



Palustrine Communities Descriptions

These are wetland natural communities in which the species composition is affected by flooding or saturated soil conditions, and the water table is at or near the surface most of the year.

Note: The term “wetland” is not used in the sense of a “jurisdictional wetland,” which has a legal definition.



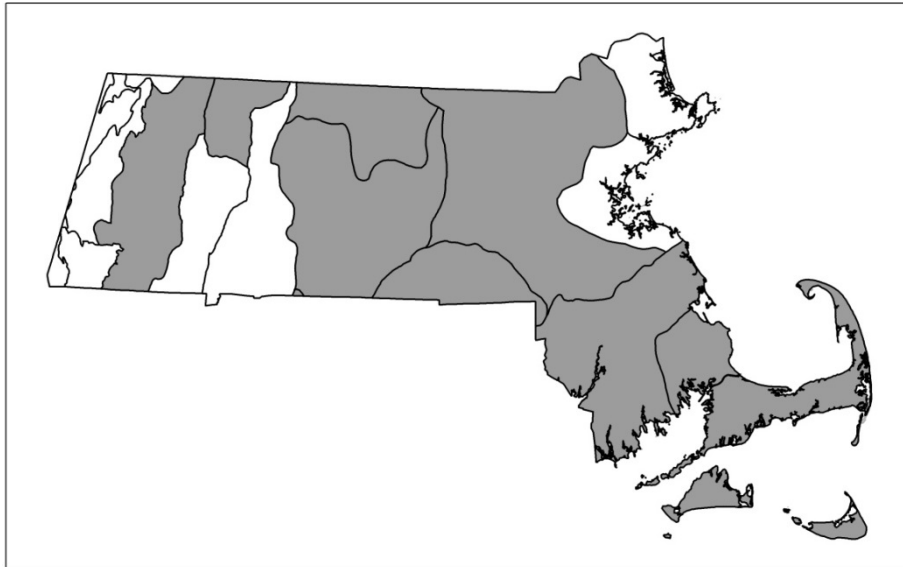
Pitcher Plant, photo by Patricia Swain, NHESP



Acidic Graminoid Fen

Community Code: CP2B0B1000

State Rank: S3



Concept: Mixed graminoid/herbaceous acidic peatlands with some groundwater and/or surface water flow but no calcareous seepage. Shrubs occur in clumps but are not dominant throughout.

Environmental Setting: Peatlands, commonly called bogs or fens, are wetland communities on peat, which is an accumulation of incompletely decomposed organic material. Bogs and acidic fens are northern communities; Massachusetts is at the southern limit of the geographic range of acidic peatlands, meaning that climatic conditions are marginal and occurrences are patchy. Acidic Graminoid Fens are sedge- and sphagnum-dominated peatlands that are weakly minerotrophic (mineral-rich). Acidic Graminoid Fens typically have some surface water inflow and some groundwater connectivity. Inlets and outlets are usually present, and standing water is present throughout much of the growing season. Peat mats are quaking and often unstable.

Vegetation Description: Species of sphagnum moss (*Sphagnum* spp.) are the most common plants in all acidic peatlands. As with vascular plants, the particular sphagnum species present vary depending on acidity and nutrient availability. Acidic Graminoid Fens have the most diversity of vascular plants of the acidic peatland communities. Graminoid (grass-like) and herbaceous species are dominant, although they share many shrub species with Acidic Shrub Fens. Typical graminoids include cotton-grasses (*Eriophorum* spp.) and other sedges such as beaked sedge (*Carex utriculata*), woolly-fruited sedge (*C. lasiocarpa* ssp. *americana*), white-beaked sedge (*Rhynchospora alba*), twig-sedge (*Cladium mariscoides*), and pondshore-rush (*Juncus pelocarpus*). Threeway sedge (*Dulichium arundinaceum*) and buckbean



(*Menyanthes trifoliata*), often found at fen edges, are good indicators of particularly minerotrophic (mineral-enriched) conditions. Characteristic herbaceous species include marsh St. John's-wort (*Triadenum virginicum*), arrow-arum (*Peltandra virginica*), and rose pogonia (*Pogonia ophioglossoides*). Large cranberry (*Vaccinium macrocarpon*) can be abundant. There is patchy shrub and tree (usually sapling) cover, including leatherleaf (*Chamaedaphne calyculata*), water-willow (*Decodon verticillatus*), swamp azalea (*Rhododendron viscosum*), sweet pepper-bush (*Clethra alnifolia*), poison sumac (*Toxicodendron vernix*), red maple (*Acer rubrum*), white or pitch pines (*Pinus strobus*, *P. rigida*), and Atlantic white cedar (*Chamaecyparis thyoides*).

Differentiating Occurrences: Natural communities on acidic peatlands all occur on sphagnum peat. The depth, density, and strength of the underlying peat control the structure and composition of each type of peatland community through the extent that plants growing on it are isolated from nutrients carried by groundwater. Acidic Graminoid Fens are differentiated by the dominance of graminoid and herbaceous species and by the lack of extensive shrubs. Threeway sedge (*Dulichium arundinaceum*) and buckbean (*Menyanthes trifoliata*) are characteristic of wet, nutrient-enriched edges of Acidic Graminoid Fens. Sea-level Fens occupy the interface between estuarine marshes and upland seepage slopes, and therefore have a distinct species assemblage including both estuarine and palustrine species. Regionally, three species are identified are considered to be diagnostic of Sea-level Fens: saltmarsh straw-sedge (*Carex hormathodes*), saltmarsh spike-sedge (*Eleocharis rostellata*), and saltmarsh threesquare (*Schoenoplectus americanus*). Twig-sedge (*Cladium mariscoides*) at the edges of salt marshes is also used as an indicator of Sea-level Fens. Interdunal Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands. Level Bog communities receive little or no stream flow and are isolated from the water table, making them the most acidic (pH ~ 3 to 4) and nutrient-poor of peatland communities. The sphagnum peat tends to be deep and well-developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Acidic Graminoid Fen - Spillway Fens are shallow acidic peatlands with mixed graminoid /herbaceous vegetation that develop on spillway bedrock channels associated with large dams.

Associated Fauna: Due to the extended periods of saturation, lack of nutrients, and high acidity and low oxygen content of the water, acidic peatlands are inhospitable to many animal species. Winged animals and large terrestrial animals can use peatlands as part of their habitat and then move on when conditions are unfavorable. Moose (*Alces alces*) and white-tailed deer (*Odocoileus virginianus*) use acidic peatlands for browsing and grazing, and their trails are often evident across the peat mat. Black bears (*Ursus americanus*) are attracted to the cranberries and blueberries in season.



Many bird species use peatlands for part of the year as nesting or foraging habitat. Massachusetts birds that can be found in acidic peatlands include Swamp Sparrows (*Melospiza georgiana*), Common Yellowthroat (*Geothlypis trichas*), Olive-sided and Alder Flycatchers (*Contopus cooperi* and *Empidonax alnorum*), Red-winged Blackbirds (*Agelaius phoeniceus*), and Gray Catbirds (*Dumetella carolinensis*). Many species of dragonflies and damselflies inhabit acidic peatlands, especially where there is adjacent open water; three state-protected rare dragonfly species, the Ringed Boghaunter (*Williamsonia lintneri*), Ebony Boghaunter (*W. fletcheri*), and Kennedy's Emerald (*Somatochlora kennedyi*) are limited to acidic peatlands in Massachusetts. Acidic peatlands are an important component of the habitat of several other uncommon animal species. Southern Bog Lemmings (*Synaptomys cooperi*) are limited to acidic peatlands in Massachusetts. Four-toed Salamanders (*Hemidactylium scutatum*) breed in nests in sphagnum moss. Spotted turtles (*Clemmys guttata*) occupy a variety of wetland habitats in Massachusetts, including acidic peatlands. Larvae of the Pitcher Plant Borer moth (*Papaipema appassionate*) feed on the stems and roots of pitcher plants, and larvae of the Chain Fern Borer (*P. stenocelis*) feed on the rhizomes of Virginia Chain Fern. These two moths are limited to sites where those plant species occur.

Public Access:

Tully Lake Reservation (US Army Corps of Engineers), Royalston; Quaboag WMA, Brookfield; Noquochoke WMA, Dartmouth; Hockomock Swamp WMA, Bridgewater; Grassy Pond Conservation Area, Acton.

Threats:

Nutrient enrichment from runoff from roads, lawns, septic systems, and agricultural fields. Other threats are alterations to the natural hydrology and trampling.

Management Needs:

Cattails appear to proliferate in areas that experience road and/or lawn runoff. Efforts should be made to minimize runoff into these communities.

USNVC/NatureServe:

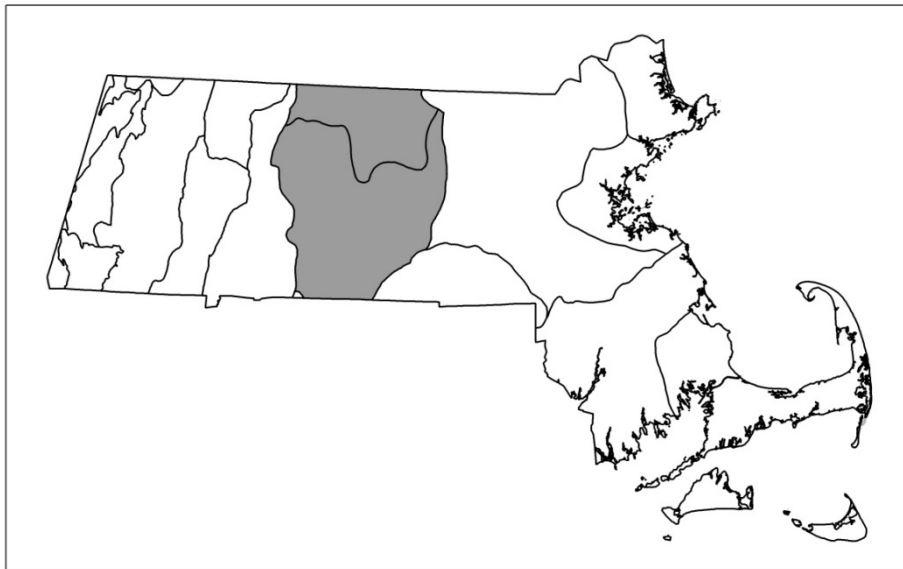
In part *Chamaedaphne calyculata*/*Carex lasiocarpa*-*Utricularia* spp. Shrub Herbaceous Vegetation but leatherleaf not dominant.



Acidic Graminoid Fen – Spillway Fen

Community Code: CP2B0B100A

State Rank: SNR



Concept: Shallow acidic peatlands with mixed graminoid /herbaceous vegetation, that develop on spillway bedrock channels associated with large dams.

Environmental Setting: Shallow peat developed on spillway channel bottoms with groundwater seepage that keeps the coarse mineral soil substrate saturated most of the time. Annual herbicide or mowing treatment to control woody plants produces small patches of high mortality of a minute proportion of the fen each year and may play an important role in the observed patch dynamics and species diversity in the community.

