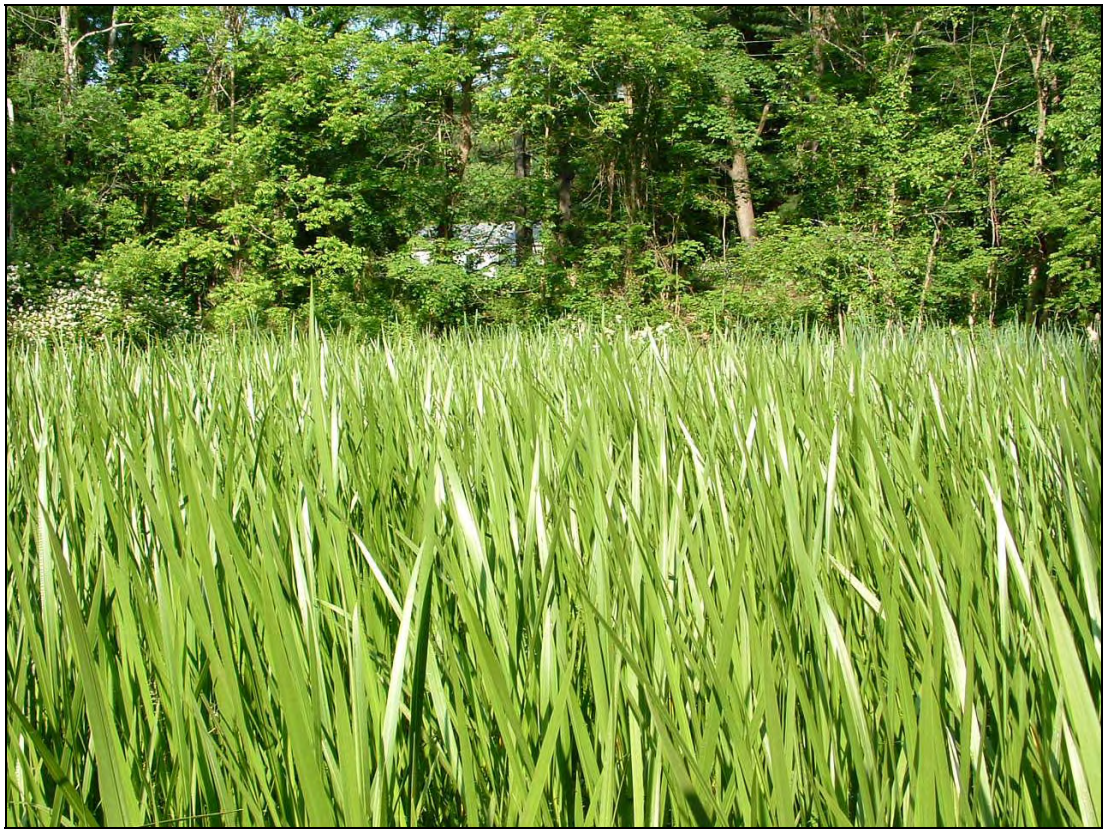

Figure 101. Cattail Marsh in Delaware Water Gap National Recreation Area (near Peters Valley in New Jersey). June 2006.

COMMON NAME (PARK-SPECIFIC): ACIDIC SEEP

SYNONYMS

NVC English Name: **Tufted Hairgrass - Hammond's Springbeauty Herbaceous Vegetation**

NVC Scientific Name: ***Deschampsia caespitosa - Claytonia virginica* var. *hammondiae* Herbaceous Vegetation**

NVC Identifier: **CEGL006101**

LOCAL INFORMATION

Environmental Description: This association is limited to a single occurrence within the park. A similar seep occurs nearby just beyond the park boundary which grades from open herbaceous seep to palustrine shrubland. The bedrock is the Ordovician Ramseyburg Member composed of acidic graywacke sandstone, siltstone, shale and slate. Soils are of the Wurtsboro-Swartswood complex, an acidic, extremely stony loam. The seeps occur near the toeslope of Kittatinny Ridge, with a southeast aspect. Groundwater seepage appears to persist for most of the growing season.

