COMMON NAME (PARK-SPECIFIC): WATER-WILLOW EMERGENT BED

SYNONYMS
NVC English Name: **American Water-willow Herbaceous Vegetation**
NVC Scientific Name: ***Justicia americana* Herbaceous Vegetation**
NVC Identifier: **CEGL004286**

LOCAL INFORMATION

Environmental Description: This association is found at the heads of islands, along the edges of bars, banks, terraces, and spits, and in shallow sections of the river channel in the Delaware River. The lower portions of the plants' stems are under water for most of the year, with the tops of the plants emerging above the flowing water. These beds are entirely submerged by most flood events. During extreme low water periods, the soil below the beds can be exposed, showing a varied mixture of sand, gravel, and cobbles, often with deposits of silt and muck.
Vegetation Description: American water-willow (*Justicia americana*) is the dominant species in this association and is often the only species present in a colonial bed. Since American water-willow spreads by rhizomes, the species can form extensive monocultural colonies. Many other herbaceous species may be associates, including rice cutgrass (*Leersia oryzoides*), water knotweed (*Polygonum amphibium*), spikerushes (*Eleocharis* spp.), waterweed (*Elodea* sp.), common threesquare (*Schoenoplectus pungens*), and field horsetail (*Equisetum arvense*). The invasive exotic purple loosestrife (*Lythrum salicaria*) may be common in this vegetation type. Scattered shrub seedlings of black willow (*Salix nigra*), river birch (*Betula nigra*), silver maple (*Acer saccharinum*), or sycamore (*Platanus occidentalis*) may also be present.
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Justicia americana*

Characteristic Species: *Justicia americana, Leersia oryzoides, Polygonum amphibium.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	1	Water-willow Rocky Bar and Shore	Walz et al. 2006
PA	S5	1	Water-willow (*Justicia americana*) - smartweed riverbed	Fike 1999

Local Range: This vegetation type is common throughout the Delaware River.
Classification Comments: This type is distinguished by the clear dominance of *Justicia americana* which is partially submerged for most of the year.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.101, DEWA.104; 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 forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	Justicia americana Temporarily Flooded Herbaceous Alliance (A.1657)
Alliance (English name)	American Water-willow Temporarily Flooded Herbaceous Alliance
Association	*Justicia americana* Herbaceous Vegetation
Association (English name)	American Water-willow Herbaceous Vegetation
Ecological System(s):	Central Appalachian Floodplain (CES202.608)
	Central Appalachian Riparian (CES202.609)
	South-Central Interior Small Stream and Riparian (CES202.706)
	Southern Piedmont Small Floodplain and Riparian Forest (CES202.323)
	Ozark-Ouachita Riparian (CES202.703)
	Cumberland Riverscour (CES202.036)
	South-Central Interior Large Floodplain (CES202.705)

GLOBAL DESCRIPTION

Concept Summary: This association is found primarily in the Piedmont, Central Appalachians, Cumberland Plateau, Interior Low Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. Stands occur on the shoals or bars of rocky streams and riverbeds. It provides habitat in some portions of its range for globally rare dragonflies and herbs. *Justicia americana* is the characteristic dominant. *Saururus cernuus* is often present and may be codominant. Other herbaceous species that may be present include *Leersia oryzoides, Lemna minor, Orontium aquaticum, Podostemum ceratophyllum, Scirpus* sp., *Schoenoplectus pungens, Cyperus* spp., *Eleocharis* spp., *Diodia teres, Gratiola brevifolia*, and *Xyris difformis* var. *difformis*. Exotics include *Lythrum salicaria* and *Lysimachia vulgaris*. A sparse canopy layer, which can include *Carpinus caroliniana* ssp. *caroliniana, Salix interior, Fagus grandifolia*, and *Fraxinus pennsylvanica*, among other species, may be present. Scattered shrub seedlings of *Salix nigra, Betula nigra, Acer saccharinum*, or *Platanus occidentalis* may also be present.

Environmental Description: This association occurs on the shoals or bars of rocky streams and riverbeds, or gravelly sands. The beds are entirely submerged by most flood events. During extreme low water periods, the soil below the beds can be exposed, showing a varied mixture of sand, gravel and cobbles, often with deposits of silt and muck.

Vegetation Description: *Justicia americana* is the characteristic dominant and may be the only species present in a colonial bed. *Saururus cernuus* is often present and may be codominant. Other herbaceous species that may be present include *Leersia oryzoides, Lemna minor, Orontium aquaticum, Podostemum ceratophyllum, Scirpus* sp., *Schoenoplectus pungens, Cyperus* spp., *Elodea* sp., *Eleocharis* spp., *Equisetum arvense, Diodia teres, Gratiola brevifolia*, and *Xyris*

difformis var. *difformis*. Exotics include *Lythrum salicaria* and *Lysimachia vulgaris*. In some areas, *Justicia* usually grows in nearly pure patches, so that few other species are associated with it. *Bidens* spp., *Cuscuta gronovii, Mimulus ringens, Polygonum* spp., *Rumex* spp., and *Salix interior* can occur (Anderson 1982). A sparse canopy layer may be present, which can include *Carpinus caroliniana, Fagus grandifolia*, and *Fraxinus pennsylvanica*, among others. Scattered shrub seedlings of *Salix nigra, Betula nigra, Acer saccharinum*, or *Platanus occidentalis* may also be present. In the Cumberland Plateau of Alabama, *Justicia americana* is present in dense patches with some interspersion of other species, including *Pilea pumila, Boehmeria cylindrica, Eclipta prostrata (= Eclipta alba), Juncus coriaceus, Mikania scandens, Ludwigia palustris, Leersia* sp., and *Bidens* sp. Schmalzer and DeSelm (1982) discuss *Orontium aquaticum* growing along streambanks or in shallow riffles "along or with" *Justicia americana* in the Obed River in the Cumberland Plateau of Tennessee.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Justicia americana*

Characteristic Species: *Justicia americana, Leersia oryzoides, Polygonum amphibium, Saururus cernuus, Schoenoplectus pungens.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This type is found primarily in the Piedmont, Interior Low Plateau, Cumberland Plateau, Ozarks, Ouachita Mountains, and adjacent provinces. It ranges from Alabama, Georgia and the Carolinas west to Arkansas and Oklahoma and north to Ohio, Pennsylvania, and Delaware.