Vegetation Description: The plants of the Acidic Graminoid Fen - Spillway Fen community include peatland species and species more typical of disturbed areas such as river or lake shores or wet gravel pits. Species shared with Acidic Graminoid Fens include sedges (*Carex* species), Tawny Cotton-grass (*Eriophorum virginicum*), Round-leaved Sundew (*Drosera rotundifolia*), and Rose Pogonia (*Pogonia ophioglossoides*). Horsetails (*Equisetum* spp.), including Variegated Scouring Rush (*Equisetum variegatum*), may cover substantial areas of the habitat. Canadian St. John's-wort (*Hypericum canadense*) and Spreading Bulrush (*Scirpus expansus*) occur at both reported sites. Both sites included multiple members of the sedge and grass families. One site included several regionally uncommon (but not State-Listed) species including Alpine Clusledge (*Trichophorum alpinum*), Swamp-thistle (*Cirsium muticum*), and Northeastern Willow-herb (*Epilobium strictum*), along with large populations of orchid species.



Differentiating Occurrences: Spillway Fens are restricted to the spillways of large dams. Any sphagnum-dominated areas in spillways would be considered to be a Spillway Fen, a cultural variant of Acidic Graminoid Fen.

Associated Fauna: Due to the extended periods of saturation, lack of nutrients, and high acidity and low oxygen content of the water, acidic peatlands are inhospitable to many animal species. Spillway Fens, being on spillways of large dams, are not likely to be used as habitat by many of the wide-ranging large species that are found in other acidic peatlands.

Public Access: Tully Lake Reservation (US Army Corps of Engineers), Athol; Barre Falls Project Area (US Army Corps of Engineers), Barre.

Threats:

Management Needs: The community is maintained through active management of the spillways. The spillway is critical infrastructure for the flood control project and maintenance and repairs to maintain its function are inevitable. The annual herbicide treatment to control woody plants produces small patches of high mortality (but affecting a minute proportion of the fen each year) and may play an important role in the observed patch dynamics and species diversity in the community. Avoid altering the existing disturbance regime affected by the annual vegetation treatment. Debris, including substantial rubble of rock falls from the steep rock walls of the channel, may eventually need to be removed from the spillway channel. Consider developing a management plan to help conserve the fen habitat prior to conducting major work in the spillway.

USNVC/NatureServe:



Acidic Pondshore/Lakeshore Community

Community Code: CP2A0B1100

State Rank: S4



Concept: The broadly defined vegetation of acidic pondshores found statewide. The vegetation is often shrubby around lakes and ponds that have little natural fluctuation of water levels.

Environmental Setting: The Acidic Pondshore/Lakeshore Community is broadly defined to cover most of the pondshores in the state that are not explicitly excluded, such as calcareous pondshores and coastal plain pondshores. Many occurrences are narrow (often <1m wide) and are submerged or saturated for a significant part of the year or continuously in wet years. In ponds or lakes that have little natural fluctuation in water levels, the shores are often shrub-dominated. Shallow ponds with gradual slopes may have broader shores with emergents along the shore or, if there is regular disturbance such as water level changes or ice scour, the vegetation may be sparse.

Vegetation Description: The vegetation is highly variable among Acidic Pondshores/ Lakeshore Community occurrences, with hydrology and topography of the basin and geographic location in the state strongly influencing the plants that are present. Shore vegetation may include shrubs such as mountain laurel (*Kalmia latifolia*), maleberry (*Lyonia ligustrina*), mountain holly (*Ilex mucronata*), arrow-wood (*Viburnum dentatum*), and leatherleaf (*Chamaedaphne calyculata*), with rhodora (*Rhododendron canadense*), steeple-bush (*Spiraea tomentosa*), and American filbert (*Corylus americana*). Herbaceous vegetation on the shoreline is diverse and commonly includes spotted Joe-pye-weed (*Eutrochium maculatum*), tussock-sedge (*Carex stricta*), northern water-horehound (*Lycopus uniflorus*), and royal fern (*Osmunda regalis*). Emergent aquatic species grow adjacent to the shoreline and can merge into it. Gradual



shores may have more beach-like conditions with herbaceous species such as golden pert (*Gratiola aurea*).

Differentiating Occurrences: Coastal Plain Pondshores and Coastal Plain Pondshores - Inland Variant have been separated out, as those communities that develop in groundwater-flooded depressions in inland outwash sand plains and have shorelines that are seasonally exposed, but submerged or saturated for a significant part of the year or continuously in wet years. The seasonal development of herbaceous vegetation in zones as water levels go down are distinctive for the Coastal Plain Pondshore - Inland Variant. Shorelines of Acidic Pondshores/Lakeshores tend to be dominated by trees or shrubs to the water edge and have limited annual fluctuation. In sites with less linear communities, the community type tends to be designated as Shrub Swamp.

Associated Fauna: The shrubs, sedges, bulrushes, and grasses of Inland Acidic Pondshore/Lakeshores provide a food resource for waterfowl and other marsh birds.

Public Access: Long Pond, Tully Lake Reservation (US Army Corps of Engineers), Royalston.

Threats: More information is needed to assess the threats to Acidic Pondshore/Lakeshore Communities. Probable threats include trampling from ORVs, alteration of normal water-level fluctuations, and shoreline development. Invasives include purple loosestrife and phragmites.

Management Needs: More information is needed to assess the management needs of Acidic Pondshore/Lakeshore Communities.

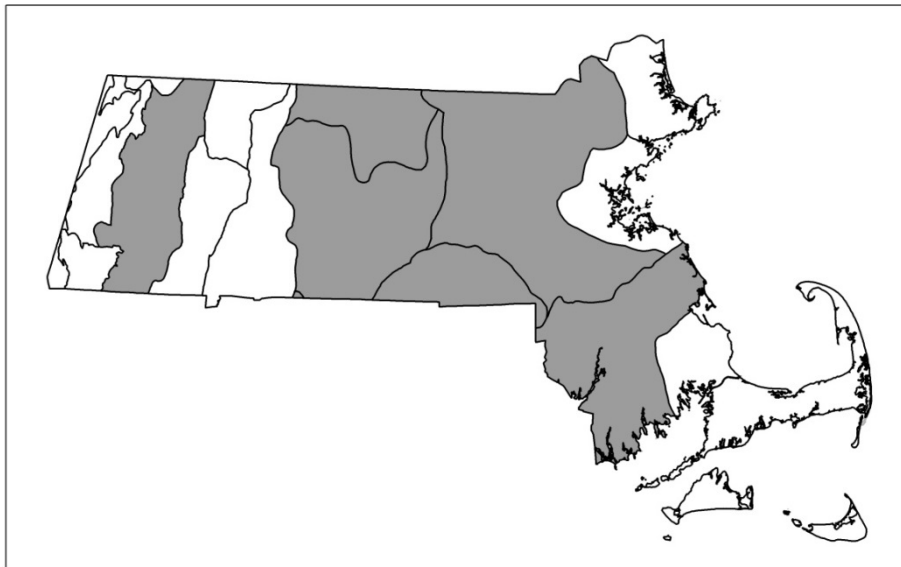
USNVC/NatureServe: In System: CES201.586 Laurentian-Acadian Lakeshore Beach and related to Eroding Clay Bank Sparse Vegetation [CEGL002584]; and Igneous - Metamorphic Cobble - Gravel Inland Lake Shore Sparse Vegetation [CEGL002303].



Acidic Shrub Fen

Community Code: CP2B0B2000

State Rank: S3



Concept: Shrub-dominated acidic peatlands characterized by a mixture of low-growing, primarily deciduous shrubs. Acidic Shrub Fens experience some groundwater and/or surface water flow, but not calcareous seepage.

Environmental Setting: Acidic Shrub Fens typically occur along pond margins, often at the edges of peat mats where the peat may be weak. Acidic Shrub Fens are primarily composed of low-growing, interwoven shrubs with patches of sphagnum moss growing at the shrub bases. Although acidic peatland communities, the plants of Acidic Shrub Fens are often in contact with pond water or have other surface or groundwater connectivity. The communities are weakly minerotrophic (some nutrients are present in the water and available to the plants). Standing water is present throughout much of the growing season. Peat mats are quaking and often unstable.

Vegetation Description: Dense, low growing (<1m tall) shrubs make up the dominant layer of Acidic Shrub Fens. Leatherleaf (*Chamaedaphne calyculata*), sweet gale (*Myrica gale*), water-willow (*Decodon verticillatus*), and meadow-sweet (*Spiraea alba* var. *latifolia*) are typical, sometimes with scattered taller highbush blueberry (*Vaccinium corymbosum*), red maples (*Acer rubrum*), alder (*Alnus* spp.), and/or sweet-pepperbush (*Clethra alnifolia*). Herbaceous plants may be abundant and diverse, or quite sparse. The layer often includes St. John's-worts (*Hypericum* spp.) and arrowheads (*Sagittaria* spp.). Typical graminoids include sedges (*Carex* spp.), cotton-grasses (*Eriophorum* spp.), and beak-rushes (*Rhynchospora* spp.).

Differentiating Occurrences: Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs with patches of sphagnum moss growing at the shrub bases. Dense water-willow and



sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands. Acidic Graminoid Fens are differentiated by the abundance of graminoid and herbaceous species and lack of extensive shrubs. Level Bog communities receive little or no stream flow and they are isolated from the water table, making them the most acidic (pH is in the range of 3 to 4) and nutrient-poor of peatland communities. The sphagnum peat tends to be deep and well developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Kettlehole Level Bogs are a subset of Level Bogs that occur in iceblock depressions (commonly called kettleholes) in sandy glacial outwash. They are typically small (<3 acres) and round, and they lack inlets and outlets. Highbush Blueberry Thickets are dominated by tall (2m or more) dense shrubs of the blueberry family with other deciduous species. Shrub Swamps lack peat, are often more diverse than Acidic Shrub Fens, and are not dominated by blueberries or other ericaceous plants. They are often dense and tall.

Associated Fauna:

Due to the extended periods of saturation, lack of nutrients, and high acidity and low oxygen content of the water, acidic peatlands are inhospitable to many animal species, including most amphibians and reptiles. Acidic Shrub Fens, when on the edge of open water, are less acidic and have more oxygen in the water than other types of peatlands. Winged animals and large terrestrial animals can use peatlands as part of their habitat and then move on when conditions are unfavorable. Many bird species use peatlands for part of the year as nesting or foraging habitat. Many species of dragonflies and damselflies inhabit acidic peatlands, especially where there is adjacent open water.

Public Access:

Lowell-Dracut-Tyngsborough State Forest, Dracut; Quaboag WMA, Brookfield; Upton State Forest, Upton; Tully Lake Reservation (US Army Corps of Engineers), Royalston; Mud Pond-Horseshoe Pond Bog, Farmington River WMA, Otis.

Threats:

Hydrologic alteration and nutrient enrichment from road and lawn runoff. Trampling from humans affects peat mat integrity, although the peat along shores is often very unstable and discourages access.

Management Needs:

Pondside occurrences are threatened by wetland alterations (including dock building, small-scale peat mining operations, and conversion to commercial cranberry bogs), encroaching development, changes in hydrology, and nutrient enrichment from leach fields, road salt run-off, and siltation.

USNVC/NatureServe:

Myrica gale - *Chamaedaphne calyculata*/*Carex (lasiocarpa, utriculata)* - *Utricularia* spp. Shrub Herbaceous Vegetation [CEGL006302] and *Myrica gale* - *Spiraea alba* - *Chamaedaphne calyculata* Shrubland [CEGL006512]. In part *Chamaedaphne calyculata* - (*Gaylussacia bigeloviana*) - *Decodon verticillatus*/*Woodwardia virginica* Dwarf-shrubland [CEGL006008]; also in part *Decodon verticillatus* Semipermanently Flooded Shrubland [CEGL005089].