Vegetation Description: Forest and shrub strata are absent from this community. The herbaceous layer is depauperate, possibly due to the acidic nature of the groundwater seepage, but total vegetation cover is greater than 95%. The herbaceous layer is dominated by tufted hairgrass (*Deschampsia caespitosa*), with downy goldenrod (*Solidago puberula*) subdominant. Other typical species include little bluestem (*Schizachyrium scoparium*), Hammond's claytonia (*Claytonia virginica* var. *hammondiae*), bromelike sedge (*Carex bromoides*), and prickly bog sedge (*Carex atlantica* ssp. *atlantica*). Boreal chickweed (*Cerastium biebersteinii*), an exotic of European origin, is also common. A bryophyte layer dominated by *Sphagnum* species included the following species: *Sphagnum bartlettianum, Sphagnum henryense, Sphagnum palustre*, and *Sphagnum recurvum*.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Cerastium biebersteinii, Claytonia virginica* var. *hammondiae, Lobelia kalmii, Solidago puberula*
Herb (field)	Graminoid	*Deschampsia caespitosa, Schizachyrium scoparium*

Characteristic Species: *Claytonia virginica* var. *hammondiae, Deschampsia caespitosa, Lobelia kalmii, Schizachyrium scoparium, Solidago puberula.*

Other Noteworthy Species: *Claytonia virginica* var. *hammondiae.*

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S1	1	Kittatinny Acidic Seep	Walz et al. 2006

Local Range: This association is limited to a single occurrence within the park associated with the surface discharge of acidic groundwater on the southeast toeslope of Kittatinny Ridge.

Classification Comments: This vegetation type also occurs downslope in the same drainageway. At this second location it grades from open Acidic Seep as described above to a palustrine shrubland. The palustrine shrubland contains scattered trees, including eastern white pine (*Pinus strobus*) and pitch pine (*Pinus rigida*). The tall-shrub layer is dominated by tree

saplings such as yellow birch (*Betula alleghaniensis*), eastern hemlock (*Tsuga canadensis*), and great laurel (*Rhododendron maximum*). The short-shrub layer is more variable and is characterized by sheep laurel (*Kalmia angustifolia*), black chokeberry (*Photinia melanocarpa*), northern spicebush (*Lindera benzoin*), and tree saplings. The herbaceous layer is slightly more diverse, with wavy hairgrass the dominant and boreal chickweed, Hammond's claytonia, skunk-cabbage (*Symplocarpus foetidus*), roundleaf sundew (*Drosera rotundifolia*), and rice cutgrass (*Leersia oryzoides*) as common associates.
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).
Plots and Data Sources: DEWA.233, DEWA.234; Radis 1989.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland (V.A.5.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland (V.A.5.N.)
Formation	Saturated temperate or subpolar grassland (V.A.5.N.m.)
Alliance	Deschampsia caespitosa Saturated Herbaceous Alliance (A.1456)
Alliance (English name)	Tufted Hairgrass Saturated Herbaceous Alliance
Association	*Deschampsia caespitosa* - *Claytonia virginica* var. *hammondiae* Herbaceous Vegetation
Association (English name)	Tufted Hairgrass - Hammond's Springbeauty Herbaceous Vegetation
Ecological System(s):	Appalachian (Hemlock)-Northern Hardwood Forest (CES202.593)
	Northeastern Interior Dry-Mesic Oak Forest (CES202.592)