States/Provinces: AL, AR, GA, KY, MD?, NC, NJ, OH:S4, OK, PA, SC?, TN, VA?, WV.

Federal Lands: NPS (Big South Fork, Delaware Water Gap, Little River Canyon?, Mammoth Cave, Natchez Trace, New River Gorge, Obed, Stones River); USFS (Bankhead, Cherokee, Daniel Boone, Oconee?, Ouachita, Ozark, Pisgah, Sumter?, Uwharrie).

CONSERVATION STATUS

Rank: G4G5 (12-Sep-1997).

Reasons: Information not available.

CLASSIFICATION INFORMATION

Status: Standard.

Confidence: 2 – Moderate.

Comments: This type, in Ohio, often forms pure patches, but consistent identification may require a simple cutoff rule, such as at least 50% cover of *Justicia* (Anderson 1982). However, Anderson (1996) no longer recognizes this type.

Similar Associations:

- *Hymenocallis coronaria* - *Justicia americana* Herbaceous Vegetation (CEGL004285).

Related Concepts:

- Aquatic Types (Schmalzer and DeSelm 1982) B
- IIE3a. Riverside Shoal and Stream Bar Complex (Allard 1990) B
- Lizard's tail emergent bed (Perles et al. 2004) ?
- Rocky Bar and Shore (Water Willow Subtype) (Schafale 1998b) ?
- Water willow emergent bed (Perles et al. 2004) ?

SOURCES

Description Authors: A. S. Weakley, mod. D. Faber-Langendoen and S. C. Gawler.

References: Allard 1990, Anderson 1982, Anderson 1996, Fike 1999, Fleming et al. 2001, Harrison 2004, Hoagland 1997, Hoagland 2000, Major et al. 1999, McCoy 1958, Nelson 1986, OHNHD unpubl. data, Palmer-Ball et al. 1988, Peet et al. unpubl. data 2002, Penfound 1953, Perles et al. 2004, Schafale 1998b, Schafale 2002, Schafale and Weakley 1990, Schmalzer and DeSelm 1982, Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data.

Figure 107. Water-willow Emergent Bed in Delaware Water Gap National Recreation Area (plot DEWA.101). August 2003.

Figure 108. Water-willow Emergent Bed in Delaware Water Gap National Recreation Area (plot DEWA.104). August 2003.

COMMON NAME (PARK-SPECIFIC): JAPANESE KNOTWEED HERBACEOUS VEGETATION

SYNONYMS
NVC English Name: **Japanese Knotweed Temporarily Flooded Herbaceous Vegetation**
NVC Scientific Name: ***Polygonum cuspidatum* Temporarily Flooded Herbaceous Vegetation**
NVC Identifier: **CEGL008472**

LOCAL INFORMATION

Environmental Description: This vegetation type occurs on islands and 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. These sites are subject to frequent floods and scour.
Vegetation Description: This vegetation type is typically a near monoculture of the invasive species Japanese knotweed (*Polygonum cuspidatum*), covering 50-100% of the area. Giant knotweed (*Polygonum sachalinense*) or a hybrid of Japanese knotweed and giant knotweed may also be present. Other typical riparian species can persist beneath and around the knotweed, including touch-me-nots (*Impatiens* spp.), garlic mustard (*Alliaria petiolata*), Japanese stiltgrass (*Microstegium vimineum*), reed canarygrass (*Phalaris arundinacea*), whitegrass (*Leersia virginica*), marshpepper knotweed (*Polygonum hydropiper*), swamp smartweed (*Polygonum hydropiperoides*), Jack-in-the-pulpit (*Arisaema triphyllum*), spotted ladysthumb (*Polygonum persicaria*), and smallspike false nettle (*Boehmeria cylindrica*).
Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Polygonum cuspidatum*

Characteristic Species: *Polygonum cuspidatum.*
Other Noteworthy Species: Information not available.
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNA	2	Japanese Knotweed Rivershore	Walz et al. 2006
PA	SNA	1	no crosswalk	Fike 1999

Local Range: This vegetation type occurs on islands and along the shoreline of the Delaware River.
Classification Comments: This type is distinguished by the extremely high cover of *Polygonum cuspidatum*, covering greater than 50% of the area in a non-forested riparian setting.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: Accuracy Assessment Observation Points DEWA.155, DEWA.177, DEWA.993; Podniesinski and Wagner 2002, 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 forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Temporarily flooded temperate perennial forb vegetation (V.B.2.N.d.)
Alliance	Polygonum cuspidatum Temporarily Flooded Herbaceous Alliance (A.2005)
Alliance (English name)	Japanese Knotweed Temporarily Flooded Herbaceous Alliance
Association	*Polygonum cuspidatum* Temporarily Flooded Herbaceous Vegetation
Association (English name)	Japanese Knotweed Temporarily Flooded Herbaceous Vegetation
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: Examples of this vegetation type are significant (monocultural) stands of the exotic forb *Polygonum cuspidatum*, which are found in temporarily flooded habitats such as scour bars. These disturbed habitats flood very frequently and have lots of light and rocky or sandy soil. Stands of this vegetation may be dense and shrubby, or somewhat more open. Species diversity is low, as the patches of *Polygonum* shade out other plant species. This vegetation ranges across the Southeast north at least to Pennsylvania and New Jersey. In North Carolina, this vegetation is found on scour bars and low rocky banks of the Nolichucky and French Broad rivers. In Kentucky, *Polygonum cuspidatum* is found primarily along disturbed riverbanks and bars mostly in the Cumberland Plateau and Cumberland Mountains where it can form pure, dense stands.

Environmental Description: Stands of this type are found in temporarily flooded habitats such as scour bars. These disturbed areas flood very frequently and have lots of light and rocky or sandy soil. In North Carolina, it is found on scour bars and low rocky banks of the Nolichucky and French Broad rivers (B. Brown pers. comm. 2001). In Kentucky, Polygonum cuspidatum is found primarily along disturbed riverbanks and bars mostly in the Cumberland Plateau and Cumberland Mountains where it can form pure, dense stands (M. Evans pers. comm. 2001).