Alluvial Atlantic White Cedar Swamp

Community Code: CP1B1A4000

State Rank: S2



Concept: Forested swamps occurring along low-gradient rivers where Atlantic white cedar is co-dominant with red maple in the overstory.

Environmental Setting: Alluvial Atlantic White Cedar Swamps occur within the floodplain of low-gradient rivers and streams, or at the fringes of open marshy areas along ponds. They receive annual or semi-annual overbank flooding, making them more mineral-rich than other Atlantic white cedar wetlands. But like other Atlantic white cedar swamps and other floodplain communities, they are often poorly drained, retaining sediment-saturated flood water well into the growing season. Groundwater from uplands and surrounding wetlands may maintain soil moisture over the growing season. Soils are typically silt loams with a mucky surface organic layer. Alluvial Atlantic White Cedar Swamps often occur in wetland mosaics with other alluvial and floodplain forests and swamps, as well as with more open wetland communities.

Vegetation Description: Alluvial Atlantic White Cedar Swamps are highly variable in their composition. Atlantic white cedar (*Chamaecyparis thyoides*) and red maple (*Acer rubrum*) dominate the tree layer, and highbush blueberry (*Vaccinium corymbosum*) and sweet pepper-bush (*Clethra alnifolia*) occur in the shrub layer, along with silky dogwood (*Swida amomum*). The herb layer is comprised of species common to very wet, open, or enriched sites, including sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), bugleweed (*Lycopus* spp.), marsh fern (*Thelypteris palustris*), and marsh St. John's-wort (*Triadenum virginicum*).



Differentiating Occurrences:	Alluvial Atlantic White Cedar Swamps differ from other Atlantic white cedar wetlands in that they occur within the floodplain of low-gradient rivers and streams or at the fringes of open marshy areas along ponds, generally in the eastern part of the state. They receive annual or semi-annual overbank flooding, making them more mineral-rich than other Atlantic white cedar wetlands. Silky dogwood, sensitive and royal ferns, bugleweed, and marsh St. John's-wort are more common than in other Atlantic white cedar swamps, and sphagnum carpets are less dense in regularly flooded areas. As with all natural communities, transitions and mixes occur. Coastal Atlantic White Cedar Swamps are not along river floodplains, although geographic distribution and resultant coastal species may overlap with Alluvial Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps may also overlap geographically, but are also not in floodplains. Yellow birch is more common in Inland Atlantic White Cedar Swamps than in Alluvial Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps have lower abundance of coastal indicators such as greenbrier, inkberry, dangleberry, swamp sweetbells, Virginia chain-fern, and netted chain-fern than Alluvial or Coastal Atlantic White Cedar Swamps. In Alluvial Red Maple Swamps, silver maple is often codominant with red maple; there is very little Atlantic white cedar (<25% cover), if it is present at all.
Associated Fauna:	Alluvial Atlantic White Cedar Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
Public Access:	Maple Park Conservation Area, Mansfield; West Hill Dam and Park (US Army Corps of Engineers), Uxbridge; Moose Hill Wildlife Sanctuary (Massachusetts Audubon Society), Sharon; Bungay River Conservation Area, Attleboro; Noquochoke WMA, Dartmouth.
Threats:	The two greatest threats to Atlantic white cedar swamps are land clearing for agricultural, commercial and residential development, and interference with normal hydrological functioning as a result of development. Atlantic white cedar has been cut extensively for posts and shingles for over three centuries. In an extensive statewide vegetation inventory funded by NHESP in 1990, no uncut stands were found, but several sites contained cedars that were 100-200 years old. Selective cutting is detrimental to the persistence of Atlantic white cedar swamps, because hardwoods, such as red maple, out-compete and replace Atlantic white cedar. Any alteration to the natural hydroperiod of Atlantic white cedar swamps threatens their persistence.
Management Needs:	Due to the limited distribution of Atlantic white cedar swamps, it is recommended that no clearing or filling of these wetlands be allowed. Atlantic white cedar will regenerate best following catastrophic disturbance events such as hurricanes and fires. Data suggest that in the absence of disturbance, red maple and shrubs increase in abundance at the expense of Atlantic white cedar. Fire suppression negatively threatens the long-term persistence of Atlantic white cedar swamps, and controlled burning practices may be an appropriate restoration tool in many areas.



Controlled burning should be accompanied by small-patch clearcuts to be most effective. By clear-cutting small patches, generally 20 m x 20 m, and removing the slash and competing vegetation, pure, even-aged stands of Atlantic white cedar are able to regenerate. Atlantic white cedar swamps require a natural cycle of wet and dry periods for their survival and reproduction. Standing water for much of the year is unfavorable for both seed germination and seedling survival, and young seedlings are killed by both drowning and drought. It is recommended that any alterations in water levels be avoided, including development and road construction in uplands surrounding Atlantic white cedar swamps which can alter water levels. Where cedar wetlands are associated with river systems, it is important to maintain the normal hydrologic regime of the river.

USNVC/NatureServe:

Chamaecyparis thyoides Northern Peatland Alliance [A3400] -- *Chamaecyparis thyoides* - *Acer rubrum*/*Lycopus* spp. Forest (CEGL006364).



Alluvial Hardwood Flat Community

Community Code: CP1A2A4000

State Rank: S3



Concept: Fairly open hardwood forests on alluvial flats along small rivers and large streams.

Environmental Setting: Alluvial Hardwood Flat Forests occur along moderate-gradient reaches of small rivers and large streams where flooding is of short, intense duration, as the small watersheds respond rapidly to local weather events. The soils tend to be coarse sand and gravel, with mesic to locally hydric moisture regimes.

Vegetation Description: White pines (*Pinus strobus*), substantially taller than the hardwood canopy, are sparsely emergent above the canopy. The sparse to closed tree canopy has black cherry (*Prunus serotina*) co-dominant with red maple (*Acer rubrum*) and scattered American elm (*Ulmus americana*), white ash (*Fraxinus americana*), sugar maple (*Acer saccharum*), and white pine. The mid-story layer consists of saplings of the tree species, plus ironwood (*Carpinus caroliniana*), smooth shadbush (*Amelanchier laevis*), alternate-leaved dogwood (*Swida alternifolia*), witch hazel (*Hamamelis virginiana*), and blackberry (*Rubus alleghaniensis*). A wide variety of shrubs and saplings are consistently present, but never at high density. Tree species that are absent from the canopy, such as red oak (*Quercus rubra*), paper birch (*Betula papyrifera*), and eastern hemlock (*Tsuga canadensis*), are common in the shrub layer. The herbaceous layer is dense and species-rich, with mesic forbs, ferns, grasses and sedges well-represented. The structure of the herbaceous layer varies from stand to stand and is often patchy within a stand. Woodgrass (*Brachyelytrum aristosum*) and New York fern (*Parathelypteris noveboracensis*) are two characteristic species normally present, often with substantial cover in dominant patches. Other fairly common plants in the layer include jack-in-the-pulpit (*Arisaema triphyllum*), lady fern (*Athyrium filix-femina* var. *angustum*), sensitive



fern (*Onoclea sensibilis*), interrupted fern (*Osmunda claytoniana*), bristly dewberry (*Rubus hispidus*), and tall meadow-rue (*Thalictrum pubescens*). The non-native invasive shrub glossy buckthorn (*Frangula alnus*) is often encountered, but seldom at high densities. Meander scars support pockets of diverse wetland vegetation and, sometimes, aquatic species.

Differentiating Occurrences: Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple. Alluvial Red Maple Swamps, along low-gradient rivers, flood annually and are slow to drain. Silver maple is often a codominant with red maple. High-terrace Floodplain Forests do not flood annually. They have a mix of floodplain trees, including silver maple, and mesic, deciduous hardwoods. The diverse herbaceous layer includes floodplain species and others more typical of rich forests. Red Maple Swamps are in basins or hillside seeps along small drainage ways. They are dominated by red maple.

Associated Fauna: Alluvial Hardwood Flats provide shade for the associated stream and filter water coming from surrounding uplands, improving water quality for the fish and other animals of the stream. Being small communities, they are part of the habitat of the wide-ranging riverine and upland animals. Old meander scars and depressions without fish provide vernal pool habitat.

Public Access: Tully Lake Reservation (US Army Corps of Engineers), Royalston; Royalston Falls Reservation (The Trustees of Reservations) and Royalston State Forest, Royalston; Warwick State Forest, Warwick.

Threats: Invasives. Succession.

Management Needs:

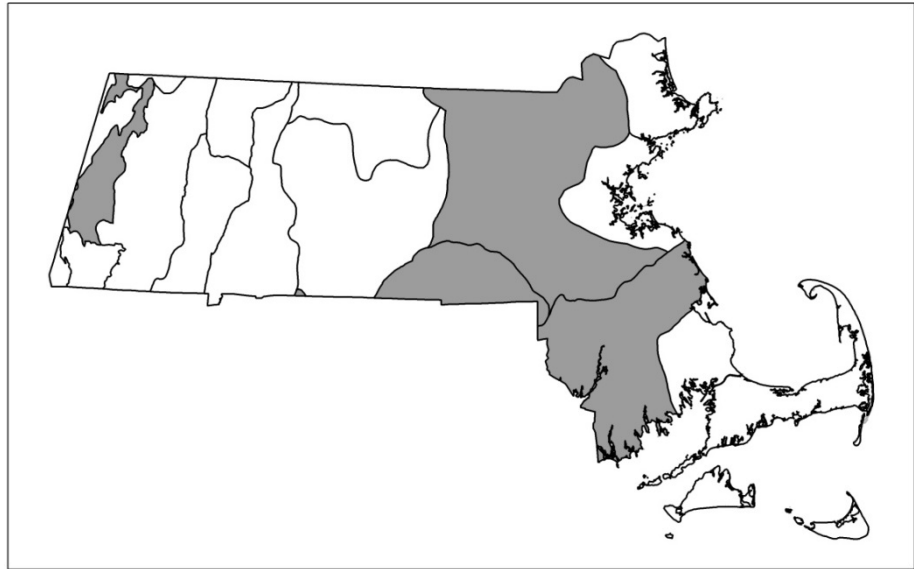
USNVC/NatureServe: *Acer rubrum* - *Prunus serotina*/*Cornus amomum* Forest, CEG006503 *Quercus bicolor* - *Acer rubrum*/*Carpinus caroliniana* Forest.



Alluvial Red Maple Swamp

Community Code: CP1A2A1A00

State Rank: S3



Concept: A rich variant of Red Maple Swamp, that occurs in low areas along rivers and streams that experience overbank flooding.

Environmental Setting: Alluvial Red Maple Swamps occur along mainstem sections of low-gradient rivers and streams that flood periodically, primarily in the eastern part of the state. They experience overbank flooding, but they appear to be more poorly drained than true floodplain forests. Soils are typically silt loams with pronounced soil mottling and a surface organic layer. Alluvial Red Maple Swamps may occur as parts of wetland mosaics with other types of floodplain forests, shrub swamps, and other wetland communities. Groundwater from uplands and surrounding wetlands may maintain soil moisture over the growing season.