GLOBAL DESCRIPTION

Concept Summary: This acidic seepage wetland community is known from a single location on the Kittatinny Mountains of northern New Jersey where seepage water is diverted to the surface by a clay fragipan. The pH ranges from 4.5-4.7. The vegetation is dominated by *Deschampsia caespitosa, Carex bromoides, Carex atlantica* ssp. *atlantica (= Carex atlantica* var. *incomperta)*, and *Claytonia virginica* var. *hammondiae*. Other less frequent associates include *Symplocarpus foetidus, Osmunda cinnamomea, Maianthemum canadense, Viola cucullata, Kalmia angustifolia, Coptis trifolia*, and *Solidago puberula*. A bryophyte layer dominated by *Sphagnum* species included the following species: *Sphagnum bartlettianum, Sphagnum henryense, Sphagnum palustre*, and *Sphagnum recurvum*. *Cerastium biebersteinii*, an exotic of European origin, also occurs in this vegetation.
Environmental Description: This acidic seepage wetland community is known from a single location on the Kittatinny Mountains of northern New Jersey where seepage water is diverted to the surface by a clay fragipan. Groundwater seepage appears to persist for most of the growing season. The bedrock is the Ordovician Ramseyburg Member composed of acidic graywacke sandstone, siltstone, shale and slate. Soils are of the Wurtsboro-Swartswood complex, an acidic,

extremely stony loam, with pH ranges from 4.5-4.7. The seeps occur near the toeslope of Kittatinny Ridge, with a southeast aspect.

Vegetation Description: The dense herbaceous vegetation is dominated by *Deschampsia caespitosa, Carex bromoides, Carex atlantica* ssp. *atlantica (= Carex atlantica* var. *incomperta),* and *Claytonia virginica* var. *hammondiae*. Other less frequent associates include *Symplocarpus foetidus, Osmunda cinnamomea, Schizachyrium scoparium, Maianthemum canadense, Viola cucullata, Kalmia angustifolia, Coptis trifolia*, and *Solidago puberula*. A bryophyte layer dominated by *Sphagnum* species included the following species: *Sphagnum bartlettianum, Sphagnum henryense, Sphagnum palustre*, and *Sphagnum recurvum*. *Cerastium biebersteinii*, an exotic of European origin, also occurs in this vegetation.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Claytonia virginica* var. *hammondiae, Lobelia kalmii, Schizachyrium scoparium, Solidago puberula*
Herb (field)	Graminoid	*Deschampsia caespitosa*

Characteristic Species: *Carex bromoides, Claytonia virginica* var. *hammondiae, Deschampsia caespitosa, Lobelia kalmii, Schizachyrium scoparium, Solidago puberula.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is known only from the Kittatinny Mountains of northern New Jersey. There is a slight potential that it may also occur in eastern Pennsylvania, southeastern New York, or in central Maryland.

States/Provinces: MD?, NJ:S1.

Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS

Rank: G1 (22-Mar-1999).

Reasons: This community is known only from the Kittatinny Mountains of northern New Jersey, where it covers only a few acres. It is threatened by the expansion of an invasive plant. Although the community is somewhat similar to other acidic seepage vegetation, the dominant species and the physical setting are distinct enough to warrant the separation of this vegetation into an association.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: Information not available.

Similar Associations: Information not available.

Related Concepts:

- Inland Acidic Seep Community (Breden 1989)

SOURCES

Description Authors: Eastern Ecology Group, mod. S. C. Gawler.

References: Breden 1989, Breden et al. 2001, Eastern Ecology Working Group n.d., Radis 1986, Snyder 1992.

Figure 102. Acidic Seep in Delaware Water Gap National Recreation Area (plot DEWA.233). August 2004.

Figure 103. Acidic Seep in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.573). May 2006.

COMMON NAME (PARK-SPECIFIC): CALCAREOUS FEN

SYNONYMS

NVC English Name:	**Eastern Red-cedar / Shrubby-cinquefoil / Yellow Sedge - Rigid Sedge Shrub Herbaceous Vegetation**
NVC Scientific Name:	***Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Shrub Herbaceous Vegetation**
NVC Identifier:	**CEGL006357**

LOCAL INFORMATION

Environmental Description: These wetlands occur as small patches where calcareous groundwater discharges to the surface. They typically occur along the toeslope of ridges. Within the park, these fens have been found in association with several calcareous bedrock formations, including the Minisink limestone, Kalkberg limestone, Buttermilk Falls limestone, and the Schoharie Formation (calcareous siltstone and silty limestone). Soils vary from silt loams of the Alden series and Lordstown-Wallpack complex to shallow mucky peat. They are usually open with little or no forest canopy.