Vegetation Description: These are primarily monospecific stands of *Polygonum cuspidatum* with few other plant species. Some disturbance-oriented forbs may be present, such as *Impatiens* spp., *Phalaris arundinacea*, *Leersia virginica*, *Polygonum hydropiper*, *Polygonum hydropiperoides*, *Polygonum persicaria*, and *Boehmeria cylindrica*, along with seedlings of some woody plants (e.g., *Platanus occidentalis*, *Salix nigra*). The invasive exotic herbs *Alliaria petiolata* and *Microstegium vimineum* may be present.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Polygonum cuspidatum*

Characteristic Species: *Polygonum cuspidatum.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This vegetation is potentially found anywhere in the southeastern and mid-Atlantic United States where the exotic rhizomatous forb Polygonum cuspidatum has formed significant (monocultural) stands. This includes at least Alabama, Georgia, Kentucky, Maryland, New Jersey, North Carolina, Pennsylvania, South Carolina, Tennessee, and Virginia.
States/Provinces: AL, GA, KY, NC, NJ, PA, SC, TN, VA.
Federal Lands: NPS (Allegheny Portage Railroad, Delaware Water Gap); USFS (Cherokee?, Daniel Boone).

CONSERVATION STATUS

Rank: GNA (invasive) (31-May-2001).
Reasons: This vegetation is composed of and dominated by a species which is not native to North America.

CLASSIFICATION INFORMATION

Status: Standard.
Confidence: Information not available.
Comments: This species has also been treated as *Reynoutria japonica*.
Similar Associations: Information not available.
Related Concepts: Information not available.

SOURCES

Description Authors: M. Pyne, mod. S. C. Gawler.
References: Brown pers. comm., Evans pers. comm., Schafale pers. comm., Schotz pers. comm., Southeastern Ecology Working Group n.d., TDNH unpubl. data, Perles et al. 2004, Podniesinski and Wagner 2002.

Figure 109. Japanese Knotweed Herbaceous Vegetation in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.992). June 2006.

COMMON NAME (PARK-SPECIFIC): MIXED FORB MARSH

SYNONYMS

NVC English Name: **Nodding Beggarticks - Swamp Verbena - Smartweed species Herbaceous Vegetation**

NVC Scientific Name: ***Bidens cernua - Verbena hastata - Polygonum* spp. Herbaceous Vegetation [Provisional]**

NVC Identifier: **CEGL006446**

LOCAL INFORMATION

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

Vegetation Description: The species composition of these wetlands is highly variable, though always dominated by hydrophilic species tolerant of standing water. Some common dominants include needle spikerush (*Eleocharis acicularis*), swamp verbena (*Verbena hastata*), nodding beggartick (*Bidens cernua*), rice cutgrass (*Leersia oryzoides*), marshpepper knotweed (*Polygonum hydropiper*), arrowleaf tearthumb (*Polygonum sagittatum*), field horsetail (*Equisetum arvense*), New England aster (*Symphyotrichum novae-angliae*), owlfruit sedge (*Carex stipata*), and marsh seedbox (*Ludwigia palustris*). Other common associates are tussock sedge (*Carex stricta*), jewelweed (*Impatiens capensis*), northern bugleweed (*Lycopus uniflorus*), fowl mannagrass (*Glyceria striata*), purplestem beggarticks (*Bidens connata*), strawcolored flatsedge (*Cyperus strigosus*), ovate spikerush (*Eleocharis ovata*), common marsh bedstraw (*Galium palustre*), sensitive fern (*Onoclea sensibilis*), and blue skullcap (*Scutellaria lateriflora*). The invasive species purple loosestrife (*Lythrum salicaria*) can from monocultures in this association. Japanese stiltgrass (*Microstegium vimineum*) is another invasive species that can be abundant in these wetlands.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Bidens cernua, Verbena hastata*
Herb (field)	Graminoid	*Eleocharis acicularis, Leersia oryzoides*

Characteristic Species: *Bidens cernua, Carex stipata, Eleocharis acicularis, Equisetum arvense, Ludwigia palustris, Polygonum hydropiper, Polygonum sagittatum, Symphyotrichum novae-angliae, Verbena hastata.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	SNR	2	Mixed Forb Basin Marsh	Walz et al. 2006
PA	S4	3	Mixed forb marsh	Fike 1999

Local Range: These wetlands occur in depressions, drainages, and basins that contain ponded water throughout the park. They are most common in the swales that occur on the Hogback and Walpack Ridges in Pennsylvania and New Jersey, respectively.
Classification Comments: Mixed Forb Marsh has highly variable species composition; however, it is distinguished from other palustrine types by the year-round ponded water and the associated hydrophilic species that are tolerant of standing water. These wetlands are not dominated by *Typha* spp. [see Cattail Marsh]. This type lacks shrubs and other woody species. The description provided here departs from Mixed Forb Marsh described in Fike (1999) by including graminoid species and specifying ponded hydrology.
Other Comments: None.
Local Description Authors: S. J. Perles (PNHP).
Plots and Data Sources: DEWA.25, DEWA.164, DEWA.170; 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 forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Semipermanently flooded temperate perennial forb vegetation (V.B.2.N.e.)
Alliance	Pontederia cordata - Peltandra virginica Semipermanently Flooded Herbaceous Alliance (A.1669)
Alliance (English name)	Pickerelweed - Green Arrow-arum Semipermanently Flooded Herbaceous Alliance
Association	*Bidens cernua* - *Verbena hastata* - *Polygonum* spp. Herbaceous Vegetation [Provisional]
Association (English name)	Nodding Beggarticks - Swamp Verbena - Smartweed species Herbaceous Vegetation
Ecological System(s):	Laurentian-Acadian Freshwater Marsh (CES201.594)

GLOBAL DESCRIPTION

Concept Summary: Information not available.
Environmental Description: Information not available.
Vegetation Description: Information not available.
Most Abundant Species: Information not available.
Characteristic Species: Information not available.
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION

Range: This community is described from Pennsylvania and New Jersey and probably ranges northward.
States/Provinces: CT?, MA?, NJ, NY?, PA, RI?, VT?
Federal Lands: NPS (Delaware Water Gap).

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

CLASSIFICATION INFORMATION
Status: Provisional.
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., Fike 1999.

Figure 110. Mixed Forb Marsh in Delaware Water Gap National Recreation Area (plot DEWA.164). August 2003.