Vegetation Description: The overstory of Alluvial Red Maple Swamps is a mixture of red maple (*Acer rubrum*) and, usually, silver maple (*A. saccharinum*) along riverbanks, with lesser amounts of American elm (*Ulmus americana*), sugar maple (*A. saccharum*), green ash (*Fraxinus pennsylvanica*), shagbark hickory (*Carya ovata*), and/or swamp white oak (*Quercus bicolor*). Red oak (*Q. rubra*), white pine (*Pinus strobus*), and black cherry (*Prunus serotina*) occur in elevated sections. A subcanopy includes the canopy dominants along with hornbeam (*Carpinus caroliniana*). Unlike true floodplain forests, Alluvial Red Maple Swamps have well-developed shrub layers with northern arrow-wood (*Viburnum dentatum* var. *lucidum*), American hazelnut (*Corylus americana*), silky dogwood (*Swida amomum*), buttonbush (*Cephalanthus occidentalis*), meadowsweet (*Spiraea alba* var. *latifolia*), and the non-native glossy buckthorn (*Frangula alnus*). Vines include poison ivy (*Toxicodendron radicans*). In the coastal plain, shrubs may include mountain laurel (*Kalmia latifolia*), winterberry



(*Ilex verticillata*), and sweet pepper-bush (*Clethra alnifolia*). The herbaceous layer is often dominated by sensitive fern (*Onoclea sensibilis*) and false nettle (*Boehmeria cylindrica*), mixed with a rich assemblage of herbaceous species that commonly includes cinnamon fern (*Osmundastrum cinnamomeum*), royal fern (*Osmunda regalis*), goldenrods (*Solidago* spp.), jewelweeds (*Impatiens* spp.), beggar-ticks (*Bidens* spp.), bugleweeds (*Lycopus* spp.), awned sedge (*Carex crinita*), and grasses, including rice cutgrass (*Leersia oryzoides*), bluejoint grass (*Calamagrostis canadensis*), and woodreed (*Cinna arundinacea*).

Differentiating Occurrences: Alluvial Red Maple Swamps occur along low-gradient rivers and receive river flood waters. Unlike true floodplain forests, alluvial swamp forests have well-developed shrub layers composed of northern arrow-wood (*Viburnum dentatum* var. *lucidum*), silky dogwood (*Swida amomum*), and the non-native glossy buckthorn (*Frangula alnus*). Silver maple is often a codominant with red maple. The periodic river flooding is a key process in the Alluvial Red Maple Swamps that affects species composition and differentiates it from closely related community types. Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple. High-terrace Floodplain Forests do not flood annually. They have a mix of floodplain trees and mesic, deciduous hardwoods. The diverse herbaceous layer includes floodplain species and others more typical of rich forests. Red Maple Swamps are in basins or hillside seeps along small drainage ways. They are less diverse than Alluvial Red Maple Swamps in all layers.

Associated Fauna: Alluvial red maple swamps, especially at the upland fringe or in old meander scars and oxbows, can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat. Riverine odonates use adjacent alluvial red maple swamps for shelter.

Public Access: Taunton River WMA and Black Brook WMA, Middleborough; West Hill Dam and Park (US Army Corps of Engineers), Northbridge; George L. Darey Housatonic Valley WMA, Lenox.

Threats: Invasion of non-native plant species, including moneywort (*Lysimachia nummularia*) and glossy buckthorn (*Frangula alnus*).

Management Needs: Removal of non-native plant species.

USNVC/NatureServe: *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance -- *Acer rubrum* - *Fraxinus* (*pennsylvanica*, *americana*)/*Lindera benzoin*/ *Symplocarpus foetidus* Forest (CEGL006406) [CEGL006975; *Acer* (*rubrum*, *saccharinum*) - *Ulmus americana* forest (but this alliance is freely drained, not poorly drained, and not as shrubby as the Mass description)]. *Quercus bicolor* - *Acer rubrum*/ *Carpinus caroliniana* Forest (CEGL006386)



Atlantic White Cedar Bog

Community Code: CP1B1B2000

State Rank: S2



Concept: Acidic forested peatlands, with a nearly continuous heath shrub layer and an open canopy in which Atlantic white cedar is the characteristic tree species.

Environmental Setting: Atlantic White Cedar Bogs are semi-forested, acidic, dwarf-shrub peatlands: wetlands with incompletely decomposed plant material (peat) that accumulates when saturated year-round with water that is cool, acidic, poorly oxygenated, and low in nutrients. Short (2-10m or 6-30 ft.) Atlantic white cedar trees dominate the open canopy. An open to nearly continuous, low (~1m or 3ft) shrub layer often includes small Atlantic white cedars. In Massachusetts, many Atlantic White Cedar Bogs occur as small (<3 acre) openings within larger Atlantic white cedar swamps, in parts of the state where oak and oak - pine forests dominate the landscape. The settings are variable: pond border, patches in large swamps, and on Cape Cod, in kettleholes where they are surrounded by upland Pitch Pine - Oak Forest/Woodlands and Pitch Pine - Scrub Oak Communities.

Vegetation Description: Total canopy coverage is low (<25% cover) with Atlantic white cedar (*Chamaecyparis thyoides*) dominant with scattered red maple (*Acer rubrum*). Occasional associates include white and pitch pine (*Pinus strobus* and *P. rigida*), grey birch (*Betula populifolia*), and black spruce (*Picea mariana*). Scattered clumps of tall shrubs include highbush blueberry (*Vaccinium corymbosum*) and swamp azalea (*Rhododendron viscosum*). An often continuous low shrub layer is dominated by leatherleaf (*Chamaedaphne calyculata*) and sheep laurel (*Kalmia angustifolia*), with black and dwarf huckleberry (*Gaylussacia baccata* and *G. bigeloviana*), rhodora (*Rhododendron canadense*), and bog rosemary (*Andromeda polifolia* var. *glaucophylla*). There is typically a well-formed sphagnum moss layer below the



shrubs, and large and small cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*), sundews (*Drosera* spp.), and pitcher plants (*Sarracenia purpurea*) occur throughout. Virginia chain-fern (*Woodwardia virginica*) tends to be more common in peatlands, including Atlantic White Cedar Bogs, in southeastern Massachusetts than in other parts of the state.

Differentiating Occurrences: Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat. Atlantic White Cedar Bogs share many species and characteristics with other acidic peatlands, including Level Bogs, which they might be considered a variation of, as well as Kettlehole Level Bogs and Acidic Graminoid Fens. The most obvious difference is the presence of Atlantic white cedar in the sparse tree layer and as scattered shrubs on the sphagnum mat. Atlantic White Cedar Bogs often occur as openings in Coastal, Inland, and Northern Atlantic White Cedar Swamps, which are forested wetland communities with closed canopies (>25% tree cover overall, generally more), with >25% cover of Atlantic white cedar. Atlantic White Cedar Bogs have, overall, <25% cover of canopy species (there may be clumps of trees with very locally greater cover; the coverage is for the extent of the community, which will have areas of no canopy cover at all), with Atlantic white cedar dominating the canopy that does occur. Whether Atlantic White Cedar Bogs are considered to be separate entities or openings in the prevailing Atlantic white cedar swamps depends on the patch size and abundance of local patches: 2 acres (that may be cumulative across local patches) are required in the community ranking specifications.

Associated Fauna: Winged animals and large terrestrial animals can use peatlands as part of a larger habitat. White-tailed deer browse on shrubs in acidic peatlands, leaving trails across the peat mat. Some birds use peatlands for nesting or foraging. The acidity and low oxygen content make peatlands poor habitat for most amphibians and reptiles, although four-toed salamanders nest in sphagnum hummocks over water and individuals may incorporate Atlantic White Cedar Bogs as part of their habitat. Many species of dragonflies and damselflies inhabit acidic peatlands, especially where there is adjacent open water. Atlantic White Cedar bogs with dense patches of Virginia chain fern or water willow are likely to support species of moths that specialize in those plants.

Public Access: Mashpee WMA, Mashpee; Hockomock Swamp WMA (Nunkets Pond, Lake Nippenicket), Bridgewater; Blue Hills Reservation (Ponkapoag Pond), Canton; Peters Pond Area (town-owned), Dracut.

Threats: The two greatest threats to Atlantic white cedar swamps are land clearing for agricultural, commercial and residential development, and interference of normal hydrological functioning as a result of development. Atlantic white cedar has been cut extensively for posts and shingles for over three centuries. In an extensive statewide vegetation inventory funded by NHESP in 1990, no uncut stands were found, but several sites contained cedars that were 100-200 years old. Selective cutting is detrimental to the persistence of Atlantic white cedar swamps, because



hardwoods, such as red maple, outcompete and replace Atlantic white cedar. Any alteration to the natural hydroperiod of Atlantic white cedar swamps threatens their persistence. The peat in Atlantic White Cedar Bogs is threatened by hydrology changes and introduction of nutrients.

Management Needs:

Due to the limited distribution of Atlantic white cedar swamps, it is recommended that no clearing or filling of these wetlands be allowed. Atlantic white cedar will regenerate best following catastrophic disturbance events such as hurricanes and fires. Data suggest that in the absence of disturbance, red maple and shrubs increase in abundance at the expense of Atlantic white cedar. Fire suppression negatively threatens the long-term persistence of Atlantic white cedar swamps, and controlled burning practices may be an appropriate restoration tool in many areas. Controlled burning should be accompanied by small-patch clearcuts to be most effective. By clear-cutting small patches (generally 20 m x 20 m) and removing the slash and competing vegetation, pure, even-aged stands of Atlantic white cedar are able to regenerate. Atlantic white cedar swamps require a natural cycle of wet and dry periods for their survival and reproduction. Standing water for much of the year is unfavorable for both seed germination and seedling survival, and young seedlings are killed by both drowning and drought. It is recommended that any alterations in water levels be avoided. This includes development and road construction in uplands surrounding Atlantic white cedar swamps which can alter water levels. Where cedar wetlands are associated with river systems, it is important to maintain normal hydrologic regime of the river.

USNVC/NatureServe:

Chamaecyparis thyoides Northern Peatland Alliance -- *Chamaecyparis thyoides*/
Chamaedaphne calyculata Woodland [CEGL006321].



Black Gum – Pin Oak – Swamp White Oak Perched Swamp

Community Code: CP1A2A3000

State Rank: S1



Concept: A red maple-dominated basin swamp, in which black gum, pin oak, and swamp white oak are important components of the overstory. This vegetation association is limited to lakebed sediments of glacial Lake Hitchcock in the Connecticut Valley.

Environmental Setting: Black Gum - Pin Oak - Swamp White Oak Perched Swamps (perched swamps) are closed-canopy deciduous forests that occur on the flat lakebed of glacial Lake Hitchcock in the Connecticut River valley. The glacial lake substrate includes layers of clay overlain by varying depths of silt and sand. The relatively impermeable nature of the clay layer produces a locally perched water table that is not directly connected with the regional water tables, and supports this wetland community that is not found in the active floodplains of the river. There may be some connection to the groundwater along the margins of these wetlands or, to a more limited degree, through slow vertical movement. The surface topography is hummock and hollow with the hummocks about 0.5 m (about 1.5 ft.) high. With the exception of some sedges most of the vegetation is confined to the hummocks. The sites are wet at least seasonally, flooding in the spring and drying out over the summer. Periodic flooding occurs as indicated by the lack of organic matter accumulation.

