
ECOLOGICAL SYSTEM: LAURENTIAN-ACADIAN WET MEADOW-SHRUB SWAMP

Summary: This system encompasses shrub swamps and wet meadows on mineral soils of the Northeast and upper Midwest. They are often associated with lakes and ponds, but are also found along streams, where the water level does not fluctuate greatly. They are commonly flooded for part of the growing season but often do not have standing water throughout the season. The size of occurrences ranges from small pockets to extensive acreages. The system can have a patchwork of shrub and graminoid dominance; typical species include *Salix* (willow) spp., *Cornus amomum* (silky dogwood), *Alnus incana* (speckled alder), *Spiraea alba* (white meadowsweet), *Calamagrostis canadensis* (bluejoint), tall *Carex* (sedge) spp., and *Juncus effusus* (soft rush). Trees are generally absent and, if present, are scattered.

High-ranked Species: *Calephelis muticum* (G3, swamp metalmark), *Clonophis kirtlandii* (G2, kirtland's snake), *Eleocharis nitida* (G3G4, slender spikerush), *Platanthera leucophaea* (G3, prairie white fringed orchid), *Polemonium vanbruntiae* (G3G4, bog jacob's-ladder), *Scirpus ancistrochaetus* (G3, barbed-bristle bulrush)

Range: New England and northern New York west across the upper Great Lakes to Minnesota, and adjacent Canada, southward to Pennsylvania and Ohio; mostly north of the glacial boundary. United States: CT, IL?, IN?, MA, ME, MI, MN, NH, NY, OH?, PA, VT, WI

Delaware Estuary Associations:

- Bluejoint Wet Meadow
- Dogwood - Willow Swamp
- Eastern Reed Marsh
- Eastern Tussock Sedge Meadow
- Reed Canarygrass Eastern Marsh
- Seasonally Flooded Mixed Graminoid Meadow
- Speckled Alder Swamp
- Willow River-Bar Shrubland
- Woolgrass Marsh

Similar Ecological Systems in the Delaware Estuary:

- Laurentian-Acadian Freshwater Marsh

CLASSIFIERS FOR LAURENTIAN-ACADIAN WET MEADOW-SHRUB SWAMP

Primary Division: 201

Land Cover Class: Herbaceous Wetland

Spatial Scale & Pattern: Large patch

Required Classifiers: Natural/Semi-natural; Vegetated (>10% vasc.); Wetland

Diagnostic Classifiers: Depressional [Lakeshore]; Riverine / Alluvial; Broad-Leaved Shrub; Graminoid; Shallow

(<15 cm) Water

Non-diagnostic Classifiers: Herbaceous; Extensive Wet Flat; Depressional [Pond]; Muck; Circumneutral Water;

Acidic Water; Moderate (100-500 yrs) Persistence

BLUEJOINT WET MEADOW

Calamagrostis canadensis - *Phalaris arundinacea* Herbaceous Vegetation

Range: This wet meadow vegetation is widely distributed in the northeastern and midwestern United States and south-central and southeastern Canada. It ranges from Maine south to West Virginia and possibly Virginia and west to Minnesota.

Environmental Description: Stands occur on the floodplains of small streams, in poorly drained depressions, beaver meadows, and lakeshores. Soils are typically mineral soil or well-decomposed peat, with a thick root mat. Water regime varies between temporarily and seasonally flooded.

