



Palustrine Shrublands



*L*eatherleaf - bog rosemary peatland, Wayne County.
Photograph by Tony Davis



*P*ine Lake Natural Area, Delaware State
Forest, Pike County. Photograph by Jean Fike.



BROADLEAF PALUSTRINE SHRUBLANDS

Buttonbush wetland

These wetlands are characterized by prolonged or semipermanent flooding. The substrate may be organic or mineral soil. This community type may occur in shallow water along lake or pond shores, associated with river systems in oxbows, in wet swales or along floodplains, or in upland depressions. In some cases, this community represents a zone of vegetation between forest on the upland side and herbaceous vegetation downslope. Other shrubs, such as *Decodon verticillatus* (water-willow), *Rhododendron viscosum* (swamp azalea), *Corpus amomum* (red-willow), *C. sericea* (red-osier dogwood), *Salix sericea* (silky willow), *S. eriocephala* (heart-leaved willow), *Sambucus canadensis* (American elder), *Vaccinium corymbosum* (highbush blueberry), and *Acer rubrum* (red maple) seedlings and saplings may occur, but *Cephalanthus occidentalis* (buttonbush) is usually a clear dominant. Characteristic herbs include *Dulichium arundinaceum* (three-way sedge), *Triadenum virginicum* (marsh St.-John's-wort), *Lycopus uniflorus* (bugleweed), *Nuphar lutea* (spatterdock), *Polygonum hydropiperoides* (mild water-pepper), *P. punctatum* (dotted smartweed), *P. amphibium* (water smartweed), *Proserpinaca palustris* var. *crebra* (mermaid-weed), *Carex lurida* (a sedge), *C. uesicaria* (a sedge), *Scirpus cyperinus* (woolgrass), *Woodwardia virginica* (Virginia chain fern), and *Thelypteris palustris* (marsh fern).

Related types: The "Alder - ninebark wetland" type below may also contain *Cephalanthus*. The two communities are distinguished by a clear dominance of buttonbush in the case of the former. The "Alder - ninebark wetland" type is typically more mixed, with either *Alnus* spp. (alder) and or *Physocarpus opulifolius* (ninebark) dominant or codominant.

Range: Entire state.

Selected references: Jennings 1927, Metzler and Tiner 1992, PNDI field surveys.

[Crosswalk: Smith's "Circumneutral Shrub Swamp" (in part), TNC's *Cephalanthus occidentalis* Shrubland Alliance.]

Alder - ninebark wetland

These are shrub swamps dominated by *Alnus serrulata* (smooth alder) or *A. incana* (speckled alder) and /or *Physocarpus opulifolius* (ninebark). The pH of these systems is broadly circumneutral to somewhat calcareous, and calciphiles may be present. These communities may occur at the upland edge of marshes, at the wetter edge of red maple wetlands, in small upland depressions, or at

the base of slopes. The substrate is generally mineral soil with a thin organic layer, although it may occasionally occur on shallow peat. In Pennsylvania, many of these are beaver influenced or otherwise impounded systems. Grazing (past or present) may also be a factor. The species composition is variable, and dominance may be shared by any of the associate shrubs, which may include *Salix* spp. (willows), *Sambucus canadensis* (American elder), *Cornus amomum* (red-willow), *Rhododendron viscosum* (swamp azalea), *Decodon verticillatus* (water-willow), *Cephalanthus occidentalis* (buttonbush), *Ilex verticillata* (winterberry), and seedling/sapling size *Acer rubrum* (red maple). Herbaceous species include *Osmunda regalis* (royal fern), *Thelypteris palustris* (marsh fern), *Typha latifolia* (common cat-tail), *Peltandra virginica* (arrow-arum), *Carex stricta* (tussock sedge), and *Galium* spp.

Related types: The "Buttonbush wetland" type above may contain alder, but is dominated by *Cephalanthus occidentalis*. This type is broadly circumneutral, while the "Alder - sphagnum wetland" type is more acidic.

Range: Glaciated NW, Pittsburgh Plateau, Ridge and Valley.

Selected references: Jennings 1927, Metzler and Tiner 1992, PNDI field surveys, Sneddon, Anderson and Metzler 1996.