Vegetation Description: This association varies in appearance from an open shrubland to open herbaceous vegetation. The tall-shrub layer, when present, is 2-5 m in height with 20% cover or less. Typical tall shrubs include silky dogwood (*Cornus amomum*), eastern red-cedar (*Juniperus virginiana*), and poison sumac (*Toxicodendron vernix*). The short-shrub layer is less than 2 m in height with 20 % cover or less. Typical short shrubs include shrubby cinquefoil (*Dasiphora floribunda*), silky dogwood, steeplebush (*Spiraea tomentosa*), white meadowsweet (*Spiraea alba* var. *latifolia*), and maleberry (*Lyonia ligustrina*). Other characteristic, often calciphilic, shrubs include sageleaf willow (*Salix candida*) and pussy willow (*Salix discolor*). Invasive shrubs may be locally abundant in some fens, especially multiflora rose (*Rosa multiflora*) and autumn-olive (*Elaeagnus umbellata*). The herbaceous layer is up to 1 m in height with total cover greater than 75% (often near 100%). Dominant herb species include golden ragwort (*Packera aurea*), fen grass of Parnassus (*Parnassia glauca*), eastern marsh fern (*Thelypteris palustris*), narrowleaf mountainmint (*Pycnanthemum tenuifolium*), sensitive fern (*Onoclea sensibilis*), woodland rush (*Juncus subcaudatus*), wrinkleleaf goldenrod, (*Solidago rugosa*), tussock sedge (*Carex stricta*), crested woodfern (*Dryopteris cristata*), and Dudley's rush (*Juncus dudleyi*). A number of calciphilic herb species are often present, albeit at low cover values, including Ontario lobelia (*Lobelia kalmii*), downy willowherb (*Epilobium strictum*), rigid sedge (*Carex tetanica*), northeastern sedge (*Carex cryptolepis*), smallhead rush (*Juncus brachycephalus*), purple avens (*Geum rivale*), and scarlet Indian-paintbrush (*Castilleja coccinea*). Purple loosestrife (*Lythrum salicaria*) can be an abundant weed species in some fens.

Most Abundant Species:

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Toxicodendron vernix, Cornus amomum*
Short shrub/sapling	Broad-leaved deciduous shrub	*Dasiphora floribunda, Spiraea tomentosa, Cornus amomum*
Herb (field)	Forb	*Packera aurea, Parnassia glauca*

Herb (field)	Graminoid	*Carex stricta, Juncus subcaudatus*
Herb (field)	Fern or fern ally	*Thelypteris palustris*

Characteristic Species: *Carex tetanica, Cornus amomum, Dasiphora floribunda, Lobelia kalmii, Packera aurea, Spiraea tomentosa, Toxicodendron vernix*

Other Noteworthy Species: *Lemna trisulca, Spiranthes lucida, Trollius laxus* ssp. *laxus, Parnassia glauca, Dasiphora floribunda, Carex tetanica, Lobelia kalmii, Carex cryptolepis, Juncus brachycephalus, Epilobium strictum, Castilleja coccinea.*

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S1S2	1	Turfy Juniper Fen	Walz et al. 2006
PA	S1	1	Poison sumac - red-cedar - bayberry fen	Fike 1999

Local Range: These wetlands occur in association with calcareous groundwater seeps throughout the park wherever limestone bedrock is at or near a toeslope position.

Classification Comments: This type is closely related to Calcareous Seep and Marl Fen. It differs from Calcareous Seeps in containing more calciphilic species and presumably a greater calcareous groundwater influence (higher pH and dissolved calcium concentration). It differs from Marl Fen in lacking active marl deposition. Marl Fen also tends to have lower total herbaceous cover than Calcareous Fen.

Other Comments: None.

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

Plots and Data Sources: DEWA.9, DEWA.224, DEWA.225; Fike 1999, Breden et al 2001, Radis 1989.