Vegetation Description: Graminoid cover is typically dense, and can form hummocky microtopography. *Calamagrostis canadensis* (bluejoint) is dominant, often occurring in almost pure stands or with tall sedges, such as *Carex aquatilis* (aquatic sedge), *Carex lacustris* (lake sedge), *Carex rostrata* (swollen-beak sedge), and *Carex stricta* (tussock sedge). In fen transitions, *Carex lasiocarpa* (wiregrass sedge) can be present. *Agrostis gigantea* (giant bentgrass), *Glyceria grandis* (American mannagrass), *Poa palustris* (fowl bluegrass), *Scirpus cyperinus* (woolgrass bulrush), and *Typha latifolia* (broadleaf cattail) are sometimes abundant. Forbs include *Campanula aparinoides* (marsh bellflower), *Epilobium leptophyllum* (bog willowherb), *Eupatorium maculatum* (spotted joe-pyeweed), *Iris versicolor* (harlequin blueflag), *Polygonum amphibium* (water smartweed), and *Comarum palustre* (purple marshlocks). Scattered shrubs, such as *Viburnum nudum* (wild raisin), *Viburnum dentatum* (southern arrow-wood), *Spiraea alba* (white meadowsweet), *Alnus incana* (speckled alder), or *Alnus serrulata* (smooth alder), may be present.

Characteristic Species: *Calamagrostis canadensis* (bluejoint)

Reference Sites: No reference site identified in PA; NJ needs to confirm if in estuary and locations of reference sites.

Global and State Conservation Ranks and Reasons: G4G5 (31-Mar-2000). DE: SNR, NJ: SNR, PA: SNR. This type is widespread throughout the northeastern and upper midwestern United States and central/southern Canada.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.687162

References: Breden et al. 2001, CAP pers. comm. 1998, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Fike 1999, Gawler 2002, Harris et al. 1996, Harrison 2004, Metzler and Barrett 2001, NAP pers. comm. 1998, Rawinski 1984, Swain and Kearsley 2001, TDNH unpubl. data, Thompson 1996, Thompson and Sorenson 2000, WINHIP unpubl. data

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)

DOGWOOD - WILLOW SWAMP

Cornus sericea - *Salix* spp. - (*Rosa palustris*) Shrubland

Range: This dogwood - willow shrub swamp community type is found in the upper midwestern region of the United States and adjacent Canada, ranging from Minnesota east to western New York and Ontario, south to Illinois and Pennsylvania. In the Delaware Estuary, this type occurs in Pennsylvania.



Photo by Pennsylvania Natural Heritage Program

Environmental Description: Stands are found along streams and lakes, or in upland depressions. Hydrology is variable, but is typically seasonally flooded. Soils are wet, organic, and minerotrophic, with either highly decomposed peat or fine mineral soils (Curtis 1959, Harris et al. 1996). The vegetation is dominated by tall shrubs between 1 and 3 m tall, with at least 25% cover, and often very dense (>60% cover). More open stands may have high graminoid cover. Trees may be scattered but cover less than 25%.

Vegetation Description: Composition of the shrub layer is quite diverse, primarily due to the diversity of *Salix* (willow) spp., which collectively share dominance with *Cornus amomum* (silky dogwood), less often with *Cornus racemosa* (gray dogwood) or *Cornus sericea* (red-osier dogwood). Willow species include *Salix nigra* (black willow), *Salix bebbiana* (long-beak willow), *Salix discolor* (pussy willow), *Salix eriocephala* (Missouri willow), *Salix exigua* (coyote willow), *Salix fragilis* (crack willow), *Salix petiolaris* (meadow willow), and *Salix sericea* (silky willow). Other shrub associates include *Cephalanthus occidentalis* (common buttonbush) (southeastward), *Ribes americanum* (wild black currant), *Rosa palustris* (swamp rose) (more common eastward), *Rosa blanda* (smooth rose), *Sambucus canadensis* (American elder), *Spiraea alba* (white meadowsweet), and *Viburnum lentago* (nannyberry). Woody vines present include *Clematis virginiana* (virgin's-bower), *Parthenocissus quinquefolia* (Virginia creeper), and *Toxicodendron radicans* (eastern poison-ivy). Characteristic herbs include *Asclepias incarnata* (swamp milkweed), *Symphyotrichum lanceolatum* var. *lanceolatum* (swamp aster), *Calamagrostis canadensis* (bluejoint), *Eupatorium maculatum* (spotted joe-pyeweed), *Glyceria striata* (fowl mannagrass), *Impatiens capensis* (orange jewelweed), *Lycopus americanus* (American water-horehound), *Lycopus uniflorus* (northern bugleweed), *Phalaris arundinacea* (reed canarygrass), *Solidago gigantea* (giant goldenrod), and *Thalictrum dasycarpum* (purple meadowrue). A variety of sedges may dominate more open stands, including *Carex lacustris* (lake sedge) and *Carex stricta* (tussock sedge). Tree species include *Acer rubrum* (red maple), *Fraxinus pennsylvanica* (green ash), and *Ulmus americana* (American elm) (Curtis 1959, White and Madany 1978, Chapman et al. 1989, Reschke 1990, MNNHP 1993, Harris et al. 1996).