Vegetation Description: The forest canopy is generally closed, but ranges from 50 to 100% closure. The stands are a mosaic of microsites with different degrees of wetness supporting slightly different species mixes. In general, red maple (*Acer rubrum*) dominates the overstory, but the species giving their names to the community that are at or near the northern limits of their ranges in the Connecticut River Valley of Massachusetts are generally present, often in abundance: these are black gum (*Nyssa sylvatica*),



pin oak (*Quercus palustris*), and swamp white oak (*Q. bicolor*). Other hardwoods, including ashes (*Fraxinus* spp.), regularly occur as scattered individuals. Drier sites include eastern hemlock (*Tsuga canadensis*) as a common associate with yellow birch (*Betula alleghaniensis*) consistently present at low densities. All sites have a fairly dense shrub layer similar to other red maple swamps. Common species include highbush blueberry (*Vaccinium corymbosum*), northern arrow-wood (*Viburnum dentatum* var. *lucidum*), common winterberry (*Ilex verticillata*), witch hazel (*Hamamelis virginiana*), and serviceberry (*Amelanchier* spp.). The wettest sites also have spicebush (*Lindera benzoin*) or often buttonbush (*Cephalanthus occidentalis*). Mountain laurel (*Kalmia latifolia*) is found in the drier sites, often in dense thickets. The herbaceous layer is variable, but cinnamon fern (*Osmundastrum cinnamomeum*) occurs at all known sites. Other common herbaceous species are Canada mayflower (*Maianthemum canadense*), goldthread (*Coptis trifolia*), Indian cucumber-root (*Medeola virginiana*), and various fern and sedge species (*Carex* spp.), particularly in the wetter sites. One of the most striking characteristics of this swamp forest is the high coverage of ferns. Netted chain-fern (*Woodwardia areolata*), a southern coastal plain species, occurs at some of the sites.

- Differentiating Occurrences:** Black Gum - Pin Oak - Swamp White Oak Perched Swamps are known only from the Connecticut River Valley in areas underlain by clays in lakebed sediments of glacial Lake Hitchcock. The presence of fairly high proportions of black gum, pin oak, and swamp white oak in the canopy, in addition to the topographic setting, distinguish the type. Red Maple - Black Gum Swamps are generally in small, topographically constrained basins surrounded by upland forests. Black gum needs to be dominant or codominant in large areas of the swamp for the occurrence to be a black gum swamp, but they don't have high proportions of pin oak or swamp white oak. Red Maple Swamps may have black gum, or occasional pin oak or swamp white oak in low proportions in the canopy, but not as dominants or codominants.
- Associated Fauna:** Perched swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
- Public Access:** Lawrence Swamp Conservation Area, Amherst; Great Swamp WMA, Whately.
- Threats:** It is likely that this community type once covered a larger area of the Connecticut Valley, but much of the lake bottom has been cleared and converted to agriculture. Only patches of these perched swamps remain. Current threats include alteration of water chemistry from road and farm runoff (in particular, the accumulation of road salts), ditching by land owners to drain water, and logging.
- Management Needs:** Disturbed areas appear to have large amounts of glossy buckthorn (*Frangula alnus*). Efforts to prevent further disturbance may prevent the spread of this invasive plant species.
- USNVC/NatureServe:** Not described; related to *Quercus palustris* - *Quercus bicolor* - *Acer rubrum* Flatwoods Forest (CEGL005037). Also related to *Quercus palustris* - *Quercus*



bicolor - *Nyssa sylvatica* - *Acer rubrum* Sand Flatwoods Forest (CEGL002100);
System: North-Central Interior Wet Flatwoods (CES202.700)



Calcareous Basin Fen

Community Code: CP2B0A3000

State Rank: S1



Concept: Sedge-shrub peatlands occurring in well-defined basins that have calcareous groundwater (and sometimes surface water) inputs. Calcareous Basin Fens are the least rich of the three calcareous fen communities described in Massachusetts.

Environmental Setting: Calcareous Basin Fens occur in well-defined basins with permanently saturated deep (>2m (6.5 ft.)) peat and consolidated or floating sedge-dominated peat mats around any open water in the basin. Waters are circumneutral to alkaline (pH 6.0-8.1), with high concentrations of calcium and magnesium cations and bicarbonate anions dissolved from limestone and dolostone bedrock or glacial materials rich in those elements. They are the least rich (with respect to water chemistry) of all the calcareous fen communities, at least partially because the nutrients get tied up in the thick peat and are not available for plant growth. Water moves slowly in peat and oxygen that groundwater carries is quickly used up: the resulting anaerobic conditions inhibit growth of microorganisms that would otherwise break down remains of dead plants, which contributes to the development of more peat. Because peat tends to absorb ions that are plant nutrients and release acid-forming hydrogen ions, the resulting water in thick peat is fairly acidic, despite the presence of calcium. This community type has existed at sites for a few thousand years and appears to be relatively stable over time.

Vegetation Description: Calcareous Basin Fens are sedge-dominated peatlands with scattered shrubs. Typical sedges include slender woolly-fruited sedge (*Carex lasiocarpa* ssp. *americana*) and water-sedge (*C. aquatilis* ssp. *altior*), with multiple other sedges, narrow-leaved cattail (*Typha angustifolia*), and white beaksedge (*Rhynchospora alba*). There are often patches of hard-stemmed bulrush (*Schoenoplectus acutus*



var. *acutus*). Grass of Parnassus (*Parnassia glauca*) may also be present. Scattered shrubs include shrubby cinquefoil (*Dasiphora floribunda*) and sweet-gale (*Myrica gale*), associated with typical bog/acidic fen species such as pitcher plant (*Sarracenia purpurea*), round-leaved sundew (*Drosera rotundifolia*), bog rosemary (*Andromeda polifolia* var. *glaucophylla*), twig rush (*Cladium mariscoides*), buckbean (*Menyanthes trifoliata*), and large cranberry (*Vaccinium macrocarpon*). Mosses are extensive and may include star campyllum moss (*Campyllum stellatum*), *Calliergonella* spp., and *Sphagnum* spp. In the increasingly wet area near the upland edge, a dense shrubby zone may include dense bog birch (*Betula pumila*).

Differentiating Occurrences: All calcareous wetlands include shrubby cinquefoil (*Dasiphora floribunda*). Most also have other calciphiles (calcium-loving plants) such as grass of Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), alder-leaf buckthorn (*Rhamnus alnifolia*), hemlock parsley (*Conioselinum chinense*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*). Within a given site, calcareous fen communities grade from one to another as conditions change. Calcareous Basin Fens have deep (> 2.0 meters (6.5 ft.)) peat in basins. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. They share many species with acidic fens, but include species restricted to calcareous conditions, such as bog birch and the calciphiles listed above. Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is mostly restricted to sedge hummocks. A diverse herbaceous layer dominates the vegetation. Tall shrubs and short trees may occur in scattered patches. Calcareous Seepage Marshes have a mixture of herbaceous, graminoid and shrub species similar to an emergent marsh, with mucky peat generally 0.5 to 2m deep. They are generally flat to slightly sloping. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps are dominated by trees and tall shrubs in a somewhat sparse forest where small openings share many of the species and conditions of Calcareous Sloping Fens. They may abut Calcareous Sloping Fens in a wetland mosaic.

Associated Fauna: Calcareous basin fens can function as vernal pool habitat if water remains standing for 2-3 months; these areas provide important amphibian breeding habitat.

Public Access: Due to the sensitivity of calcareous wetlands to damage from visitation, most land owners prefer not to publicize the locations.

Threats: Changes in groundwater quality and quantity; and any human activities that disturb the vegetation, substrate, or water supply. In disturbed areas, cattails may displace calcium-loving species. Beaver activity threatens calcareous fen communities by altering surface water chemistry. There is evidence to suggest that ponding of water by beaver dams may increase the water's relative acidity, possibly due to the accumulation of organic acids or to dilution from acid rain (Motzkin, 1993).

Management Needs: Fires, grazing, and/or mowing may be necessary to maintain open fen habitats. More information is needed.



USNVC/NatureServe:

Myrica gale-*Dasiphora fruticosa* ssp. *floribunda*/*Carex lasiocarpa* - *Cladium mariscoides* Shrub Herbaceous Vegetation [CEGL006068] G2G3; *Cornus racemosa*/*Carex (sterilis, aquatilis, lacustris)* Shrub Herbaceous Vegetation (CEGL006123) G2G3.



Calcareous Pondshore/Lakeshore Community

Community Code: CP2A0B1300

State Rank: S2



Concept: Vegetated gravelly, sandy, or muddy shores of calcareous or circumneutral inland lakes and ponds.

Environmental Setting: Calcareous Pondshore/Lakeshores are submerged or saturated for a significant part of the year or continuously in wet years. The substrate is mineral soil and may range in texture from fine silts to sand and gravel. Organic material may accumulate, creating quite mucky sediments. Some shores are steep mineral banks; others are gradual with emergent vegetation that grades into Deep or Shallow Emergent Marshes, calcareous fens, shrub swamps, or forested swamps that can form extensive wetland complexes within the basins. Calcareous ponds are restricted to limestone areas of Berkshire County where they are surrounded by upland Northern Hardwoods - Hemlock - White Pine Forests.

Vegetation Description: Calcareous Pondshores/Lakeshores have abundant shrubs in many areas with red maple (*Acer rubrum*), speckled alder (*Alnus incana* spp. *rugosa*), and swamp rose (*Rosa palustris*). The herbaceous layer is dominated by sedges, especially awned sedge (*Carex crinita*), porcupine sedge (*C. hystericina*), lakeside sedge (*C. lacustris*), tussock sedge (*C. stricta*), threeway sedge (*Dulichium arundinaceum*), and soft-stemmed spikerush (*Eleocharis obtusa*). Northern blue flag (*Iris versicolor*) is also common on the shore. Emergent species in the shallow water adjacent to the often ill-defined shoreline include bur reeds (*Sparganium angrocladum* and *S. eurycarpum*). The shores and surrounding marshes often have patches of the invasives purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and reed canary-grass (*Phalaris arundinacea*). Sites with steep silty banks may have additional exotics such as true forget-me-not (*Myosotis scorpioides*) and



moneywort (*Lysimachia nummularia*). The ponds themselves contain mats of the green alga stonewort (*Chara* sp.) and support aquatic plants including several species of pondweeds (*Potamogeton* spp.) that are restricted to calcareous waters.

Differentiating Occurrences: All the pondshore/lakeshore communities occur around water bodies that can be differentiated by setting and location. Calcareous Ponds and Lakes occur in the Marble Valleys of Berkshire County and have calcium in the water derived from nearby limestone or dolostone bedrock. The ponds usually have inflow and outflow, and often have mats of stoneworts (*Chara* sp.) in the lake bottoms. The shore line is often not distinct, merging into marsh or other wetlands. Acidic ponds and lakes have lower pH than calcareous ponds, and do not have stoneworts. Many have inflow or outflows. Acidic pondshore vegetation is broadly defined and variable, and includes shorelines not explicitly included in calcareous or coastal plain pondshores. Coastal Plain Ponds are generally on sand in the coastal plain in closed basins that intersect groundwater that affects pond levels. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports common and rare, generally coastal or southern, mostly herbaceous species. Coastal Plain Pondshores - Inland Variant also occur in closed basins in sandy outwash, but in the Connecticut River Valley. Coastal plain species grow in them, but include fewer specialists. Freshwater Mud Flat Communities are within ponds rather than on shorelines. They have low, sparse, annual herbaceous vegetation on recently exposed muddy sediments.