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

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Saturated temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.p.)
Alliance	Carex (flava, hystericina, interior, sterilis) Saturated Shrub Herbaceous Alliance (A.1561)
Alliance (English name)	(Yellow Sedge, Bottlebrush Sedge, Inland Sedge, Sterile Sedge) Saturated Shrub Herbaceous Alliance
Association	*Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Shrub Herbaceous Vegetation
Association (English name)	Eastern Red-cedar / Shrubby-cinquefoil / Yellow Sedge - Rigid Sedge Shrub Herbaceous Vegetation
Ecological System(s):	North-Central Appalachian Seepage Fen (CES202.607)

GLOBAL DESCRIPTION

Concept Summary: This association is a saturated wetland of turfy mineral soil occurring over calcareous bedrock, a fen supporting a number of calciphitic species. It occurs in New Jersey and Pennsylvania. It varies in appearance from an open shrubland to open herbaceous vegetation. The tall-shrub layer, when present, is 2-5 m in height with 20% cover or less. Typical tall shrubs include *Cornus amomum, Juniperus virginiana*, and *Toxicodendron vernix*. Typical short shrubs include *Dasiphora fruticosa* ssp. *floribunda, Spiraea tomentosa, Spiraea alba* var. *latifolia*, and *Lyonia ligustrina*. Other characteristic, often calciphilic, shrubs include *Salix candida* and *Salix discolor*. Invasive shrubs may be locally abundant in some fens, especially *Rosa multiflora* and *Elaeagnus umbellata*. The herbaceous layer is greater than 75% cover (often near 100%). Dominant herb species include *Packera aurea (= Senecio aureus), Parnassia glauca, Thelypteris palustris, Pycnanthemum tenuifolium, Onoclea sensibilis, Juncus subcaudatus, Solidago rugosa, Carex stricta, Dryopteris cristata*, and *Juncus dudleyi*. Other associates include *Juncus nodosus, Equisetum fluviatile, Sisyrinchium angustifolium, Solidago uliginosa, Eupatorium maculatum, Liatris spicata, Spiranthes lucida, Rudbeckia fulgida, Pedicularis canadensis*, and *Pedicularis lanceolata*. A number of calciphilic herb species are often present at low cover values, including *Lobelia kalmii, Epilobium strictum, Carex tetanica, Carex flava, Juncus brachycephalus, Bromus kalmii, Cypripedium parviflorum, Geum rivale*, and *Castilleja coccinea*. *Lythrum salicaria* can be an abundant weed species in some fens. This vegetation has been generally affected by grazing in the past, which in some cases continues to the present, and as such this vegetation is known locally as a pasture fen.

Environmental Description: These wetlands occur as small patches where calcareous groundwater discharges to the surface. They typically occur along the toeslope of ridges, in association with limestone and calcareous siltstone. Soils vary from silt loams to shallow mucky peat.

Vegetation Description: This association varies in appearance from an open shrubland to open herbaceous vegetation. The tall-shrub layer, when present, is 2-5 m in height with 20% cover or less. Typical tall shrubs include *Cornus amomum, Juniperus virginiana*, and *Toxicodendron vernix*. Typical short shrubs include *Dasiphora fruticosa* ssp. *floribunda, Spiraea tomentosa, Spiraea alba* var. *latifolia*, and *Lyonia ligustrina*. Other characteristic, often calciphilic, shrubs include *Salix candida* and *Salix discolor*. Invasive shrubs may be locally abundant in some fens, especially *Rosa multiflora* and *Elaeagnus umbellata*. The herbaceous layer is greater than 75% cover (often near 100%). Dominant herb species include *Packera aurea (= Senecio aureus), Parnassia glauca, Thelypteris palustris, Pycnanthemum tenuifolium, Onoclea sensibilis, Juncus subcaudatus, Solidago rugosa, Carex stricta, Dryopteris cristata*, and *Juncus dudleyi*. Other associates include *Juncus nodosus, Equisetum fluviatile, Sisyrinchium angustifolium, Solidago uliginosa, Eupatorium maculatum, Liatris spicata, Spiranthes lucida, Rudbeckia fulgida, Pedicularis canadensis*, and *Pedicularis lanceolata*. A number of calciphilic herb species are often present at low cover values, including *Lobelia kalmii, Epilobium strictum, Carex tetanica, Carex flava, Juncus brachycephalus, Bromus kalmii, Cypripedium parviflorum, Geum rivale*, and *Castilleja coccinea*. *Lythrum salicaria* can be an abundant weed species in some fens.