Characteristic Species: *Asclepias incarnata* (swamp milkweed), *Cornus amomum* (silky dogwood), *Salix bebbiana* (long-beak willow), *Salix discolor* (pussy willow), *Salix nigra* (black willow)

Dynamics/Successional Trajectory: Shrub swamps may naturally succeed herbaceous wet meadows as part of successional series in lakes and ponds. They may also originate from clearing of forested swamps (Curtis 1959), or draining of wet meadows (MNNHP 1993). Such open herbaceous meadows may first succeed to a shrubby meadow before becoming a dense shrub swamp.

Management Concerns: Infrequent fires may have maintained shrub swamps in the western part of the range, preventing tree canopy closure (MNNHP 1993).

Reference Sites: Great Marsh, Chester County, PA

Global and State Conservation Ranks and Reasons: G5 (3-Oct-1996). PA: SNR.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.686190

References: Anderson 1996, Bakowsky and Lee 1996, Borowitz and Stephenson 1985, Chapman 1986, Curtis 1959, Edinger et al. 2002, Harris et al. 1996, Lee et al. 1998, MNNHP 1993, Midwestern Ecology Working Group n.d., Reschke 1990, WINHIP unpubl. data, White and Madany 1978

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cornus amomum</i> (silky dogwood)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix bebbiana</i> (long-beak willow)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix discolor</i> (pussy willow)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix nigra</i> (black willow)

EASTERN REED MARSH

Phragmites australis Eastern North America Temperate Semi-natural Herbaceous Vegetation

Range: This reed marsh type is found across the east-temperate regions of the United States and Canada, ranging from Maine west to the eastern Dakotas and Manitoba, south to Texas and east to Florida. It occurs in all three states in the Delaware Estuary.

Environmental Description: Stands occur in semipermanently flooded marshes, ditches, impoundments, etc. that have often been disturbed by human activity.

Vegetation Description: The vegetation is often variable, as *Phragmites australis* (common reed) will often invade into existing natural or semi-natural communities present on the site. Once firmly established, this community is usually strongly dominated by *Phragmites australis* (common reed), with few or no other vascular plants present.



Photo by Linda Kelly

Characteristic Species: *Phragmites australis* (common reed)

Dynamics/Successional Trajectory: This community is strongly influenced by anthropogenic disturbances such as ditches and impoundments that freshen marshes and also dry them out. The biology of *Phragmites* (reed) also perpetuates the drying out of marshes because the plant has the ability to grow rapidly in one season and produce a considerable amount of biomass litter, which adds more organic matter to the marsh and thereby effectively creates higher and drier microsites that are favorable to the plant. *Phragmites* (reed) typically excludes the establishment of other species as it consumes available rooting space through dense underground rhizomes and also shades out understory species.

Management Concerns: This is a naturalized type that arises from human disturbance. *Phragmites australis* (common reed) is invasive globally, and the formation of these extensive monocultures are often considered fire hazards.