Figure 111. Mixed Forb Marsh in Delaware Water Gap National Recreation Area (plot DEWA.170). September 2003.

COMMON NAME (PARK-SPECIFIC): CALCAREOUS SEEP

SYNONYMS

NVC English Name:	**New York Ironweed - Eastern Marsh Fern - Skunk-cabbage Herbaceous Vegetation**
NVC Scientific Name:	***Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation**
NVC Identifier:	**CEGL006448**

LOCAL INFORMATION

Environmental Description: These small wetlands typically occur in small patches (0.1 hectare) where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm). Two known locations for this type are underlain by calcareous limestone (Devonian Buttermilk Falls Formation) and calcareous siltstone and shale (Devonian Oriskany group).

Vegetation Description: This association is characterized by a highly variable species composition. Tall shrubs may be present at low cover (<10%) and may include willows (*Salix* spp.), northern spicebush (*Lindera benzoin*), and poison sumac (*Toxicodendron vernix*). The short-shrub layer is also sparse (<15% total cover) and is often dominated by willows. Both the tall- and short-shrub layers may contain invasive shrubs, especially multiflora rose (*Rosa multiflora*), Morrow's honeysuckle (*Lonicera morrowii*), and Japanese barberry (*Berberis thunbergii*). Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include New York ironweed (*Vernonia noveboracensis*), eastern marsh fern (*Thelypteris palustris*), violets (*Viola* spp.), golden ragwort (*Packera aurea*), skunk-cabbage (*Symplocarpus foetidus*), Jack in the pulpit (*Arisaema triphyllum*), American marshpennywort (*Hydrocotyle americana*), thoroughworts (*Eupatorium* spp.), touch-me-nots (*Impatiens* spp.), whorled mountainmint (*Pycnanthemum verticillatum*), American hogpeanut (*Amphicarpaea bracteata*), twoleaf miterwort (*Mitella diphylla*), and white turtlehead (*Chelone glabra*). Typical graminoid species include bristlystalked sedge (*Carex leptalea*), limestone meadow sedge (*Carex granularis*), prickly bog sedge (*Carex atlantica*), white edge sedge (*Carex debilis*), Japanese stiltgrass (*Microstegium vimineum*), rice cutgrass (*Leersia oryzoides*), and fowl bluegrass (*Poa palustris*). Purple loosestrife (*Lythrum salicaria*) may be present in more open seeps. Mosses are usually present but are a minor component of the vegetation (typically <5% of total vegetation cover).

Most Abundant Species:

Stratum	Lifeform	Species
Tall shrub/sapling	Broad-leaved deciduous shrub	*Salix* spp., *Lindera benzoin*, *Toxicodendron vernix*
Short shrub/sapling	Broad-leaved deciduous shrub	*Salix* spp.
Herb (field)	Forb	*Amphicarpaea bracteata*, *Hydrocotyle americana*, *Packera aurea*, *Symplocarpus foetidus*, *Vernonia noveboracensis*

Herb (field)	Graminoid	*Carex debilis*, *Leersia oryzoides*
Herb (field)	Fern or fern ally	*Thelypteris palustris*

Characteristic Species: *Salix* spp., *Carex debilis, Hydrocotyle americana, Leersia oryzoides, Lindera benzoin, Packera aurea, Symplocarpus foetidus, Thelypteris palustris, Vernonia noveboracensis, Viola* spp.

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S1S2	2	Rich Seepage Marsh	Walz et al. 2006
PA	S2	1	Golden ragwort - sedge rich seep	Fike 1999

Local Range: These wetlands are known from the New Jersey portion of the Walpack Ridge and Shoemakers Swamp in Pennsylvania, but may occur throughout the park where mineral-rich groundwater seepage occurs.

Classification Comments: This type differs from the marl and calcareous fen types in having fewer calciphilic plant species. Hydrology and groundwater pH differentiate the Calcareous Seep from the more common and generic Wet Meadow. The Calcareous Seep has base-rich groundwater discharge (alkaline to circumneutral) present throughout the growing season, whereas the hydrology in a Wet Meadow is not necessarily groundwater seepage, is typically circumneutal, and usually becomes dry later in the growing season. In addition, the Calcareous Seep typically occurs as a small patch (0.1 ha) embedded in a forested setting, while Wet Meadows are typically of larger size and not overtopped by forest canopy.

Other Comments: None.

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

Plots and Data Sources: DEWA.223; Fike 1999, Wagner and Leimanis 1998.

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

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Herbaceous Vegetation (V)
Physiognomic Subclass	Perennial forb vegetation (V.B.)
Physiognomic Group	Temperate or subpolar perennial forb vegetation (V.B.2.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar perennial forb vegetation (V.B.2.N.)
Formation	Saturated temperate perennial forb vegetation (V.B.2.N.f.)
Alliance	Symplocarpus foetidus - Caltha palustris Saturated Herbaceous Alliance (A.1694)
Alliance (English name)	Skunk-cabbage - Yellow Marsh-marigold Saturated Herbaceous Alliance
Association	*Vernonia noveboracensis - Thelypteris palustris - Symplocarpus foetidus* Herbaceous Vegetation
Association (English name)	New York Ironweed - Eastern Marsh Fern - Skunk-cabbage Herbaceous Vegetation
Ecological System(s):	Information not available

GLOBAL DESCRIPTION

Concept Summary: These small wetlands (0.1 ha) occur as patches within the forest matrix where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm). This association is characterized by a highly variable species composition. Tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. The shrub layers may contain invasive shrubs, especially *Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla*, and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides*, and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present, the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.

Environmental Description: These small wetlands (0.1 ha) occur where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm).

Vegetation Description: This association is characterized by a highly variable species composition. Tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. The shrub layers may contain invasive shrubs, especially *Rosa multiflora, Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla*, and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides*, and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present, the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.

Most Abundant Species:

Stratum	Lifeform	Species
Herb (field)	Forb	*Amphicarpaea bracteata, Hydrocotyle americana, Packera aurea, Symplocarpus foetidus, Vernonia noveboracensis*
Herb (field)	Graminoid	*Leersia oryzoides*
Herb (field)	Fern or fern ally	*Thelypteris palustris*

Characteristic Species: *Carex debilis, Hydrocotyle americana, Leersia oryzoides, Lindera benzoin, Packera aurea, Symplocarpus foetidus, Thelypteris palustris, Toxicodendron vernix, Vernonia noveboracensis.*
Other Noteworthy Species: Information not available.
USFWS Wetland System: Palustrine.