[Crosswalk: Smith's "Circumneutral Shrub Swamp" (in part), TNC's *Alnus (serrulata, incana)* Shrubland Alliance, *Alnus serrulata - Physocarpus* Community.]

Alder - sphagnum wetland

These are wetlands dominated by *Alnus serrulata* (smooth alder) and/or *A. incana* (speckled alder), and having a sphagnum layer. The substrate may be peat or mineral soil with a substantial accumulation of organic matter. This community type typically occurs in upland depressions, along slow-moving streams, or associated with large wetland complexes, frequently influenced by beaver action or other impoundment. Shrub associates include *Vaccinium corymbosum* (highbush blueberry), *Lyonia ligustrina* (maleberry), *Ilex verticillata* (winterberry), *Cornus racemosa* (swamp dogwood), and seedling and sapling size *Acer rubrum* (red maple). The most characteristic herbaceous species is *Osmunda cinnamomea* (cinnamon fern), although a variety of species, mostly ferns and sedges, may also occur.

Related types: This community type may be differentiated from the "Alder - ninebark" type described above, in that this type occupies the lower end of the pH spectrum for alder-dominated wetlands, while the former is



circumneutral to slightly calcareous. The associate species reflect this shift, with shrubs like *Physocarpus opulifolius* (ninebark), and *Cornus amomum* (red-willow) occurring in circumneutral situation, while acid-loving heaths like *Vaccinium corymbosum* (highbush blueberry) and *Lyonia ligustrina* (maleberry) are more typical under lower pH conditions. The presence of a substantial sphagnum layer generally distinguishes the two. This community type is also related to the "Highbush blueberry - sphagnum wetland" type. When *Vaccinium corymbosum* (highbush blueberry) and *Alnus* spp. occur together underlain by sphagnum, the types may be distinguished by dominance.

Range: Entire state except Coastal Plain.

Selected references: Sneddon, Anderson and Metzler 1996.

[Crosswalk: Smith's "Acidic Shrub Swamp" (in part), TNC's *Alnus (incana, serrulata)* Shrubland Alliance, *Alnus (incana, serrulata) - Osmunda cinnamomea - Sphagnum* spp. Community.]

Highbush blueberry - meadow-sweet wetland

Vaccinium corymbosum (highbush blueberry) and either *Spiraea latifolia* (meadow-sweet) or *S. alba* (meadow-sweet) are usually both present. Additional woody species include *Amelanchier* spp. (serviceberry), *Alnus incana* (speckled alder), *Viburnum recognitum* (arrow-wood), *S. tomentosa* (steeple-bush), *Rubus hispidus* (swamp dewberry), *Ilex verticillata* (winterberry), *Sambucus canadensis* (American elder), and seedling and sapling-size *Acer rubrum* (red maple). These wetlands generally lack a thick organic layer. In Pennsylvania, many of these systems are beaver-influenced or otherwise impounded, although some occur in upland depressions. The herbaceous layer is generally dominated by graminoids such as *Carex strictor* (tussock sedge), *Juncus* spp. (rushes), and *Eleocharis* spp. (spike-rushes), and by ferns, especially *Osmunda cinnamomea* (cinnamon fern), *O. regalis* (royal fern), *Onoclea sensibilis* (sensitive fern), and *Thelypteris palustris* (marsh fern). Forbs like *Triadenum virginicum* (marsh St.-John's -wort), *Symplocarpus foetidus* (skunk-cabbage), and *Impatiens* spp. (jewelweed) may also occur. Sphagnum either forms a continuous layer or occurs on hummocks.

Related types: The "Highbush blueberry - sphagnum" type below is found in more acidic situations, more often glacial in origin, with a stronger heath component.

Range: Entire state.

Selected references: PNDI field surveys, Metzler

and Tiner 1991.

[Crosswalk: Smith's "Acidic Shrub Swamp" (in part), TNC's *Vaccinium corymbosum* Shrubland Alliance.]