Associated Fauna: There are a few species that specialize in alkaline (therefore calcareous, in Massachusetts) ponds or lakes, but these invertebrates are not particularly associated with shorelines, but the waterbodies themselves. Some shorelines immediately become shrub swamp and emergent marshes where inconspicuous ("secretive") water birds nest. Such marsh nesters are not concerned with the water chemistry, but rather in the extent of habitat and lack of human disturbance. Their use of extensive marshes and associated open water are not shore-based, per se.

Public Access: Three Mile Pond WMA, Sheffield; Agawam Lake WMA, Stockbridge.

Threats: The primary threat is exotic, invasive species including purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), and reed canary-grass (*Phalaris arundinacea*). Other threats include alteration of normal water-level fluctuations, shoreline development, and disturbance from off road vehicles.

Management Needs: More information is needed to assess the management needs of calcareous pondshore/lakeshore communities.

USNVC/NatureServe: Pond: A4066: *Potamogeton* spp. - *Ceratophyllum* spp. - *Elodea* spp. Herbaceous Alliance: *Elodea canadensis* - *Potamogeton* spp. Eastern Herbaceous Vegetation [CEGL006431].



Calcareous Seepage Marsh

Community Code: CP2B0A2000

State Rank: S2



Concept: Mixed herbaceous/graminoid/shrub wetlands that experience some calcareous groundwater seepage. Calcareous Seepage Marshes are intermediate in richness of the three calcareous fen communities described in Massachusetts.

Environmental Setting: Calcareous Seepage Marshes are open (non-forested) wetlands, with scattered shrubs in a mix of herbaceous and graminoid plants. There may be areas of open water and some of the herbaceous vegetation may occur on floating mats during the growing season. Although there are hummocks and hollows, the overall surface is flat to slightly sloping. The community is maintained by calcareous groundwater in a variety of physical settings: in basins, in canopy gaps in rich forested swamps, in current or former beaver drainages, or in level to slightly sloping sites associated with sloping fens. Typically, there are 50-200+ cm (1-6.5 ft.) of mucky peat (moderate to well-decomposed organic sediments). Waters are circumneutral to alkaline (pH 6.0-8.1) with high concentrations of calcium and magnesium cations and bicarbonate anions dissolved from bedrock or glacial materials rich in those elements. In marshes, the plant materials in the mucky substrate are decomposed more than in fens with peat, likely due to greater availability of more types of nutrients, more oxygen, and/or warmer ground water. Peat accumulates as plants die back each year; in cool, acidic, wet, anaerobic environments with low nutrient availability, they decompose very slowly and organic material builds up.

Vegetation Description: Calcareous Seepage Marshes have a mix of scattered shrubs, herbaceous, and graminoid species similar to an emergent marsh. A diverse but generally not dense shrub layer may include winterberry (*Ilex verticillata*), buttonbush (*Cephalanthus occidentalis*), highbush blueberry (*Vaccinium corymbosum*), swamp rose (*Rosa*



palustris), meadowsweet (*Spiraea alba* var. *latifolia*), alders (*Alnus* spp.), and/or poison-sumac (*Toxicodendron vernix*), as well as shrubby calciphiles such as hoary willow (*Salix discolor*), autumn willow (*S. serissima*), swamp birch (*Betula pumila*), and shrubby cinquefoil (*Dasiphora floribunda*). The dense herbaceous/graminoid layer is a mixture of typical marsh species such as cattails (*Typha angustifolia*, *T. latifolia*), sweet flag (*Acorus calamus*), lakeside sedge (*Carex lacustris*), tussock sedge (*C. stricta*), cinnamon fern (*Osmundastrum cinnamomeum*), royal fern (*Osmunda regalis*), swamp milkweed (*Asclepias incarnata*), and swamp loosestrife (*Lysimachia thyrsiflora*), and calciphiles such as Labrador bedstraw (*Galium labradoricum*), grass-of-Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), hemlock parsley (*Conioselinum chinense*), and slender cotton-grass (*Eriophorum gracile*).

Differentiating Occurrences: All calcareous wetlands include shrubby cinquefoil (*Dasiphora floribunda*). Most also have other calciphiles (calcium-loving plants) such as grass-of-Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), alder-leaf buckthorn (*Rhamnus alnifolia*), hemlock parsley (*Conioselinum chinense*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*). Within a given site, calcareous fen communities grade from one to another as conditions change. Calcareous Seepage Marshes share species with both Shallow and Deep Emergent Marshes, but contain more calciphiles. Calcareous Basin Fens have deep (> 2.0 meters (6.5 ft.)) peat in basins. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. They share many species with acidic fens, but include species restricted to calcareous conditions, such as bog birch and the calciphiles listed above. Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is mostly restricted to sedge hummocks. A diverse herbaceous layer dominates the vegetation. Tall shrubs and short trees may occur in scattered patches. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps are dominated by sparse trees and tall shrubs. Small openings share many of the species and conditions of Calcareous Sloping Fens.

Associated Fauna: Calcareous Seepage Marshes contribute variation within the habitats of large, mobile animals. They function as vernal pool habitat if water remains standing for 2-3 months; these areas provide important amphibian breeding habitat.

Public Access: Due to the sensitivity of calcareous wetlands to damage from visitation, most land owners prefer not to publicize the locations.

Threats: Changes in groundwater quality and quantity; and any human activities that disturb the vegetation, substrate, or water supply. In disturbed areas, cattails may displace calcium-loving species. Beaver activity threatens calcareous fen communities by altering surface water chemistry. There is evidence to suggest that ponding of water by beaver dams may increase the water's relative acidity, possibly due to the accumulation of organic acids or to dilution from acid rain (Motzkin, 1993).



Management Needs: Fires, grazing, and/or mowing may be necessary to maintain open fen habitats. More information is needed.

USNVC/NatureServe: Includes G805 *Cornus amomum-Salix discolor/Pentaphylloides floribunda/Carex stricta* shrubland [CEGL006359].



Calcareous Sloping Fen

Community Code: CP2B0A1000

State Rank: S2



Concept: Open, sedge-dominated wetlands occurring on slight to moderate slopes where there is calcareous groundwater seepage. Calcareous Sloping Fens are the most calcium- and species-rich of the three calcareous fen communities described in Massachusetts. They are rare species "hot spots" with many associated rare plant and animal species.

Environmental Setting: Calcareous Sloping Fens are generally small, open, graminoid- and herbaceous-dominated wetlands, which may occur as multiple patches in a wetland or in wetland complexes with other wetland community types. They are on (or at the base of) shallow to moderate slopes and maintained by circumneutral to alkaline (pH 6.0-8.1) groundwater seepage, with high concentrations of calcium and magnesium cations and bicarbonate anions dissolved from nearby bedrock or glacial materials. Seepage may be visible as distinct rivulets. Where there is heavy groundwater discharge, the mineral soil is exposed with organic matter accumulations in small hummocks. Calcareous Sloping Fens have a shallower depth of organic matter than other types of calcareous fens due to more rapid and aerated groundwater flow. Some form of disturbance is important to preventing dominance by woody species.

Vegetation Description: Calcareous Sloping Fens are dominated by sedges, such as prickly sedge (*Carex interior*), delicate sedge (*C. leptalea*), yellow sedge (*C. flava*), tussock sedge (*C. stricta*), marsh sedge (*C. lacustris*) and porcupine sedge (*C. hystericina*), and grasses, including marsh muhly (*Muhlenbergia glomerata*) and fowl mannagrass (*Glyceria striata*). Herbaceous species include Kalm's lobelia (*Lobelia kalmii*), water-horehound (*Lycopus uniflorus*), grass-of-Parnassus (*Parnassia glauca*),



rough-leaved goldenrod (*Solidago patula*), fen-goldenrod (*S. purshii*), and marsh fern (*Thelypteris palustris* var. *pubescens*). Shrubby cinquefoil (*Dasiphora floribunda*) is almost always present in a low shrub layer, sometimes with the native alder-leaf buckthorn (*Rhamnus alnifolia*). A sparse, and generally low, canopy layer may include white pine (*Pinus strobus*), larch (*Larix laricina*), red maple (*Acer rubrum*), and alders (*Alnus incana* spp. *rugosa*, *A. serrulata*), with shrubby autumn, hoary, and silky willow (*Salix serissima*, *S. candida*, and *S. sericea*) along the margins. There is often a bryophyte layer, dominated by sphagnum moss species, though moss cover is generally less in sloping fens than other fens. Calcareous Sloping Fens may occur as openings at the bases of slopes, in upland forests or swamps, or may grade into more open wetlands downslope.

Differentiating Occurrences: All calcareous wetlands include shrubby cinquefoil (*Dasiphora floribunda*). Most also have other calciphiles (calcium-loving plants) such as grass-of-parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), alder-leaf buckthorn (*Rhamnus alnifolia*), hemlock parsley (*Conioselinum chinense*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*). Within a given site, calcareous fen communities grade from one to another as conditions change. Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is mostly restricted to sedge hummocks. A diverse herbaceous layer dominates the vegetation. Tall shrubs and short trees may occur in scattered patches. Nutrients arrive as seepage from uplands through mineral soil. Calcareous Seepage Marshes have a mixture of herbaceous, graminoid and shrub species similar to an emergent marsh, with peat generally 0.5 to 2m deep. They are generally flat but may be slightly sloping. Calcareous Basin Fens are peatlands with deep organic soil > 2.0 meters (6.5 ft.). They are dominated by sedges with a sparse shrub layer and generally contain a more developed bryophyte layer than the other calcareous fens. They form in basins (best observed away from the edges). They share many species with acidic fens, but include some species restricted in Massachusetts to calcareous conditions, such as bog birch and some of the calciphiles listed above. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps are dominated by trees and tall shrubs in a somewhat sparse forest where small openings share many of the species and conditions of Calcareous Sloping Fens. They may abut Calcareous Sloping Fens in a wetland mosaic.

Associated Fauna: Calcareous sloping fens can function as vernal pool habitat if water remains standing for 2-3 months; these areas provide important amphibian breeding habitat. Rare animals include turtles and dragonflies. Regionally rare ant species are also known to occur in this community type.

Public Access: Due to the sensitivity of calcareous wetlands to damage from visitation, most land owners prefer not to publicize the locations.

Threats: Changes in groundwater quality and quantity, and any human activities that disturb the vegetation, substrate, or water supply. In disturbed areas, cattails may displace calcium-loving species. Beaver activity threatens calcareous fen communities by



altering surface water chemistry. There is evidence to suggest that ponding of water by beaver dams may increase the water's relative acidity, possibly due to the accumulation of organic acids or to dilution from acid rain (Motzkin, 1993). Invasive species tolerant of wet conditions noted in calcareous fens include reed-canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), common reed (*Phragmites australis*), buckthorns (*Rhamnus cathartica* and *Frangula alnus*), Japanese barberry (*Berberis thunbergii*), and bush honeysuckle (*Lonicera morrowii*).

Management Needs:

Calcareous Sloping Fens are dependent on groundwater. Since they are small, slight changes in the amount or quality of groundwater could profoundly affect species composition and abundance. Activities occurring uphill, such as groundwater withdrawal, could reduce flows to the fen. Surface discharges may also increase flows as well as erosion. Disturbance such as ditching or other alterations to drainage patterns can also have significant effects. Impounding of wetlands from road crossings or from beaver activity can increase water levels, flooding the fens and eliminating habitat. At the same time, without natural disturbance events, vegetation succession leading to increasing shrub dominance could reduce the size of these peatland communities and their rare species habitat. Periodic grazing, mowing, fire, or short-term flooding may be necessary to maintain open fen habitats.