Most Abundant Species:

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved shrub	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Toxicodendron vernix*

Short shrub/sapling	Broad-leaved deciduous shrub	*Dasiphora fruticosa* ssp. *floribunda*
Herb (field)	Forb	*Packera aurea, Parnassia glauca*
Herb (field)	Graminoid	*Carex stricta, Juncus subcaudatus*
Herb (field)	Fern or fern ally	*Thelypteris palustris*

Characteristic Species: *Carex tetanica, Castilleja coccinea, Cornus amomum, Dasiphora fruticosa* ssp. *floribunda, Juniperus virginiana, Lobelia kalmii, Packera aurea, Spiraea tomentosa, Toxicodendron vernix.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This association occurs in New Jersey, Pennsylvania, and possibly southeastern New York.
States/Provinces: NJ:S1S2, NY, PA.
Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS

Rank: G1G2 (23-Jan-1998).
Reasons: This association is restricted to saturated wetlands of turfy mineral soil occurring over calcareous bedrock in New Jersey, Pennsylvania, and possibly New York. There are 10-20 estimated occurrences in New Jersey and possibly the same number from Pennsylvania. These fens are 0.1-1.5 acres in size, with a total of 20-40 acres known from New Jersey. The total potential acreage of this type is well below 200 acres rangewide.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 2 – Moderate.
Comments: Edinger et al.'s (2002) Rich Shrub Fen has been crosswalked to this association (as well as four others), in which case the range would extend to New York.
Similar Associations:

- *Morella pensylvanica - Dasiphora fruticosa* ssp. *floribunda / Carex sterilis - Carex flava* Shrub Herbaceous Vegetation (CEGL006103)--has active marl deposition and lower herbaceous cover.
- *Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation (CEGL006448)--has fewer calciphilic species.

Related Concepts: Information not available

SOURCES

Description Authors: Eastern Ecology Group, mod. S. C. Gawler.
References: Breden et al. 2001, Eastern Ecology Working Group n.d., Edinger et al. 2002, Fike 1999, Radis 1986.

Figure 104. Calcareous Fen in Delaware Water Gap National Recreation Area (plot DEWA.9). May 2003.

Figure 105. Calcareous Fen in Delaware Water Gap National Recreation Area (plot DEWA.224). August 2004.

COMMON NAME (PARK-SPECIFIC): MARL FEN

SYNONYMS

NVC English Name:	**Northern Bayberry - Shrubby-cinquefoil / Sterile Sedge - Yellow Sedge Shrub Herbaceous Vegetation**
NVC Scientific Name:	***Morella pensylvanica - Dasiphora fruticosa* ssp. *floribunda / Carex sterilis - Carex flava* Shrub Herbaceous Vegetation**
NVC Identifier:	**CEGL006103**

LOCAL INFORMATION

Environmental Description: This association is limited to a single occurrence within the park. The bedrock is shaley to sandy siltstone of the Devonian Esopus Formation, which does include some minor calcareous siltstone beds. However, the groundwater supporting the fen likely originates in the adjacent uplands where the bedrock is calcareous siltstone and limestone of the Devonian Schoharie Formation. The soil is very stony marl deposits. Marl is actively being deposited, the result of precipitation of calcium carbonate in supersaturated groundwater seepage on the upslope edge of the fen. This fen is open with no forest canopy except where the fen borders the surrounding forest. Flowing rivulets are common throughout the fen, and the substrate is typically marl and calcium carbonate-coated stones and woody debris.