Highbush blueberry - sphagnum wetland

This community type generally occurs in shallow upland depressions or along the banks of slow moving acidic streams, or often as an intermediate zone between a low shrub type and a woodland or forest type within a structurally diverse wetland complex. It may also represent a successional phase, especially in beaver-influenced or otherwise impounded systems. These communities are heath-dominated with a sphagnum layer beneath. The substrate may be peat or mineral soil with a substantial accumulation of organic matter. Aside from *Vaccinium corymbosum* (highbush blueberry), shrubs commonly present include *Rhododendron viscosum* (swamp azalea), *Nemopanthus mucronatus* (mountain holly), *Chamaedaphne calyculata* (leatherleaf), *Viburnum cassinoides* (withe-rod), and *Lyonia ligustrina* (maleberry). Seedling or sapling-size *Acer rubrum* (red maple), *Betula populifolia* (gray birch), or other tree species may also be present. This community type may occur as part of the "Acidic glacial peatland complex."

Related types: The "Highbush blueberry - meadow-sweet wetland" type described above is typically found in less acidic to circumneutral situations. The "Highbush blueberry-sphagnum" type here is more characteristic of glaciated regions, is dominated by heaths, and is often associated with larger peatland complexes, while the winterberry type is more often found in upland depressions or areas of past impoundment.

Range: Glaciated NE, Glaciated NW, Piedmont (?), Pocono Plateau, Ridge and Valley, South Mountain.

Selected references: Crum 1988, Johnson 1985, PNDI field surveys, Sneddon, Anderson and Metzler 1996.

[Crosswalk: Smith's "Nonglacial Bog" (in part), "Acidic Shrub Swamp" (in part), TNC's *Vaccinium corymbosum* Shrubland Alliance, *Vaccinium corymbosum / Sphagnum* spp. Shrubland Community.]

Leatherleaf - sedge wetland

This community type usually occurs either in upland depressions or in areas of past (often beaver) impoundment. Substrate may be organic soil or mineral soil with a substantial accumulation of organic matter. This community may occupy an extensive area or occur as a relatively narrow band between herbaceous vegetation and



taller shrubs or trees. *Chamaedaphne calyculata* (leatherleaf) dominates, together with a mix of sedges and other herbs. There is usually at least a partial layer of sphagnum. In more nitrogen-poor situations, *Drosera rotundifolia* (round-leaved sundew) and occasionally *Sarracenia purpurea* (pitcher-plant) may occur. Sedges are common; species include *Carex canescens*, *C. trisperma*, *C. folliculata*, *C. lasiocarpa*, *C. rostrata*, *C. stricta*, *Eriophorum vaginatum* (cotton-grass), *E. virginicum* (tawny cotton-grass), and *Dulichium arundinaceum* (three-way sedge). Other herbs include *Sagittaria latifolia* (arrowhead), *Potentilla palustris* (marsh cinquefoil), *Lysimachia terrestris* (swamp-candles), *Vaccinium macrocarpon* (cranberry), and *Triadenum virginicum* (marsh St.-John's-wort).

Related types: The "Leatherleaf - cranberry" and "Leatherleaf - bog rosemary" peatland types below are generally found in glacial bogs, are more acidic, and have a deeper organic layer, sometimes occurring on a floating mat of sphagnum peat. This type is less acidic/nitrogen poor, younger, and often occurs on mineral soil (less than 16 inches organic matter). The associate species here are less strongly ericaceous and insectivorous plants are less common.

Range: Glaciated NE, Glaciated NW, Pocono Plateau, Ridge and Valley, Unglaciated Allegheny Plateau.

Selected references: Crum 1988, Reschke 1990, PNDI field surveys, Johnson 1985.

[Crosswalk: Falls between Smith's "Nonglacial Bog" and "Acidic Shrub Swamp" types, TNC's *Chamaedaphne calyculata* - *Carex lasiocarpa* Sparse Shrubland Alliance.]