USNVC/NatureServe:

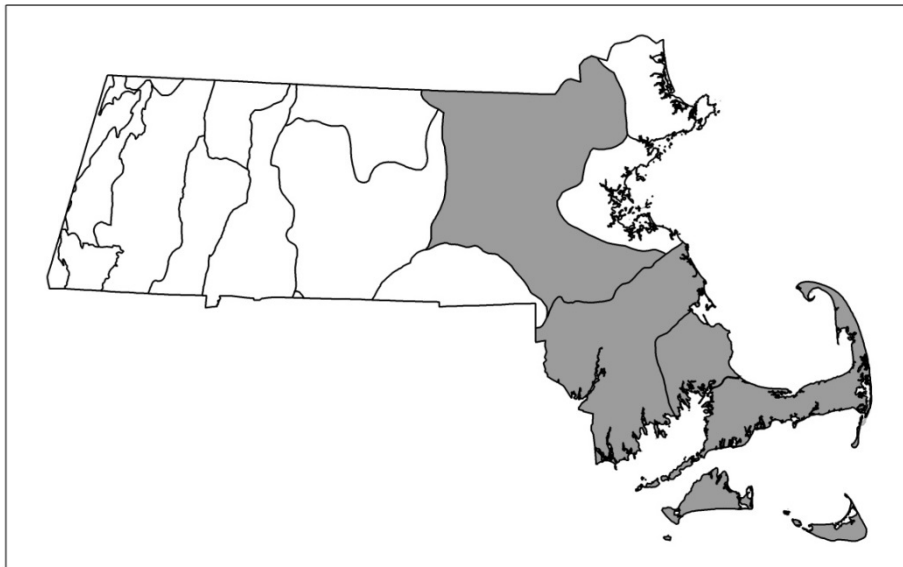
Dasiphora fruticosa ssp. *floribunda*/*Carex* (*sterilis*, *hystericina*, *flava*) Shrub Herbaceous Vegetation [CEGL006326] G2.



Coastal Atlantic White Cedar Swamp

Community Code: CP1B1A1000

State Rank: S2



Concept: Basin swamps dominated by Atlantic white cedar in the overstory and by a mixture of coastal species in the understory.

Environmental Setting: Coastal Atlantic White Cedar Swamps typically occur at low elevations (< 60 ft. above sea level) in southeastern Massachusetts (Cape Cod and Islands, Plymouth and Bristol Counties), with saturated peat of variable depth over the mineral sediments. As in all Atlantic white cedar swamps, standing water generally occurs for at least half of the growing season. The water and soil are nutrient-poor, and particularly low in nitrogen and phosphorus. There is a high iron content in the soil; the iron (called "bog iron") was mined in the early days of manufacturing. Soil pH is acidic (3.1-5.5) and leaf litter decomposition is slow. Because of the dominance of conifers in the canopy, occurrences may be dark and have limited understory growth. Fallen and tipped trees are common.

Vegetation Description: Atlantic white cedar swamps are defined as having >25% cover of Atlantic white cedar in the canopy; it is usually mixed with red maple (*Acer rubrum*). Occasional associates in Coastal Atlantic White Cedar Swamps include white pine (*Pinus strobus*), hemlock (*Tsuga canadensis*), and occasionally pitch pine (*Pinus rigida*). These swamps can have a very dense shrub layer, including highbush blueberry (*Vaccinium corymbosum*), swamp azalea (*Rhododendron viscosum*), sweet pepper-bush (*Clethra alnifolia*) and fetterbush (*Eubotrys racemosa*). In Cape Cod sites, inkberry (*Ilex glabra*) frequently occurs. The herb layer is sparse and patchy with cinnamon fern (*Osmundastrum cinnamomeum*), Virginia chain fern (*Woodwardia virginica*), starflower (*Lysimachia borealis*), and wild sarsaparilla (*Aralia nudicaulis*). The ground layer is dominated by *Sphagnum* spp. mosses.



Differentiating Occurrences: Although each of the Atlantic white cedar swamp community types has a characteristic vegetation structure and composition, as with all natural communities, transitions and mixes do occur. Coastal Atlantic White Cedar Swamps generally occur below 60 ft. elevation and in southeastern Massachusetts (the Cape and Islands, Plymouth and Bristol Counties). In Coastal Atlantic White Cedar Swamp, pitch pine (*Pinus rigida*) is an occasional canopy associate seldom found in other Atlantic white cedar swamp types. Other species that are found in greater abundance in coastal than elsewhere include greenbrier (*Smilax rotundifolia*), the shrubs inkberry (*Ilex glabra*), dangleberry (*Gaylussacia frondosa*), sheep laurel (*Kalmia angustifolia*), and fetterbush (*Eubotrys racemosa*), and the ferns Virginia chain-fern and netted chain-fern (*Woodwardia virginica* and *W. areolata*). Inland Atlantic White Cedar Swamps typically occur at elevations > 60 ft. above sea level and not in southeastern Massachusetts. Yellow Birch (*Betula alleghaniensis*) is more common than in Coastal Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps have lower abundance of coastal indicators than Coastal Atlantic White Cedar Swamps. High-elevation Inland Atlantic White Cedar Swamps also have northern species, such as creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Chamaepericlymenum canadense*). Atlantic white cedar also occurs in Atlantic White Cedar Bogs, relatively open peatland communities with canopy cover <25%. Alluvial Atlantic White Cedar Swamps are along streams. The vegetation is highly variable. Atlantic white cedar and red maple dominate the tree layer, and highbush blueberry and sweet pepperbush occur in the shrub layer along with silky dogwood (*Swida amomum*). The herb layer includes sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), bugleweed (*Lycopus* spp.) and marsh St. John's-wort (*Hypericum virginicum*). Red Maple Swamps in basins in southeastern Massachusetts are often former Atlantic white cedar swamps that were cut in the past. Many have small patches of Atlantic white cedar; however, Atlantic white cedar needs to be dominant in the overstory for the community to be classified as an Atlantic white cedar swamp. Mapping of relatively large dense patches of Atlantic white cedar as Atlantic white cedar swamp communities may be useful within a Red Maple Swamp to indicate a mosaic of wetland communities.

Associated Fauna: Young Atlantic white cedar thickets provide excellent cover for deer, rabbits and birds. Atlantic white cedar foliage and twigs are preferred winter browse for white-tailed deer, while rabbits and mice can feed on cedar seedlings. Although no bird species appear to be restricted to Atlantic white cedar communities, they provide nesting habitat for many species including Northern Waterthrush (*Parkesia noveboracensis*), Veery (*Catharus fuscescens*), Red-breasted Nuthatch (*Sitta canadensis*), Brown Creeper (*Certhia americana*), Black-and-white Warbler (*Mniotilta varia*), and Black-capped Chickadee (*Poecile atricapillus*). Coastal Atlantic White Cedar Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.

Public Access: Marconi Atlantic White Cedar Swamp, Cape Cod National Seashore, Wellfleet; Mashpee Pine Barrens WMA, Mashpee; Freetown-Fall River State Forest and



Copicut WMA, Freetown; Great Cedar Swamp (Massachusetts Audubon Society), Lakeville; Hockomock Swamp WMA, Taunton/Bridgewater.

Threats:

The two greatest threats to Atlantic white cedar swamps are land clearing for agricultural, commercial and residential development, and interference of normal hydrological functioning as a result of development. Atlantic white cedar has been cut extensively for posts and shingles for over three centuries. In an extensive statewide vegetation inventory funded by MNHESP in 1990, no uncut stands were found, but several sites contained cedars that were 100-200 years old. Selective cutting is detrimental to the persistence of Atlantic white cedar swamps, because hardwoods, such as red maple, outcompete and replace Atlantic white cedar. Any alteration to the natural hydroperiod of Atlantic white cedar swamps threatens their persistence.

Management Needs:

Due to the limited distribution of Atlantic white cedar swamps, it is recommended that no clearing or filling of these wetlands be allowed. Atlantic white cedar will regenerate best following catastrophic disturbance events such as hurricanes and fires. Data suggest that in the absence of disturbance, red maple and shrubs increase in abundance at the expense of Atlantic white cedar. Fire suppression negatively threatens the long-term persistence of Atlantic white cedar swamps, and controlled burning practices may be an appropriate restoration tool in many areas. Controlled burning should be accompanied by small-patch clearcuts to be most effective. By clear-cutting small patches (generally 20 m x 20 m) and removing the slash and competing vegetation, pure, even-aged stands of Atlantic white cedar are able to regenerate. Atlantic white cedar swamps require a natural cycle of wet and dry periods for their survival and reproduction. Standing water for much of the year is unfavorable for both seed germination and seedling survival, and young seedlings are killed by both drowning and drought. It is recommended that any alterations in water levels be avoided. This includes development and road construction in uplands surrounding Atlantic white cedar swamps which can alter water levels. Where cedar wetlands are associated with river systems, it is important to maintain normal hydrologic regime of the river.

USNVC/NatureServe:

Chamaecyparis thyoides Northern Peatland Alliance [A3400] -- *Chamaecyparis thyoides/Ilex glabra* - *Rhododendron viscosum* Forest (CEGL006188) -distinguished by coastal plain indicators.



Coastal Plain Pondshore Community

Community Code: CP2A0B1200

State Rank: S3



Concept: Herbaceous communities of exposed pondshores in southeastern Massachusetts that are characterized by a distinct coastal plain flora.

Environmental Setting: Coastal Plain Pondshore Communities are herbaceous communities characterized by a distinct coastal plain flora on exposed pondshores in southeastern Massachusetts. Coastal plain ponds are shallow, highly acidic, low-nutrient, groundwater ponds in sandy glacial outwash, with no inlet or outlet. Water rises and falls with changes in the water table, typically leaving an exposed shoreline in late summer. Annual and inter-annual fluctuations in water levels are key to maintaining the community: low-water years eliminate obligate aquatic plants and allow adapted plants to grow, and high-water years limit invasion by woody species. The community develops best in small ponds or bays of larger ponds with little space for wind sweep that causes wave and ice damage along shorelines on large ponds. The substrates are usually sand, sometimes with cobbles; a surface layer of organic muck occurs on some ponds and pondshores. Many of the plant species of the community are able to start growth from seed, perennial basal leaves, or roots while under water in the spring and grow in the increasingly dry soils as the season progresses; others may germinate only when exposed to air. In wet years, the water level does not recede as far as in dry years, and the constituent species may grow vegetatively while submerged, with little flowering, or may not grow or germinate at all.

Vegetation Description: Coastal Plain Pondshore Communities are composed of a mixture of herbaceous and graminoid plants that include state-rare species that can be locally abundant, growing mixed with more common plants typical of dry grasslands (such as little



bluestem (*Schizachyrium scoparium*)) or marshes (including rushes (*Juncus* spp.), sedges (Cyperaceae species), bonesets (*Eupatorium perfoliatum*), and purple gerardia (*Agalinis purpurea*)). Vegetation zonation is correlated with flooding regime. A characteristic zonation pattern from dry to waterline is as follows: 1. upland oak/pine forest; 2. shrub border dominated by highbush blueberry (*Vaccinium corymbosum*) associated with sweet pepper-bush (*Clethra alnifolia*) and green briar (*Smilax rotundifolia*); 3. an intermediate area of beach providing habitat for most of the species of the Coastal Plain Pondshore Community: an emergent exposed pondshore dominated by slender-leaved flat-topped goldenrod (*Euthamia caroliniana*), pondshore rush (*Juncus pelocarpus*), rose coreopsis (*Coreopsis rosea*), golden pert (*Gratiola aurea*), beaksedges (*Rhynchospora* spp.), lance-leaf violet (*Viola lanceolata*), and dwarf St. John's-wort (*Hypericum mutilum*); 4. semi-permanently flooded zone characterized by one or more of the following: bayonet rush (*Juncus militaris*), spike-rushes (*Eleocharis* spp.), or pipewort (*Eriocaulon aquaticum*); and 5. hydromorphic rooted vegetation in deeper water including yellow water-lily (*Nuphar variegata*), white water-lily (*Nymphaea odorata*), and Robbins' spike-rush (*Eleocharis robbinsii*). Not every pond has every zone, shores within ponds vary, and zones change width and species composition from year to year.