Reference Sites: Bombay Hook NWR, DE; Supawna Meadows NWR, NJ

Global and State Conservation Ranks and Reasons: GNA (invasive) (23-Nov-1997). DE: SNA, NJ: SNA, PA: SNA. Although almost always occurring as a naturalized type that arises from human disturbance, some stands in northern Minnesota and further north in Canada may be native. If so, they should be tracked as a separate type.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.685380

References: Bailey 1997, Bailey 1998, Clancy 1993b, Harris et al. 1996, INAI unpubl. data, Metzler and Barrett 1992, Metzler and Barrett 2001, Nelson 1986, Rawinski 1984, Schafale and Weakley 1990, Schotz pers. comm., Southeastern Ecology Working Group n.d., Swain and Kearsley 2001

MOST ABUNDANT SPECIES

STRATUM	LIFEFORM	SPECIES
Herb (field)	Graminoid	<i>Phragmites australis</i> (common reed)

EASTERN TUSSOCK SEDGE MEADOW

Carex stricta - *Carex vesicaria* Herbaceous Vegetation

Range: This tussock sedge meadow is found in northern New England, the Adirondack Mountains, and parts of the Appalachians. In the Delaware Estuary, this community occurs in Pennsylvania.

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.



Photo by Pennsylvania Natural Heritage Program

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* (tussock sedge), in its tussock form, is the usual dominant. *Carex vesicaria* (inflated sedge), *Carex utriculata* (beaked sedge), and *Calamagrostis canadensis* (bluejoint) may also be locally abundant. Associated graminoids include *Carex canescens* (silvery sedge), *Carex comosa* (longhair sedge), *Carex scoparia* (broom sedge), *Carex stipata* (stalk-grain sedge), *Carex vulpinoidea* (fox sedge), *Glyceria canadensis* (rattlesnake manna grass), *Dulichium arundinaceum* (threeway sedge), *Leersia oryzoides* (rice cutgrass), and *Scirpus cyperinus* (woolgrass bulrush); forbs and ferns include *Asclepias incarnata* (swamp milkweed), *Thelypteris palustris* (eastern marsh fern), *Eupatorium maculatum* (spotted joe-pyeweed), *Campanula aparinoides* (marsh bellflower), *Osmunda regalis* (royal fern), *Comarum palustre* (purple marshlocks), *Lysimachia terrestris* (swamp-candles), *Angelica atropurpurea* (great angelica), *Eupatorium perfoliatum* (common boneset), *Lycopus americanus* (American water-horehound), *Galium obtusum* (bluntleaf bedstraw), and others. *Lythrum salicaria* (purple loosestrife) may be invasive in some settings. Shrub associates vary with geography. In the northern part of the range, *Alnus incana* (speckled alder), *Myrica gale* (sweet gale), *Ilex verticillata* (common winterberry), *Chamaedaphne calyculata* (leatherleaf), and *Spiraea alba* (white meadowsweet) are often present. Bryophytes, where present, include *Sphagnum magellanicum* (Magellan's peatmoss), *Sphagnum girgensohnii* (Girgensohn's peatmoss), *Sphagnum palustre* (prairie peatmoss), *Drepanocladus aduncus* (drepanocladus moss), and others.

Noteworthy Associated Plant and/or Animal Species: *Scirpus ancistrochaetus* (barbed-bristle bulrush)

Characteristic Species: *Carex stricta* (tussock sedge)

Dynamics/Successional Trajectory: Some of these sedge meadows may be associated with beaver impoundments.

Management Concerns: *Lythrum salicaria* (purple loosestrife) may be invasive in some settings.

Reference Sites: No reference sites were identified.

Global and State Conservation Ranks and Reasons: G4G5 (12-Dec-2005). DE: SNR, NJ: SNR, PA: SNR. This association is widely distributed throughout New England and northern New York in its small-patch setting and extends sporadically southward.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.690011

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

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)
Herb (field)	Graminoid	<i>Carex stricta</i> (tussock sedge)
Herb (field)	Graminoid	<i>Carex utriculata</i> (beaked sedge)
Herb (field)	Graminoid	<i>Carex vesicaria</i> (inflated sedge)

REED CANARYGRASS EASTERN MARSH

Phalaris arundinacea Eastern Herbaceous Vegetation

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. It occurs in the Pennsylvania portion of the Delaware Estuary.