Leatherleaf - bog rosemary peatland

Chamaedaphne calyculata (leatherleaf) is the dominant shrub. Associate species include *Kalmia angustifolia* (sheep laurel), *Andromeda polifolia*^s (bog-rosemary), *Aronia arbutifolia* (red chokeberry), *Gaylussacia baccata* (black huckleberry), and *Ledum groenlandicum*^s (Labrador tea). This type often occurs between a woodland or tall-shrub type and the "Leatherleaf-cranberry peatland" type below. Herbaceous species include *Sarracenia purpurea* (pitcher-plant), *D. rotundifolia* (round-leaved sundew), *Rhynchospora alba* (white beak-rush), *Vaccinium macrocarpon* (cranberry), and *Eriophorum virginicum* (tawny cotton-grass). There is usually a continuous sphagnum layer. This type occurs on organic soil, sometimes on a floating mat. This community type may occur as part of the "Acidic glacial peatland complex."

Related types: In terms of pH and nitrogen availability, this type is probably intermediate

between the other two

leatherleaf types. This type is characterized by low mixed ericaceous shrubs and herbs over sphagnum, usually on organic soil.

Range: Glaciated NW, Glaciated NE, Pocono Plateau, Unglaciated Allegheny Plateau.

Selected references: Crum 1988, Johnson 1985, PNDI field surveys, Reschke 1990.

[Crosswalk: Smith's "Oligotrophic Kettlehole Bog," and "Weakly Minerotrophic Lakeside Bog," TNC's *Chamaedaphne Calyculata* Dwarf - Shrubland Alliance.]

Leatherleaf - cranberry peatland

In glacial bogs, this community often occupies the central zone or one of the final zones of rooted vegetation surrounding an aquatic interior (also see "Water-willow (*Decadon verticillatus*) wetland" type). The dominant species are *Chamaedaphne calyculata* (leatherleaf) -stunted form, cranberry (*Vaccinium oxycoccus* and/or *macrocarpon*), and sphagnum. Associates include *Sarracenia purpurea* (pitcher-plant), *Drosera intermedia* (spatulate-leaved sundew), *Drosera rotundifolia* (round-leaved sundew), *Rhynchospora alba* (white beak-rush), *Xyris montana*^s (yellow-eyed-grass), and *Eriophorum virginicum* (tawny cotton-grass). This community type may occur as part of the "Acidic glacial peatland complex."

Related types: The "Leatherleaf - bog rosemary peatland" type may grade into this type, but the overwhelming dominance of stunted *Chamaedaphne calyculata* (leatherleaf) distinguishes this from the taller, more mixed type.

Range: Glaciated NW, Glaciated NE, Pocono Plateau, Unglaciated Allegheny Plateau.

Selected references: Crum 1988, Johnson 1985, Reschke 1990.

[Crosswalk: Smith's "Oligotrophic Kettlehole Bog" and "Nonglacial Bog," TNC's *Chamaedaphne Calyculata* Dwarf - Shrubland Alliance.]

Water-willow (*Decadon verticillatus*) shrub wetland

Water-willow (*Decadon verticillatus*) has the ability to extend itself laterally over open water and thus forms a fringe along the aquatic edge of lakeside, creekside, or bog-lake-side wetlands. The associated species vary widely; some common examples are *Nuphar lutea* (spatterdock), *Peltandra virginica* (arrow-arum), *Pontederia*



cordata (pickerel-weed), *Utricularia* spp. (bladderworts), and *Cephalanthus occidentalis* (buttonbush). This community type may occur as part of the "Acidic glacial peatland complex."

Related types: *Decodon verticillatus* (water-willow) may occur in a variety of other palustrine types. This type is intended to describe areas of clear dominance by *Decodon verticillatus* (water-willow).

Range: Glaciated NE, Glaciated NW, Great Lakes Region, Pocono Plateau, Ridge and Valley.

Selected references: Crum 1988, Johnson 1985, Sneddon, Anderson, and Metzler 1996.

[Crosswalk: TNC's *Decodon verticillatus* Shrubland Alliance.]