DISTRIBUTION
Range: This community is currently known from New Jersey and Pennsylvania and is possible over a larger area.
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:
- *Caltha palustris - Impatiens capensis - Viola cucullata* Herbaceous Vegetation [Provisional] (CEGL006258)--are woodland seeps that are less species-rich and with fewer calciphiles.
- *Symplocarpus foetidus - Impatiens capensis* Herbaceous Vegetation [Provisional] (CEGL006567).

Related Concepts: Information not available.

SOURCES
Description Authors: S. C. Gawler.
References: Eastern Ecology Working Group n.d., Fike 1999.

Figure 112. Calcareous Seep in Delaware Water Gap National Recreation Area (plot DEWA.223). August 2004.

COMMON NAME (PARK-SPECIFIC): SANDSTONE TALUS

SYNONYMS

NVC English Name: **(Toadskin Lichen, Pennsylvania Toadskin Lichen) - Golden Moonglow Lichen - Culberson's Black-parmelia Nonvascular Vegetation**

NVC Scientific Name: ***Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)*** **Nonvascular Vegetation**

NVC Identifier: **CEGL004142**

LOCAL INFORMATION

Environmental Description: This association typically occurs on very steep, typically south- to southeast-facing slopes of Kittatinny Ridge composed of coarse, bouldery sandstone talus. The parent material is sandstone and sandstone conglomerate of the Silurian Shawangunk Formation. There is little available soil except for small amounts of accumulated organic matter in crevices. The slopes appear unstable, though the frequency of rockslides is uncertain.

Vegetation Description: The species composition of this type is dominated by drought-tolerant species. Tree and shrub species, when present, are often stunted. Canopy cover is variable from 0-50% and is often dominated by sweet birch (*Betula lenta*). Other canopy associates may include chestnut oak (*Quercus prinus*), black oak (*Quercus velutina*), scarlet oak (*Quercus coccinea*), northern red oak (*Quercus rubra*), pignut hickory (*Carya glabra*) red hickory (*Carya ovalis*), and black walnut (*Juglans nigra*). Tree canopy height ranges from 5 to 20 m. The shrub layer is very sparse and typically consists of scattered tree saplings and drought-tolerant shrubs. Typical shrub layer species include American witch-hazel (*Hamamelis virginiana*), American chestnut (*Castanea dentata*), mountain laurel (*Kalmia latifolia*), common serviceberry (*Amelanchier arborea*), and saplings of sassafras (*Sassafras albidum*), sweet birch and other canopy trees. The herbaceous layer is typically sparse to absent. Vines are often present at low cover and may include eastern poison-ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), and summer grape (*Vitis aestivalis*). Lichen cover is typically high on boulders.

Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula lenta, Quercus* spp., *Carya* spp.
Shrub/sapling (tall & short)	Broad-leaved evergreen shrub	*Kalmia latifolia*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Hamamelis virginiana*
Short shrub/sapling	Broad-leaved deciduous shrub	*Betula lenta*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia, Toxicodendron radicans, Vitis aestivalis*

Characteristic Species: *Betula lenta, Quercus* spp., *Kalmia latifolia, Toxicodendron radicans, Vitis aestivalis.*

Other Noteworthy Species: Information not available.

Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S3?	2	Central Appalachian Talus Slope	Walz et al 2006
PA	S3	1	no crosswalk	Fike 1999

Local Range: This type is common on the steep south- and southeast-facing slopes of Kittatinny Ridge. Excellent large examples occur near the Delaware Water Gap.
Classification Comments: This type is variable in composition but is best defined by the substrate (coarse, bouldery sandstone talus) and sparse vegetation. Areas of talus with greater than 50% canopy cover are considered Oak - Birch Talus Forest. Similar boulderfields occur elsewhere in the park, particularly on the north- and northwest-facing slopes of Kittatinny Ridge, but these boulderfields typically have a closed canopy and are considered Oak - Birch Talus Forest. Similar boulderfields also occur in depression on the top of Kittatinny Ridge, however, these hold water seasonally and are classified as Boulderfield Vernal Pool Sparse Vegetation.
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).
Plots and Data Sources: DEWA.236.
Delaware Water Gap National Recreation Area Inventory Notes: Information not available.

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Nonvascular Vegetation (VI)
Physiognomic Subclass	Lichen vegetation (VI.B.)
Physiognomic Group	Temperate or subpolar lichen vegetation (VI.B.1.)
Physiognomic Subgroup	Natural/Semi-natural temperate or subpolar lichen vegetation (VI.B.1.N.)
Formation	Alpine to submontane temperate or subpolar lichen vegetation (VI.B.1.N.b.)
Alliance	Lasallia (papulosa, pensylvanica) Nonvascular Alliance (A.1824)
Alliance (English name)	(Toadskin Lichen, Pennsylvania Toadskin Lichen) Nonvascular Alliance
Association	*Lasallia (papulosa, pensylvanica) - Dimelaena oreina - (Melanelia culbersonii)* Nonvascular Vegetation
Association (English name)	(Toadskin Lichen, Pennsylvania Toadskin Lichen) - Golden Moonglow Lichen - Culberson's Black-parmelia Nonvascular Vegetation
Ecological System(s):	North-Central Appalachian Acidic Cliff and Talus (CES202.601)

GLOBAL DESCRIPTION

Concept Summary: These small wetlands (0.1 ha) occur as patches within the forest matrix where calcareous groundwater discharge is present throughout the growing season. The substrate may vary from mineral soils to sapric peat (muck). Peat deposits, when present, are generally thin (<50 cm). This association is characterized by a highly variable species composition. Tall shrubs may be present at low cover (<10%) and include *Salix* spp., *Lindera benzoin*, and *Toxicodendron vernix*. The short-shrub layer is also sparse and often dominated by willows. The shrub layers may contain invasive shrubs, especially *Rosa multiflora*, *Lonicera morrowii*, and *Berberis thunbergii*. Open sites with little or no woody plant cover often are dominated by

graminoids, while more shaded sites have a higher cover of forb species. Herbaceous vegetation typically exceeds 90% and may reach 2 m in height in some forb species. Typical forb species include *Vernonia noveboracensis, Thelypteris palustris, Viola* spp., *Packera aurea (= Senecio aureus), Symplocarpus foetidus, Arisaema triphyllum, Hydrocotyle americana, Eupatorium* spp., *Impatiens* spp., *Pycnanthemum verticillatum, Amphicarpaea bracteata, Mitella diphylla*, and *Chelone glabra*. Typical graminoid species include *Carex leptalea, Carex granularis, Carex atlantica, Carex debilis, Leersia oryzoides*, and *Poa palustris*. The invasive plants *Lythrum salicaria* and *Microstegium vimineum* may be present, the former particularly in more open seeps. Mosses are usually present but are typically <5% of total vegetation cover.