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



Photo by Pennsylvania Natural Heritage Program

Vegetation Description: Stands are dominated by *Phalaris arundinacea* (reed canarygrass), a 0.5-2 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 a more aggressive ecotype than native strains (Barnes 1999). It tends to occur in monocultures or associated with *Calamagrostis canadensis* (bluejoint). Other associates in the Northeast include *Viburnum nudum* (wild raisin), *Alnus incana* (speckled alder) or *Alnus serrulata* (smooth alder), *Viburnum dentatum* (southern arrow-wood), and *Agrostis gigantea* (giant bentgrass). Midwest associates include species characteristic of wet meadows. *Phalaris arundinacea* (reed canarygrass) 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.

Characteristic Species: *Phalaris arundinacea* (reed canarygrass)

Dynamics/Successional Trajectory: Shoreline habitats can be temporarily or seasonally flooded in spring. *Phalaris arundinacea* (reed canarygrass) may respond well to summer drawdowns (Barnes 1999).

Management Concerns: The European strain of *Phalaris arundinacea* (reed canarygrass) may be a more aggressive ecotype than native strains (Barnes 1999).

Reference Sites: This community does not need a reference condition, as it is not a desirable type for restoration.

Global and State Conservation Ranks and Reasons: GNA (invasive) (1-Dec-1997). DE: SNA, NJ: SNA, PA: SNA.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.689615

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, Podniesinski et al. 2006, Rawinski 1984, Sperduto 2000a, Swain and Kearsley 2001, TDNH unpubl. data, TNC and WPC 2004, Thompson 1996, Thompson and Sorenson 2000

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Herb (field)	Graminoid	<i>Phalaris arundinacea</i> (reed canarygrass)

SEASONALLY FLOODED MIXED GRAMINOID MEADOW

Calamagrostis canadensis - *Scirpus* spp. - *Dulichium arundinaceum* Herbaceous Vegetation

Range: These are seasonally flooded, mixed-composition wetland meadows of the northeastern United States. Within the Delaware Estuary, this community occurs in Pennsylvania and Delaware.

Environmental Description: These are seasonally flooded, mixed-composition wetland meadows of the northeastern United States. They occur on flats, floodplains of small streams, beaver meadows, and lakeshores. The substrate is muck or well-decomposed peat overlying mineral soil, usually slightly acidic (pH 5.0-6.0). After spring flooding, many sites will dry to exposed soil during the summer.



Photo by Pennsylvania Natural Heritage Program

Vegetation Description: Shrub species typically include *Spiraea alba* (white meadowsweet) and *Salix* (willow) spp. Other shrub constituents vary from site to site, and may include *Alnus incana* (speckled alder), *Alnus serrulata* (smooth alder), *Cephalanthus occidentalis* (common buttonbush), *Cornus sericea* (red-osier dogwood), *Ilex verticillata* (common winterberry), *Myrica gale* (sweet gale), *Salix pedicellaris* (bog willow), *Spiraea tomentosa* (steeplebush), *Vaccinium corymbosum* (highbush blueberry), or *Viburnum dentatum* (southern arrow-wood). The herbaceous layer is often dominated by *Calamagrostis canadensis* (bluejoint), *Scirpus* (bulrush) spp. (including *Scirpus cyperinus* (woolgrass bulrush), *Scirpus expansus* (woodland bulrush), and *Scirpus atrovirens* (green bulrush)), and *Dulichium arundinaceum* (threeway sedge). Other locally common species may include *Acorus calamus* (sweetflag), *Agrostis gigantea* (giant bentgrass), *Carex lacustris* (lake sedge), *Carex lupulina* (hop sedge), *Carex lupuliformis* (false hop sedge), *Carex lurida* (sallow sedge), *Carex stricta* (tussock sedge), *Carex utriculata* (beaked

sedge), *Glyceria canadensis* (rattlesnake mannagrass), *Glyceria grandis* (American mannagrass), *Iris versicolor* (harlequin blueflag), *Hypericum ellipticum* (pale St. John's-wort), *Juncus canadensis* (Canadian rush), *Leersia oryzoides* (rice cutgrass), *Lysimachia terrestris* (swamp-candles), *Onoclea sensibilis* (sensitive fern), *Osmunda regalis* (royal fern), *Phalaris arundinacea* (reed canarygrass), *Poa palustris* (fowl bluegrass), and *Triadenum fraseri* (Fraser's marsh-St. John's-wort).