River birch - sycamore floodplain scrub

These are areas along the riverbank floodplain or on river gravel bars and islands. Tree species, mostly *Betula nigra* (river birch), *Platanus occidentalis* (sycamore), *Acer negundo* (box-elder), *Ulmus americana* (American elm), and *Acer saccharinum* (silver maple) dominate the community, but seldom exceed 5 meters in height. Associate shrub species include *Cornus amomum* (red-willow), *Salix exigua* (sandbar willow), *S. sericea* (silky willow), *S. erioccephala* (heart-leaved willow), *Alnus serrulata* (smooth alder), and *Physocarpus opulifolius* (ninebark). Along the riverbank, this community often occurs as a zone between the floodplain forest upslope and the low shrub and/or herbaceous communities to the river side. This is an early successional type usually maintained by flood and ice scour events that prevent further development toward a forested condition. The herbaceous layer is highly variable, and may include species like *Polygonum virginianum* (jumpseed), *Justicia americana* (water-willow), *Lobelia cardinalis* (cardinal-flower), and *Arisaema dracontium* (green-dragon). Exotic species, especially *Polygonum cuspidatum* (Japanese knotweed), are frequently a major problem in these systems. This community type is part of the "River bed - bank - floodplain complex."

Related types: The "Sycamore - (river birch) - box elder floodplain forest" and "Silver maple floodplain forest" types may grade into this type.

Range: Piedmont, Ridge and Valley, Unglaciated Allegheny Plateau.

Selected references: Sneddon, Anderson, and Metzler 1996.

[Crosswalk: Smith's "River Gravel Community," TNC's *Betula nigra* Shrubland Alliance.]

Black willow scrub/shrub wetland

These communities are most typical of stream and riverbanks, but may also occur along the banks of lakes or ponds. *Salix nigra* (black willow) generally dominates; associates include *Alnus serrulata* (smooth elder), *A. incana* (speckled alder), *Cornus amomum* (red-willow), *C. sericea* (red-osier dogwood), and *Salix* spp. (willows). The herbaceous layer is variable, but often includes *Polygonum* spp. (smartweeds), *Bidens* spp. (beggar-ticks), *Phalaris arundinacea*⁰¹ (reed canary-grass), *Eleocharis erythropoda* (a spike-rush). This community type is part of the "River bed - bank - floodplain complex."

Related types: The "Sycamore - (river birch) - box-elder floodplain forest" and "Silver maple floodplain forest" types may grade into this type.

Range: Entire state.

Selected references: Sneddon, Anderson, and Metzler 1996.

[Crosswalk: Smith's "River Gravel Community," TNC's *Salix nigra* Shrubland Alliance.]

Poison sumac - red-cedar - bayberry fen

This community type is specific to northeastern Pennsylvania and western New Jersey. These are wetlands that have developed under the influence of base-rich water, and usually have a substantial organic layer. The pH of surface water during the growing season ranges from 7.0 to 8.1. Structurally, they are dominated by a mixture of shrubs and herbaceous plants (predominantly sedges). Most sites have areas in the wettest portions that are without woody vegetation. Depth of organic matter ranges from zero in actively seeping areas to over a meter in basins. The dominant shrubs include *Juniperus virginiana* (red-cedar), *Myrica pensylvanica* (bayberry), *Toxicodendron vernix* (poison sumac), *Salix* spp. (willow), *Potentilla fruticosa*^s (shrubby cinquefoil), *Cornus racemosa* (swamp dogwood), *Rhamnus* (alder-leaved buckthorn), and *Physocarpus opulifolius* (ninebark). Herbaceous species include *Carex sterilis*^s (Atlantic sedge), *C. flava*^s (yellow sedge), *C. tetanica*^s (Wood's sedge), *C. lurida* (a sedge), *C. stricta* (tussock sedge), *Muhlenbergia glomerata* (spike muhly), *Rhynchospora capillacea*^s (capillary beak-rush), *R. alba* (white beak-rush), *Lobelia kalmii*^s (brook lobelia), *Eupatorium maculatum* (spotted joe-pye-weed), *Cirsium muticum* (swamp thistle), *Thelypteris palustris* (marsh fern), *Pycnanthemum virginianum* (mountain-mint),



Selaginella apoda (creeping spikemoss), *Lycopus uniflorus* (bugleweed), *Drosera rotundifolia* (round-leaved sundew), *Parnassia glauca*^s (grass-of-Parnassus), *Aster lateriflorus* (calico aster), and *Vernonia noveboracensis* (New York ironweed). Characteristic bryophytes include *Campylium stellatum*, *Aulacomnium palustre*, *Fissidens adiantoides*, and *Bryum pseudotriquetrum*. *Chara* spp. (stoneworts) occur in seeps and in unvegetated flats.