Environmental Description: This association occurs primarily on fully exposed, minimally weathered quartzite and sandstone boulderfields at low and middle elevations of the northern Blue Ridge, Ridge and Valley, and adjacent foothills of the upper Piedmont. A few occurrences have also been noted on boulderfields composed of acidic granitic rocks (e.g., on Old Rag Mountain in Shenandoah National Park). The known elevation range is from about 300 to 1000 m (1000-3300 feet). Aspect is variable among sites, but slopes are typically steep to very steep (often >30 degrees). Block size is highly variable, from relatively small and loose stones (<1 m in diameter) to large, stable boulders (>1 m in diameter). Although this association is most extensive on boulder deposits, it may also occur on outcrops associated with the boulderfields, or on very large, exposed cliffs. There is little or no available soil except for occasional small deposits of organic matter in crevices.

Vegetation Description: On the largest occurrences, vascular plants are generally absent and lichens dominate. Maximum patch size is about ten acres, but most patches are considerably smaller. *Lasallia papulosa* and *Lasallia pensylvanica*, either singly or in combination, are generally abundant and conspicuous. *Dimelaena oreina* abundantly covers many dry, exposed rock surfaces that are not covered with *Lasallia* spp. and larger foliose lichens. Although of scattered occurrence, *Melanelia culbersonii* has been found across the full elevation range of the type and is a good diagnostic species, as it appears to be restricted mostly to siliciclastic rocks (and occasionally coarse-grained, quartz-rich granites that are nearly devoid of dark minerals) in this region. Other minor umbilicate and foliose species include *Hypogymnia physodes, Physcia subtilis, Umbilicaria muehlenbergii, Xanthoparmelia conspersa*, and *Xanthoparmelia plittii*. Many crustose species occur, including *Aspicilia cinerea, Fuscidea recensa, Lecanora* spp., *Lepraria* spp., *Rhizocarpon obscuratum (= Rhizocarpon reductum)*, and *Sarcogyne clavus*. Flat surfaces and interstices that have thin deposits of organic matter often support a variety of fruticose lichens, including *Cladina rangiferina, Cladina uncialis, Cladonia crispata, Cladonia macilenta, Cladonia ochrochlora*, and *Cladonia squamosa*. In the upper elevation range, boreal lichens such as *Melanelia stygia* and *Arctoparmelia centrifuga* are present, but they are not abundant. Along the edges of the boulderfields, scattered individuals of *Parthenocissus quinquefolia, Vaccinium* spp., and other vascular plants may occur in transition zones with forests or woodlands. Smaller, more marginal occurrences frequently have sparse vascular plant cover, primarily stunted trees of *Betula lenta, Sassafras albidum, Quercus prinus, Quercus coccinea, Quercus velutina, Carya glabra*, and *Carya ovalis*. Widely scattered shrubs may include *Kalmia latifolia* and other ericads. Herbs are usually absent, but *Dicentra eximia* is known from some occurrences.

Most Abundant Species: Information not available.

Characteristic Species: Information not available.

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This community is currently known from New Jersey and Pennsylvania and is possible over a larger area.
States/Provinces: MD, NJ, PA, VA, WV.
Federal Lands: NPS (Catoctin Mountain, Delaware Water Gap, Shenandoah); USFS (George Washington, Jefferson, Monongahela?).

CONSERVATION STATUS

Rank: G4? (28-Nov-2006).
Reasons: Although aggregate acreage is not large, there are probably several hundred occurrences of this association in Virginia alone, with many more known from or likely in adjacent states. Habitats are typically remote, extremely steep and difficult to traverse, minimizing potential human threats.

CLASSIFICATION INFORMATION

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

- *Lasallia papulosa* - *Lasallia pensylvanica* Nonvascular Vegetation (CEGL004385)--of quartzite cliffs in the western North Carolina Piedmont.
- *Lasallia papulosa* - *Stereocaulon glaucescens* - *Chrysothrix chlorina* Nonvascular Vegetation (CEGL004143)--occurs on mafic (metabasaltic) boulderfields of the northern Blue Ridge.
- *Umbilicaria muehlenbergii* - *Lasallia papulosa* - *(Melanelia stygia)* Nonvascular Vegetation (CEGL004389)--occurs at higher elevations in the same region and has different dominant species.

Related Concepts: Information not available.

SOURCES

Description Authors: G. P. Fleming.
References: Eastern Ecology Working Group n.d., Fleming et al. 2006, Flenniken 1999.

Figure 113. Sandstone Talus in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.187). March 2006.