Noteworthy Associated Plant and/or Animal Species: *Scirpus ancistrochaetus* (barbed-bristle bulrush)

Characteristic Species: *Calamagrostis canadensis* (bluejoint), *Dulichium arundinaceum* (threeway sedge), *Scirpus cyperinus* (woolgrass bulrush)

Dynamics/Successional Trajectory: These seasonally flooded wet meadows are typically wet in the spring and dry in the summer. The vegetation is dominated by robust graminoids or graminoids mixed with shrubs. Shrub cover can range up to 50%, but in most cases graminoid cover exceeds woody cover. The herbaceous layer is well-developed, often over 40% cover and up to nearly 100% cover. Bryophyte cover is usually little to none but may occasionally be extensive.

Reference Sites: Unionville, Fern Hill, Brintons Quarry (Chester), PA; Pink Hill, DE

Global and State Conservation Ranks and Reasons: GNR (6-Jul-1999). DE: SNR, PA: SNR.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.685540

References: Calhoun et al. 1994, Eastern Ecology Working Group n.d., Gawler 2002, Northern Appalachian Ecology Working Group 2000, Sperduto 2000b, Sperduto and Nichols 2004, Thompson and Sorenson 2000

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Short shrub/sapling	Broad-leaved deciduous shrub	<i>Spiraea alba</i> (white meadowsweet)
Herb (field)	Graminoid	<i>Calamagrostis canadensis</i> (bluejoint)
Herb (field)	Graminoid	<i>Dulichium arundinaceum</i> (threeway sedge)
Herb (field)	Graminoid	<i>Scirpus cyperinus</i> (woolgrass bulrush)

SPECKLED ALDER SWAMP

Alnus incana Swamp Shrubland

Range: This alder swamp community type is widespread in the midwestern and northeastern United States and southern Canada, ranging from Maine west to Manitoba, south to Iowa, and east to New Jersey. It occurs in Pennsylvania's portion of the Delaware Estuary.

Environmental Description: Sites are typically along streams, lakeshores, edges of beaver meadows, swales associated with small streams in peatlands or upland forests, or near seeps. Most have little to no slope, but some sites are on moderate slopes. Hydrologic conditions can range from temporarily flooded to seasonally flooded, or even saturated, but are typically seasonally



Photo by Pennsylvania Natural Heritage Program

flooded/saturated. The water ranges from non-stagnant, nutrient-rich, and often slightly calcareous (Curtis 1959) to rather stagnant and nutrient-poor where over acidic bedrock or till. Soils are wet, often mucks or peats (Anderson 1982, Chapman et al. 1989). In the upper Midwest, this community is found on Precambrian Shield bedrock that is overlaid with sandy loam soils, which are moderately well-drained and deep (>60 cm). In northeastern Minnesota stands can occur on northeast- and south-facing slopes that are moderate to steep, with slopes ranging from 4 to 45% (Ohmann and Ream 1971). The climate is highly variable, with temperature extremes between -46 and 38 degrees C and 58-91 cm precipitation.