Vegetation Description: Forest canopy and tall-shrub layers are absent from this vegetation type. The short-shrub layer is low (less than 0.5 m in height) and covers about 40% of the fen. The dominant shrub is shrubby cinquefoil (*Dasiphora floribunda*). Other occasional shrub and tree sapling species include Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), and eastern hemlock (*Tsuga canadensis*). The herbaceous layer is somewhat sparse, with total cover about 40%. Herbaceous vegetation is usually less than 1 m in height. The herbaceous layer is characterized by a high relative cover of calciphilic vegetation, including fen grass of Parnassus (*Parnassia glauca*), Ontario lobelia (*Lobelia kalmii*), needle beaksedge (*Rhynchospora capillacea*), rigid sedge (*Carex tetanica*), and golden ragwort (*Packera aurea*). Other common herbaceous species included slender spikerush (*Eleocharis tenuis*), spiked muhly (*Muhlenbergia glomerata*), peppermint (*Mentha X piperita*), common selfheal (*Prunella vulgaris*), and knotted rush (*Juncus nodosus*). Some herbs invasive to fens are also present, including coltsfoot (*Tussilago farfara*) and ox-eye daisy (*Leucanthemum vulgare*). Bryophytes are common with a total cover of 20%. The alga stonewort (*Chara* sp.) is common in flowing rivulets.

Most Abundant Species:

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Dasiphora floribunda*
Herb (field)	Forb	*Lobelia kalmii, Packera aurea, Parnassia glauca*
Herb (field)	Graminoid	*Carex tetanica, Eleocharis tenuis, Rhynchospora capillacea*

Characteristic Species: *Carex tetanica, Dasiphora floribunda, Lobelia kalmii, Packera aurea, Parnassia glauca, Rhynchospora capillacea, Chara* spp.

Other Noteworthy Species: *Carex tetanica, Dasiphora floribunda, Lobelia kalmii, Parnassia glauca.*

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S2	1	Marl Seep Fen	Walz et al. 2006

Local Range: This association is limited to a single occurrence associated with the surface discharge of groundwater supersaturated with dissolved calcium carbonate.
Classification Comments: This type is closely related to Calcareous Fen but differs in the lower total herbaceous cover and the active precipitation of marl deposits.
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).
Plots and Data Sources: DEWA.227.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial graminoid vegetation (V.A.)
Physiognomic Group	Temperate or subpolar grassland with a sparse shrub layer (V.A.7.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar grassland with a sparse shrub layer (V.A.7.N.)
Formation	Saturated temperate or subpolar grassland with a sparse cold-deciduous shrub layer (V.A.7.N.p.)
Alliance	Carex (flava, hystericina, interior, sterilis) Saturated Shrub Herbaceous Alliance (A.1561)
Alliance (English name)	(Yellow Sedge, Bottlebrush Sedge, Inland Sedge, Sterile Sedge) Saturated Shrub Herbaceous Alliance
Association	*Morella pensylvanica* - *Dasiphora fruticosa* ssp. *floribunda* / *Carex sterilis* - *Carex flava* Shrub Herbaceous Vegetation
Association (English name)	Northern Bayberry - Shrubby-cinquefoil / Sterile Sedge - Yellow Sedge Shrub Herbaceous Vegetation
Ecological System(s):	North-Central Appalachian Seepage Fen (CES202.607)

GLOBAL DESCRIPTION

Concept Summary: This calcareous fen association is characterized by herbaceous vegetation maintained by groundwater springs. It is restricted to New Jersey, Pennsylvania, and perhaps New York. Peat accumulation is minimal, with mineral soil or marl often evident at the surface, particularly where groundwater emerges. Although the shrubs are generally sparse (less than 25%), they are characteristic of this vegetation, with *Dasiphora fruticosa* ssp. *floribunda (= Pentaphylloides floribunda)* and *Morella pensylvanica (= Myrica pensylvanica)* common and *Toxicodendron vernix, Acer rubrum,* and *Juniperus virginiana* as frequent associates. Wettest portions of these fens lack woody vegetation. The herbaceous cover is usually about 40%. It is rich and diverse and includes the sedges *Carex sterilis, Carex flava, Carex cryptolepis, Carex tetanica, Rhynchospora capillacea, Rhynchospora alba,* as well as *Parnassia glauca, Sanguisorba canadensis, Drosera rotundifolia, Sarracenia purpurea, Packera aurea (= Senecio aureus), Lobelia kalmii, Panicum flexile, Deschampsia caespitosa, Juncus brachycephalus, Juncus nodosus, Eleocharis tenuis, Muhlenbergia glomerata, Mentha X piperita,* and *Spiranthes*