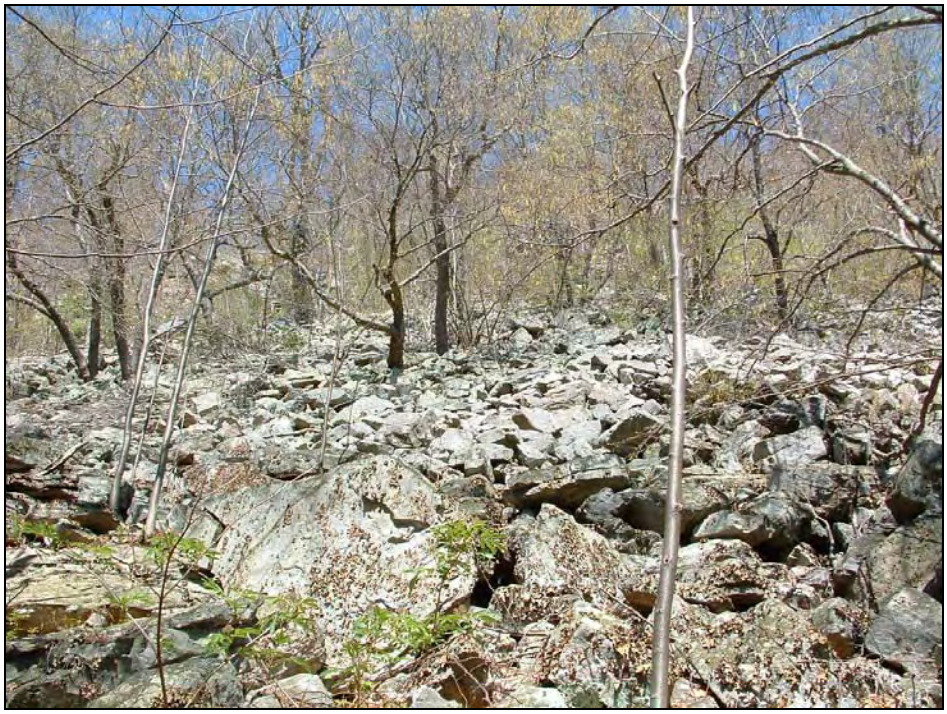

Figure 114. Sandstone Talus in Delaware Water Gap National Recreation Area (Accuracy Assessment Observation Point DEWA.180). April 2006.

COMMON NAME (PARK-SPECIFIC): SPARSELY VEGETATED CLIFF

SYNONYMS
NVC English Name: **Eastern Red-cedar - Rock Harlequin Cliff Sparse Vegetation**
NVC Scientific Name: ***Juniperus virginiana - Corydalis sempervirens* Cliff Sparse Vegetation**
NVC Identifier: **CEGL006422**

LOCAL INFORMATION

Environmental Description: This association occurs on south- to southeast-facing acidic sandstone bedrock outcrops (Devonian Shawangunk Formation) along the Kittatinny Ridge and acidic to circumneutral shale and siltstone cliffs along the eastern edge of the Glaciated Low Plateau. The outcrops are typically vertical to near vertical. Vegetation habitat is restricted to narrow ledges and crevices in the rock face. These cliffs often occur immediately below Hickory - Eastern Red-cedar Rocky Woodlands that persist at the top of the cliff.
Vegetation Description: This vegetation type is characterized by sparse vegetation growing on narrow ledges or from bedrock crevices. The vegetation can vary greatly in composition but is generally limited to drought-tolerant species. Trees are typically absent or, when present, are usually stunted and less than 10 m in height. Occasional trees include eastern red-cedar (*Juniperus virginiana*), white ash (*Fraxinus americana*), red hickory (*Carya ovalis*), pignut hickory (*Carya glabra*), and chestnut oak (*Quercus prinus*). Tall-shrub/sapling layer (2 to 5 m in height) may include occasional bear oak (*Quercus ilicifolia*), black cherry (*Prunus serotina*), and other tree saplings. The short-shrub layer (<2 m in height), when present, is variable and may include tree saplings, sumacs (*Rhus* spp.), Allegheny blackberry (*Rubus allegheniensis*), Carolina rose (*Rosa carolina*), and Blue Ridge blueberry (*Vaccinium pallidum*). The herb layer can be very diverse, but the total cover is usually very low, ranging from <1% to as high as 40% total cover. Typical species are wavy hairgrass (*Deschampsia flexuosa*), little bluestem (*Schizachyrium scoparium*), smooth crabgrass (*Digitaria ischaemum*), poverty oatgrass (*Danthonia spicata*), and eastern hayscented fern (*Dennstaedtia punctilobula*). Occasional herbaceous species include eastern prickly-pear (*Opuntia humifusa*), rusty woodsia (*Woodsia ilvensis*), hairy lipfern (*Cheilanthes lanosa*), rock harlequin (*Corydalis sempervirens*), red columbine (*Aquilegia canadensis*), early saxifrage (*Saxifraga virginiensis*), and moss phlox (*Phlox subulata*). Vines may be present, typically summer grape (*Vitis aestivalis*) and Virginia creeper (*Parthenocissus quinquefolia*). Lichens are usually present and often abundant on bare rock.
Most Abundant Species:

Stratum	Lifeform	Species
Tree canopy	Broad-leaved deciduous tree	*Betula lenta*, *Carya glabra*, *Carya ovalis*
Tall shrub/sapling	Needle-leaved shrub	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Betula lenta*
Short shrub/sapling	Broad-leaved deciduous shrub	*Acer rubrum*, *Rhus copallina*, *Rubus allegheniensis*, *Vaccinium pallidum*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia*, *Vitis aestivalis*

Herb (field)	Graminoid	*Danthonia spicata, Deschampsia flexuosa, Digitaria ischaemum, Schizachyrium scoparium*
Herb (field)	Fern or fern ally	*Dennstaedtia punctilobula*

Characteristic Species: *Betula lenta, Deschampsia flexuosa, Digitaria ischaemum, Schizachyrium scoparium, Danthonia spicata.*
Other Noteworthy Species: *Opuntia humifusa, Asplenium montanum.*
Subnational Distribution with Crosswalk data:

State	State Rank	Confidence	State Name	Reference
NJ	S3?	1	Eastern Temperate Acidic Cliff	Walz et al. 2006
PA	S3	1	no crosswalk	Fike 1999

Local Range: Restricted to sandstone cliffs on Kittatinny Ridge and shale cliffs along the eastern edge of the Glaciated Low Plateau with south and southeast aspect.
Classification Comments: Key features of this type are sparse vegetation and vertical to near-vertical sandstone outcrops and cliffs associated with Kittatinny Ridge and sparsely vegetated near-vertical shale cliffs associated with the eastern edge of the Glaciated Low Plateau. Actual species composition is variable given the limited habitat to support vegetation and the unpredictable nature of plant colonization and establishment.
Other Comments: None.
Local Description Authors: G. S. Podniesinski (PNHP).
Plots and Data Sources: DEWA.229, DEWA.230, DEWA235; Podniesinski 1999, Podniesinski and Kunsman 1999.