Vegetation Description: The vegetation is dominated by tall shrubs, 2-8 m in height, with a moderately open to dense shrub canopy. There is an understory of shorter shrubs and herbaceous species. The density of the understory varies inversely with the tall-shrub canopy. The overstory is usually overwhelmingly dominated by *Alnus incana* (speckled alder), but where it is not as dominant, other shrubs, such as *Cornus sericea* (red-osier dogwood), *Rubus idaeus* (red raspberry), *Salix* (willow) spp., *Spiraea alba* (white meadowsweet), *Spiraea tomentosa* (steeplebush), and *Viburnum* (viburnum) spp., can be found. The herbaceous layer contains species such as *Symphyotrichum lanceolatum* var. *lanceolatum* (swamp aster), *Symphyotrichum puniceum* (purple-stem aster), *Calamagrostis canadensis* (bluejoint), *Caltha palustris* (yellow marsh-marigold), *Carex lacustris* (lake sedge), *Carex prairea* (prairie sedge), *Carex trisperma* (three-seed sedge), *Doellingeria umbellata* (parasol whitetop), *Eupatorium maculatum* (spotted joe-pyeweed), *Impatiens capensis* (orange jewelweed), *Lycopus uniflorus* (northern bugleweed), *Onoclea sensibilis* (sensitive fern), *Osmunda cinnamomea* (cinnamon fern), *Rubus pubescens* (dewberry), *Scirpus atrovirens* (green bulrush), *Symplocarpus foetidus* (skunk-cabbage), *Thelypteris palustris* (eastern marsh fern), *Typha* (cattail) spp., and *Viola* (violet) spp. Mosses include *Climacium dendroides* (tree climacium moss) and *Sphagnum* (peatmoss) spp. Where the tall-shrub canopy is open, the graminoids can become dense. Scattered trees are found in many stands, including *Acer rubrum* (red maple), *Fraxinus nigra* (black ash), and *Thuja occidentalis* (northern white-cedar) (Curtis 1959, Anderson 1982, MNNHP 1993, Harris et al. 1996, Sperduto 2000b, Thompson and Sorenson 2000, Gawler 2002). Where stands border on saturated conditions with peaty soils, peatland species such as *Chamaedaphne calyculata* (leatherleaf), *Rhododendron canadense* (rhodora), and *Sphagnum* (peatmoss) spp. may be present.

Characteristic Species: *Alnus incana* (speckled alder)

Reference Sites: No reference sites identified.

Global and State Conservation Ranks and Reasons: G5? (3-Oct-1996). NJ: S2S4, PA: SNR.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.689638

References: Anderson 1982, Anderson and Barren 1991, Breden et al. 2001, Chapman 1986, Curtis 1959, Fike 1999, Gawler 2002, Greenall 1996, Harris et al. 1996, INAI unpubl. data, MNNHP 1993, Midwestern Ecology Working Group n.d., NDNHI unpubl. data, Ohmann and Ream 1971, Sperduto 2000b, Swain and Kearsley 2001, Thompson and Sorenson 2000, WINHIP unpubl. data

MOST ABUNDANT SPECIES		
STRATUM	LIFEFORM	SPECIES
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Alnus incana</i> (speckled alder)

WILLOW RIVER-BAR SHRUBLAND

Salix nigra / *Carex torta* Temporarily Flooded Shrubland

Range: This shrubland occurs in the eastern United States from New Hampshire and Vermont south to Pennsylvania. It occurs in Pennsylvania in the Delaware Estuary.

Environmental Description: It occurs on cobble substrates with sand and gravel in areas that are flooded only during high-water events but receive winter ice-scour. It occupies an intermediate position along disturbance gradient between open, herbaceous cobble shores and higher floodplain forests.