cernua. The invasive exotic shrubs *Berberis thunbergii* and *Rosa multiflora* may also be present. The diagnostic characteristic is the presence of *Morella pensylvanica* in the shrub layer.
Environmental Description: This community is a spring-fed calcareous fen generally with minimal peat accumulation over mineral soil or marl. Marl is actively deposited, the result of precipitation of calcium carbonate in supersaturated groundwater seepage upslope. Flowing rivulets are common, and the substrate is typically marl and calcium carbonate-coated stones and woody debris.
Vegetation Description: Although the shrubs are generally sparse (less than 25%), they are characteristic of this vegetation, with *Dasiphora fruticosa* ssp. *floribunda (= Pentaphylloides floribunda)* and *Morella pensylvanica (= Myrica pensylvanica)* common and *Toxicodendron vernix, Acer rubrum*, and *Juniperus virginiana* as frequent associates. Wettest portions of these fens lack woody vegetation. The herbaceous cover is usually about 40%. It is rich and diverse and includes the sedges *Carex sterilis, Carex flava, Carex cryptolepis, Carex tetanica, Rhynchospora capillacea, Rhynchospora alba*, as well as *Parnassia glauca, Sanguisorba canadensis, Drosera rotundifolia, Sarracenia purpurea, Packera aurea (= Senecio aureus), Lobelia kalmii, Panicum flexile, Deschampsia caespitosa, Juncus brachycephalus, Juncus nodosus, Eleocharis tenuis, Muhlenbergia glomerata, Mentha X piperita*, and *Spiranthes cernua*. The invasive exotic shrubs *Berberis thunbergii* and *Rosa multiflora* may also be present. The diagnostic characteristic is the presence of *Morella pensylvanica* in the shrub layer.
Most Abundant Species:

Stratum	Lifeform	Species
Short shrub/sapling	Broad-leaved deciduous shrub	*Dasiphora fruticosa* ssp. *floribunda*
Herb (field)	Forb	*Lobelia kalmii, Packera aurea, Parnassia glauca*
Herb (field)	Graminoid	*Carex tetanica, Eleocharis tenuis, Rhynchospora capillacea*

Characteristic Species: *Carex cryptolepis, Carex flava, Carex sterilis, Carex tetanica, Dasiphora fruticosa* ssp. *floribunda, Lobelia kalmii, Muhlenbergia glomerata, Packera aurea, Parnassia glauca, Rhynchospora capillacea.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION
Range: This association is limited to New Jersey and Pennsylvania and possibly southwestern New York.
States/Provinces: NJ:S2, NY?, PA.
Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS
Rank: G2 (12-Jan-1998).
Reasons: This "fen" vegetation type is restricted in distribution to a few calcareous or limestone areas occurring largely in the non glaciated regions of New Jersey and Pennsylvania. There are fewer than 15 known occurrences of this vegetation, with a potential for 5-10 more. The occurrences are generally very small in size, often only an acre or two. Most occurrences are associated with areas of historic or current grazing, which apparently limits shrub establishment. In areas where grazing has been discontinued the fens are often rapidly filling with shrubs,

particularly Cornus (racemosa or sericea). In other areas, disruptions in local hydrology, caused by nearby development has had a negative effect on the condition of some occurrences. These often contain many weedy species, both native and exotic.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: 1 – Strong.
Comments: Information not available.
Similar Associations:

- *Juniperus virginiana / Dasiphora fruticosa* ssp. *floribunda / Carex flava - Carex tetanica* Shrub Herbaceous Vegetation (CEGL006357)--is similar but lacks active marl deposits and *Morella pensylvanica*.

Related Concepts: Information not available

SOURCES

Description Authors: S. L. Neid, mod. S. C. Gawler.
References: Breden et al. 2001, Eastern Ecology Working Group n.d., Fike 1999.

Figure 106. Marl Fen in Delaware Water Gap National Recreation Area (plot DEWA.227). August 2004.