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

GLOBAL INFORMATION

NVC CLASSIFICATION

Physiognomic Class	Sparse Vegetation (VII)
Physiognomic Subclass	Consolidated rock sparse vegetation (VII.A.)
Physiognomic Group	Sparsely vegetated cliffs (VII.A.1.)
Physiognomic Subgroup	Natural/Semi-natural sparsely vegetated cliffs (VII.A.1.N.)
Formation	Cliffs with sparse vascular vegetation (VII.A.1.N.a.)
Alliance	Open Cliff Sparsely Vegetated Alliance (A.1836)
Alliance (English name)	Open Cliff Sparsely Vegetated Alliance
Association	*Juniperus virginiana* - *Corydalis sempervirens* Cliff Sparse Vegetation
Association (English name)	Eastern Red-cedar - Rock Harlequin Cliff Sparse Vegetation
Ecological System(s):	North-Central Appalachian Acidic Cliff and Talus (CES202.601)

GLOBAL DESCRIPTION

Concept Summary: This sparsely vegetated cliff association occurs in the oak - pine - hemlock forest region of the northeastern U.S. The setting is dry vertical exposures of resistant acidic bedrock such as granite, quartzite, sandstone, shale or schist, with little or no soil development. These cliffs are mostly dry but may contain small areas of seepy conditions, with associated floristic variation. The patchy vegetation is restricted to cracks and crevices and can vary from

well-vegetated to barren across the cliff face. In most cases, overall cover averages less than 25%. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical tree species include *Juniperus virginiana, Fraxinus americana, Acer rubrum*, and *Betula papyrifera*; none usually grow very large. Individuals of additional tree species from the surrounding forest may also be present; these include *Tsuga canadensis, Quercus* spp., and *Carya* spp. *Rubus odoratus, Rubus allegheniensis*, and *Rhus copallinum* are representative shrubs. Woody vines include *Vitis aestivalis* and *Parthenocissus quinquefolia*. Herbaceous composition varies; typical species include *Deschampsia flexuosa, Danthonia spicata, Campanula rotundifolia, Aquilegia canadensis, Corydalis sempervirens, Saxifraga virginiensis*, and *Woodsia ilvensis*. *Adlumia fungosa* may be found in these habitats; *Opuntia humifusa* occurs in some of the most southerly occurrences of this association.

Environmental Description: This community is found on cliff faces developed on resistant acidic bedrock such as granite, quartzite, sandstone, shale or schist, with little or no soil development. The outcrops are typically vertical to near-vertical. Exposure varies, and moisture regime likewise varies from dry on the exposed faces to moist on more protected or seepy areas. These cliffs may contain small areas of seepage vegetation among the generally dry substrate. [For extensive seepage cliffs, see the cliff seep association Drosera rotundifolia - Viola spp. Cliff Sparse Vegetation (CEGL006429).]

Vegetation Description: The patchy vegetation is restricted to cracks and crevices and can vary from well-vegetated to barren across the cliff face. In most cases, overall cover averages less than 25%. The association presents itself as a mixture of open rock, scrubby trees and shrubs, herbaceous plants, and bryoids. Typical tree species include *Juniperus virginiana, Fraxinus americana, Acer rubrum*, and *Betula papyrifera*; none usually grow very large. Individuals of additional tree species from the surrounding forest may also be present; these include *Tsuga canadensis, Quercus* spp., and *Carya* spp. *Rubus odoratus, Rubus allegheniensis*, and *Rhus copallinum* are representative shrubs. Woody vines include *Vitis aestivalis* and *Parthenocissus quinquefolia*. Herbaceous composition varies; typical species include *Deschampsia flexuosa, Danthonia spicata, Campanula rotundifolia, Aquilegia canadensis, Corydalis sempervirens, Saxifraga virginiensis*, and *Woodsia ilvensis*. *Opuntia humifusa* occurs in some of the most southerly occurrences of this association.

Most Abundant Species:

Stratum	Lifeform	Species
Tall shrub/sapling	Needle-leaved shrub	*Juniperus virginiana*
Tall shrub/sapling	Broad-leaved deciduous shrub	*Betula lenta*
Short shrub/sapling	Broad-leaved deciduous shrub	*Acer rubrum, Rubus allegheniensis*
Herb (field)	Vine/Liana	*Parthenocissus quinquefolia*

Characteristic Species: *Aquilegia canadensis, Campanula rotundifolia, Corydalis sempervirens, Danthonia spicata, Deschampsia flexuosa, Juniperus virginiana, Rhus copallinum, Rubus odoratus, Woodsia ilvensis.*

Other Noteworthy Species: Information not available.

USFWS Wetland System: Not applicable.

DISTRIBUTION

Range: This type is documented from Massachusetts, New Hampshire, Vermont, New Jersey, and Pennsylvania; southward and westward extent has not been determined.

States/Provinces: CT, MA, NH, NJ, NY, PA, VT:S4.

Federal Lands: NPS (Delaware Water Gap).

CONSERVATION STATUS
Rank: G4 (22-Jun-2006).
Reasons: This community is considered relatively common in at least two of the states where it occurs (state conservation rank of S4).

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

- Piedmont Acidic Cliff Sparse Vegetation (CEGL003979)--occurs primarily in the Southeast, within topographically low settings such as river bluffs that are not subject to flood scouring.
- *Polypodium (virginianum, appalachianum)* Cliff Sparse Vegetation (CEGL006528)--is similar in physiognomy and in that both occur on acidic cliffs. They are different in that this type represents a warmer climate, more typical of Lower New England than Northern Appalachians.
- Sandstone Dry Cliff Sparse Vegetation (CEGL002045)--occurs in the Midwest and the species composition is different.
- Western Allegheny Plateau Sandstone Dry Cliff Sparse Vegetation (CEGL006435)--species composition is different due to ecoregional differences.

Related Concepts: Information not available.

SOURCES
Description Authors: S. C. Gawler and G .S. Podniesinski.
References: Anderson 1996, Collins and Anderson 1994, Eastern Ecology Working Group n.d., Edinger et al. 2002, Metzler and Barrett 2004, Sneddon and Menard 2002, Sperduto 1992, Sperduto 2000a, Swain and Kearsley 2000, Thompson and Sorenson 2000.

Figure 115. Sparsely Vegetated Cliff in Delaware Water Gap National Recreation Area (plot DEWA.229). August 2004.

Figure 116. Sparsely Vegetated Cliff in Delaware Water Gap National Recreation Area (plot DEWA.235). September 2004.