Photo by Pennsylvania Natural Heritage Program

Vegetation Description: This is a willow shrubland of low riverbanks along moderate- to high-energy rivers in the Northeast and High Allegheny Plateau. *Salix nigra* (black willow) is often dominant or codominant with other willows or dogwoods. Less frequent shrubs and tree saplings include *Platanus occidentalis* (sycamore), *Salix eriocephala* (Missouri willow), *Salix sericea* (silky willow), *Alnus incana* (speckled alder), *Alnus serrulata* (smooth alder), *Alnus viridis* (green alder) (infrequent), *Cornus amomum* (silky dogwood), *Cornus sericea* (red-osier dogwood), *Spiraea alba* var. *latifolia* (broadleaf meadowsweet), *Platanus occidentalis* (sycamore), and *Populus deltoides* (eastern cottonwood). The herbaceous layer is typically sparse with variable composition, including *Carex torta* (twisted sedge), *Carex trichocarpa* (hairy-fruit sedge), *Panicum dichotomiflorum* (fall panicgrass), *Dichanthelium clandestinum* (deer-tongue witchgrass), *Echinochloa crus-galli* (large barnyard grass), *Phalaris arundinacea* (reed canarygrass), *Calamagrostis canadensis* (bluejoint), *Apocynum cannabinum* (Indian-hemp), *Agrostis* (bentgrass) spp., *Solidago gigantea* (giant goldenrod), *Solidago rugosa* (wrinkleleaf goldenrod), *Eupatorium maculatum* (spotted joe-pyeweed), *Lysimachia terrestris* (swamp-candles), *Polygonum* (smartweed, knotweed) spp., and *Bidens* (beggarticks) spp. Invasive, exotic species can be problematic in this community, including *Polygonum cuspidatum* (Japanese knotweed), *Tussilago farfara* (colt's-foot), and *Cynanchum louiseae* (black swallow-wort).

Characteristic Species: *Carex torta* (twisted sedge), *Salix nigra* (black willow)

Dynamics/Successional Trajectory: This community is subject to extreme ice-scour events as well as erosion and deposition during floods. The clonal nature of most of the woody species in this community serves to stabilize the substrate and allows rapid regeneration of above-ground biomass following damage and removal caused by flooding/scour events. Unless flow regime is altered (i.e., flow manipulation from dams), this type is relatively persistent, with minor spatial shifts due to erosion and sedimentation during flood events. Flow regulation may cause a shift to more mature vegetation by reducing flood severity and duration.

Management Concerns: This type is subject to invasion by some exotic species (e.g., *Lythrum salicaria* (purple loosestrife)). Flow regulation may cause a shift to riparian tall-shrub or forest communities.

Reference Sites: Shapnack Island, Delaware Water Gap National Recreation Area, PA

Global and State Conservation Ranks and Reasons: GNR (25-Mar-2003). PA: SNR.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.689581

References: Eastern Ecology Working Group n.d., Fike 1999, Gawler 2002, Metzler and Barrett 2001, Nichols et al. 2001, TNC and WPC 2004

MOST ABUNDANT SPECIES

STRATUM	LIFEFORM	SPECIES
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Cornus amomum</i> (silky dogwood)
Shrub/sapling (tall & short)	Broad-leaved deciduous shrub	<i>Salix nigra</i> (black willow)

WOOLGRASS MARSH

Scirpus cyperinus Seasonally Flooded Herbaceous Vegetation

Range: These marshes occur in Pennsylvania within the Delaware Estuary.

Environmental Description: This community consists of seasonally flooded marshes.

Vegetation Description: This community is dominated or characterized by *Scirpus cyperinus* (woolgrass bulrush). The vegetation composition is variable. Associated species include *Glyceria* (mannagrass) spp., *Thelypteris palustris* (eastern marsh fern), as well as other species of *Scirpus* (bulrush), including *Scirpus microcarpus* (red-tinge bulrush) and *Scirpus atrovirens* (green bulrush).



Photo by Pennsylvania Natural Heritage Program

Characteristic Species: *Scirpus cyperinus* (woolgrass bulrush)

Reference Sites: No sites identified in PA.

Global and State Conservation Ranks and Reasons: GNR (1-Dec-1997). DE: SNR, NJ: SNR, PA: SNR.

VegBank Link for Plot Data: http://vegbank.org/natureserve/element_global.2.687973

References: Breden et al. 2001, Cowardin et al. 1979, Eastern Ecology Working Group n.d., Fike 1999, Gawler 2002, Harrison 2004

MOST ABUNDANT SPECIES

STRATUM	LIFEFORM	SPECIES
Herb (field)	Graminoid	<i>Scirpus cyperinus</i> (woolgrass bulrush)