Related types: This type is ecologically similar to and shares many species with the "Buckthorn - sedge fen" type. The two differ in their distribution and species composition.

Range: Glaciated Northeast.

Selected references: PNDI field surveys, WPC and TNC 1995.

[Crosswalk: Smith's "Shrub Fen," "Basin Graminoid Forb Fen," TNC's *Carex (flava, hystericina, interior, sterilis)* - *Campylium stellatum* Herbaceous Alliance.]

Buckthorn - sedge (*Carex interior*) - golden ragwort fen

In Pennsylvania, this community type is most characteristic of the northwestern glaciated section, although it may occur elsewhere. These are wetlands that have developed under the influence of base-rich water, and usually have a substantial organic layer. The pH of surface water during the growing season ranges from 6.9 to 7.9. Structurally, they are dominated by a mixture of shrubs and herbaceous plants (predominantly sedges). Most sites have an area in the wettest portion that is without woody growth. Also, within the wetland complex, there are frequently areas of visible surface flow (seeps). Characteristic shrubs include *Rhamnus alnifolia* (alder-leaved buckthorn), *Salix* spp. (willows), *Vaccinium myrtilloides* (velvet-leaf berry), *Rubus pubescens* (dwarf blackberry), *V. corymbosum* (highbush blueberry), *Alnus incana* spp. *rugosa* (speckled alder), *Viburnum recognitum* (arrow-wood), and *Cornus sericea* (red-osier dogwood). The herbaceous species vary; some typical representatives are *Senecio aureus* (golden ragwort), *Geum rivale* (water avens), *Solidago patula* (spreading goldenrod), *Eupatorium perfoliatum* (boneset), *Equisetum arvense* (common horsetail), *Glyceria striata* (fowl mannagrass), *Carex interior* (a sedge), *C. Lasiocarpa*^s (many-fruited sedge), *C. hystericina* (a sedge), *Chelone glabra* (turtlehead), *Thelypteris palustris* (marsh fern), *Symplocarpus foetidus* (skunk cabbage), *C. lacustris* (a sedge), and *Typha latifolia* (common cat-tail). Some sites may contain calciphilic species such as *Carex aurea* (golden-fruited sedge), *C. flava*^s (yellow sedge),

C. prairea^s (prairie sedge), *C. sterilis*^s (Atlantic sedge), *C. tetanica*^s (Wood's sedge), *Eriophorum viridicarinaratum*^s (thin-leaved cotton-grass), *Muhlenbergia glomerata* (spike muhly), and *Parnassia glauca*^s (grass-of Parnassus). Characteristic bryophytes include *Campylium stellatum*, *Plagiomnium ellipticum*, *Sphagnum palustre*, *Bryum pseudotriquetrum*, and *Climacium americanum*. On many of these sites, microtopography and vegetation response creates a tight mosaic of locally different chemical conditions. Mounds of mosses, especially *Sphagnum* spp., form at the base of shrubs and stumps and lower the pH in their immediate surroundings. This provides a suitable habitat for acid-loving species like *Vaccinium* spp. (blueberries), *Clintonia* spp. (bluebead and speckled wood lilies), *Gaultheria procumbens* (teaberry), and *Tsuga canadensis* (eastern hemlock).

Related types: The presence of heaths in these systems may at first be confusing, but a closer look should reveal a number of calciphilic species. Calciphiles that may occur include *C. flava*^s (yellow sedge), *C. aurea* (golden-fruited sedge), *C. sterilis* (a sedge), *C. prairea* (prairie sedge), *C. tetanica*^s (a sedge), *Parnassia glauca*^s (grass-of Parnassus), *Muhlenbergia glomerata* (spike muhly), and *Eriophorum viridicarinaratum*^s (thin-leaved cotton-grass). This type is ecologically similar to and shares many species with the "Poison sumac - red-cedar - bayberry fen" type. The two differ in their distribution and species composition.

Range: Glaciated Northwest.

Selected references: PNDI field surveys, WPC and TNC 1995.

[Crosswalk: Smith's "Shrub Fen," "Basin Graminoid Forb Fen," TNC's *Carex (flava, hystericina, interior, sterilis)* - *Campylium stellatum* Herbaceous Alliance.]

Great Lakes Region scarp seep

This community type is specific to seepage areas of the extremely steep, actively eroding lakeshore-bluff and creek-wall slopes along Lake Erie. In the case of creek gorge seeps, groundwater seepage occurs at the interface of glacial and glacial-lacustrine deposits and the underlying eroded shales and sandstone. On the lakeshore bluffs, the seeps usually occur at the boundary of old beach deposits of sand and gravel, and an underlying layer of dense, more restrictive till. These communities are characteristically open, with a mixture of shrubs, sometimes with scattered trees. This is a very dynamic system, and the structure of the vegetation depends largely on its successional status. Recently slumped areas are first colonized by bryophytes and *Equisetum*



spp. (horsetails). As the substrate becomes more stable, and organic matter accumulates, graminoids, other herbs and shrubs colonize the seep. Eventually, perhaps due to the weight of the vegetation and organic matter, the entire community will "slump" or slide downslope, and the cycle begins again. More protected sites slump less frequently, and may develop a tree canopy. Woody species include *Salix* spp. (willows), *Cornus rugosa* (round-leaved dogwood), *C. sericea* (red-osier dogwood), *C. altemifolia* (alternate-leaved dogwood), *Alnus incana* (speckled alder), *Amelanchier arborea* (shadbush), *Tsuga canadensis* (eastern hemlock), *Acer saccharum* (sugar maple), *Lindera benzoin* (spicebush), *Populus deltoides* (cottonwood), *Ostrya virginiana* (hop-hornbeam), and *Rubus odoratus* (purple-flowering raspberry).

Herbaceous species include *Equisetum arvense* (common horsetail), *Parnassia glauca*^s (grass-of-Parnassus), *Senecio aureus* (golden ragwort), *Solidago flexicaulis* (zigzag goldenrod), *Impatiens pallida* (pale jewelweed), *Arisaema triphyllum* (jack-in-the-pulpit), *Glyceria striata* (fowl mannagrass), *Carex aureus*^s (golden-fruited sedge), a variety of other graminoids, the exotic species *Tussilago farfara*ⁱ (coltsfoot), and the invasive *Phragmites australism*^h (common reed). This community type is part of the "Great Lakes Region scarp complex."

Related types: Areas of the scarp that lack substantial groundwater discharge are described in the terrestrial section as "Great Lakes Region scarp woodland."

Range: Great Lakes Region.

Selected references: PNDI field surveys, WPC and TNC 1998.

[Crosswalk: Smith's "Eastern Great Lakes Bluff/Cliff Community."]

Great Lakes Region bayberry - mixed shrub palustrine shrubland

In Pennsylvania, this community type occurs only at Presque Isle. The substrate is sand, and the water table fluctuates seasonally; it is at or near the surface during the spring and below the surface in the fall. These are shrublands dominated by a mixture of *Myrica pensylvanica* (bayberry), *Cornus amomum* (red-willow), *Cornus sericea* (red-osier dogwood), *Lonicera morrowii*ⁱ (Morrow's honeysuckle), and *Salix* spp. (willows), with scattered *Populus deltoides* (cottonwood), and *Betula pendula*ⁱ (European white birch). Herbaceous species include *Calamagrostis canadensis* (bluejoint), *Carex scoparia* (a sedge), *C. bebbii*ⁱ (a sedge), *Scarps atrocinctus* (blackish woolgrass), *Solidago canadensis* (Canada goldenrod), *Juncus acuminatus* (sharp-fruited rush), and *Iris virginicas*^s (southern blue flag). This community type

is part of the "Great Lakes Region beach -dune - sandplain complex."

Related types: This type may closely resemble the "Great Lakes Region bayberry -cottonwood community," which is drier. Because the substrate on which both communities occur is sand, at times when the water table is below the surface, palustrine sites may appear dry. A careful survey for wetland species may be necessary to make a determination. The two types may intergrade.

Range: Great Lakes Region.

Selected references: Bissell and Bier, 1987.

[Crosswalk: Smith's "Eastern Great Lakes Dune Community."]