Differentiating Occurrences: Coastal Plain Pondshore Communities are in the coastal plain, generally on sand around ponds in closed basins that intersect groundwater affecting pond levels. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports common and rare, often coastal or southern, herbaceous species. Coastal Plain Pondshore Communities - Inland Variant also occur in closed basins in sandy outwash, but are in the Connecticut River Valley. Some, but fewer, coastal plain species grow in them. Acidic Pondshore/Lakeshore Community is broadly defined, variable, and includes shorelines not explicitly included in coastal plain pondshores, the inland variant, or calcareous ponds. The shoreline is often not distinct, merging into marsh or other wetlands. Many ponds have inflow or outflows. Calcareous Pondshores /Lakeshores occur in the Marble Valleys of Berkshire County, around ponds that have calcium in the water. Freshwater Mud Flat Communities are within ponds rather than along shores. Mud flats in Coastal Plain Ponds are treated as part of the pondshore community.

Associated Fauna: Coastal plain pondshores and ponds provide habitat for a number of state-rare animal and plant species, many of which occur only on coastal plain ponds. Coastal plain pondshores are important habitat for dragonflies and damselflies (over 45 species are known to occur on coastal plain ponds and several of those species are rare). They are also important turtle habitat, for painted, musk, spotted, and snapping turtles, and the federally endangered Northern red-bellied cooters. Larger ponds and pondshores are used by migrating and wintering waterfowl, including common and hooded mergansers, goldeneye, and bufflehead. Coastal plain ponds support warm-water fish and freshwater mussels. They can function as vernal pool habitat when fish populations are absent.



Public Access:	Myles Standish State Forest, Carver; Hyannis Ponds WMA, Barnstable; Nickerson State Park, Brewster.
Threats:	Multiple threats affect coastal plain pondshore communities. The greatest threat is from overdevelopment of coastal Massachusetts which impacts pondshores directly through housing and recreation and indirectly through water withdrawal. Shrub and tree encroachment threaten pondshore vegetation in areas with heavy water withdrawal and lessened inundation of the upper shore.
Management Needs:	Natural hydrology needs to be maintained. Periodic high water prevents tree and shrub encroachment, and seasonal low water is necessary to expose the pondshore. Vehicle use should be prohibited along pondshores.
USNVC/NatureServe:	<p>The following USNVC/NatureServe associations are known to occur in Massachusetts, and are included within the broad category of coastal plain pondshore community. They are listed according to the zones in which they occur (as described above). Shrub border (zone 2) includes <i>Vaccinium corymbosum</i>/<i>Sphagnum</i> spp. shrubland [CEGL006190] and a typically narrow band of <i>Calamagrostis canadensis</i>-<i>Dichanthelium meridionale</i> herbaceous vegetation [CEGL006243]. The emergent exposed pondshore (zone 3) is characterized by one or more of the following: <i>Rhexia virginica</i>-<i>Panicum verrucosum</i> herbaceous vegetation [CEGL006264]; <i>Rhexia virginica</i>-<i>Crotalaria sagittalis</i> herbaceous vegetation [CEGL006300]; and <i>Rhynchospora capitellata</i>-<i>Sabatia kennedyana</i> herbaceous vegetation [CEGL006210]. The semipermanently flooded zone (zone 4) has <i>Lysimachia terrestris</i>-<i>Dulichium arundinaceum</i> herbaceous vegetation [CEGL006035]; <i>Juncus militaris</i> herbaceous vegetation [CEGL006345]; <i>Eleocharis (obtus, flavescens)</i>-<i>Eriocaulon aquaticum</i> herbaceous vegetation [CEGL006261]; and <i>Eleocharis flavescens</i>-<i>Xyris difformis</i> herbaceous vegetation [CEGL006400]. Open water (zone 5) is common to other ponds in MA and includes <i>Nuphar lutea</i> ssp. <i>advena</i> herbaceous vegetation [CEGL004324] and <i>Nymphaea odorata</i>-<i>Eleocharis robbinsii</i> herbaceous vegetation [CEGL006086].</p>



Coastal Plain Pondshore – Inland Variant

Community Code: CP2A0B120A

State Rank: S1



Concept: The community has apparent vegetation zones of graminoids or herbaceous species on sloping, seasonally exposed, gravelly, sandy or muddy shores of acidic, inland lakes and ponds with substantial natural fluctuation of water levels.

Environmental Setting: Coastal Plain Pondshore Community - Inland variant is very similar to the Coastal Plain Pondshore Community: both are subsets of Acidic Pondshores/Lakeshores. Coastal Plain Pondshore Community - Inland Variant develops in groundwater-flooded depressions in outwash sand plains outside of southeastern Massachusetts. The shorelines of Coastal Plain Pondshore Communities - Inland Variant are seasonally exposed, but submerged or saturated for a significant part of the year or continuously in wet years. Natural fluctuation of water levels throughout any particular year and between years is necessary for the community to develop: plants of the community emerge during low-water periods and high-water years limit invasion by woody species. Shorelines range from broad expanses of mucky shores on very shallow, muddy ponds with shrub islands, to narrow sandy shores on ponds in steep depressions, and large sand-bottomed ponds where shoreline substrate ranges from sand to deep muck. Essentially all of the Coastal Plain Pondshore Communities - Inland Variant have been impacted by recreation and development.

Vegetation Description: The vegetation of Coastal Plain Pondshore Communities - Inland Variant may be sparse or dense, with variable species composition. Exposed pondshores may be narrow bands or cover much or all of a basin. The community is usually a mix of graminoid and herbaceous vegetation in zones created when habitat is made accessible as water levels go down throughout the growing season. A characteristic



zonation pattern from dry to waterline is: 1. shrub border dominated by highbush blueberry (*Vaccinium corymbosum*) associated with red maple (*Acer rubrum*), often grading into water-willow (*Decodon verticillatus*); 2. zone of exposed sandy pondshore with mostly annual species such as flatsedges (*Cyperus* spp.), rushes (*Juncus* spp.), smartweeds (*Polygonum* and *Persicaria* spp.), false pimpernel (*Lindernia dubia*), and St. John's-worts (*Hypericum* and *Triadenum* spp.); 3. semipermanently flooded zone with low herbaceous and emergent species on organic sediments characterized by spike-rushes (*Eleocharis* spp.), pipewort (*Eriocaulon aquaticum*), beak-rushes/ horned-sedges (*Rhynchospora* spp.), golden pert (*Gratiola aurea*), seedboxes or water purslane (*Ludwigia* spp.), or false pimpernel (*Lindernia dubia*), or stranded aquatic plants; 4. open, deeper water zone with rooted aquatic vegetation including yellow (*Nuphar variegata*) and white water-lilies (*Nymphaea odorata*). Not every pond has every zone, and zones vary in width and species composition from year to year.

Differentiating Occurrences: Coastal Plain Pondshore Communities are in the coastal plain, generally on sand around ponds in closed basins that intersect groundwater that affects pond levels. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports herbaceous species. Coastal Plain Pondshores - Inland Variant also occur in closed basins in sandy outwash, but are in the Connecticut River Valley. Some, but fewer, coastal plain species grow in them. Acidic Pondshore/Lakeshore Community is broadly defined, variable, and includes shorelines not explicitly included in coastal plain pondshores, the inland variant, or calcareous ponds. The shoreline may merge into marsh or other wetlands. Many ponds have inflow or outflows. Kettlehole Wet Meadows are also seasonally inundated, but develop into dense graminoid marshes on mucky peat. Freshwater Mud Flat Communities are within ponds rather than along shores. Mud flats in Coastal Plain Pondshore Communities - Inland Variant are treated as part of the pondshore community.

Associated Fauna: Coastal Plain Pondshore Communities - Inland Variant and ponds are parts of the habitat of wide-ranging animals, including dragonflies and damselflies. Shorelines, particularly larger muddy areas, are used for foraging by shorebirds. Larger ponds and pondshores are used by migrating and wintering waterfowl.

Public Access: Five Mile Pond, Loon Pond, and Lake Lorraine, Springfield; Spectacle Pond, Wilbraham.

Threats: Trampling from walking and ORVs, alteration of normal water-level fluctuations, and shoreline development. Exotic plants including purple loosestrife.

Management Needs: Protection of areas near beaches from clearing, filling, and trampling. Control of invasives.

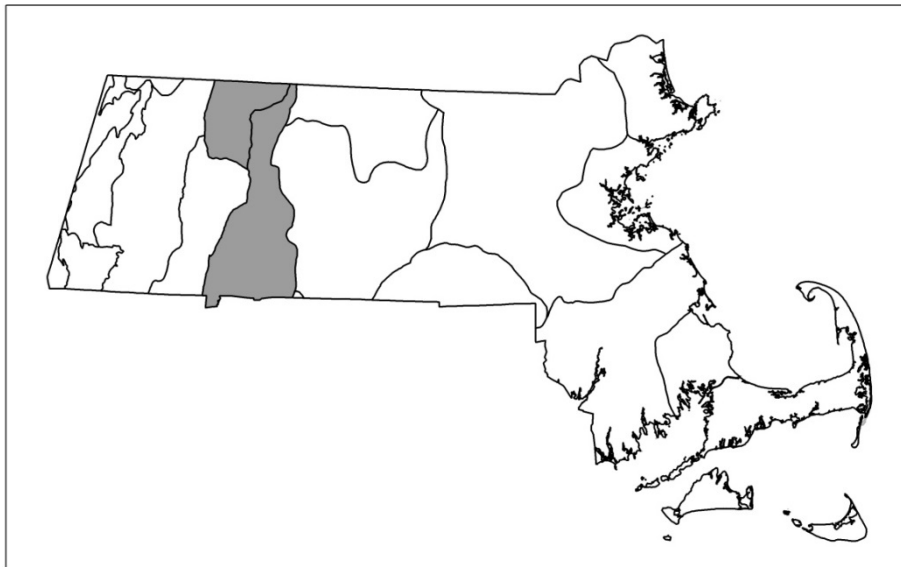
USNVC/NatureServe: CES203.518 Northern Atlantic Coastal Plain Pond - system.



Cobble Bar Forest

Community Code: CP1A2B5000

State Rank: S2



Concept: A variant of high-energy riverbanks, characterized by open forests dominated by sycamores and cottonwoods growing on sandy cobble bars.

Environmental Setting: Cobble Bar Forests occur on coarse alluvial substrate (cobble, gravel, and sand deposited by rivers) on flood- and ice-scoured river shores and islands, in relatively low-gradient sections of high-energy rivers where the bank is low. These forests are often young or successional, with fairly open canopies. Older, possibly more stabilized, community occurrences accumulate silt and other relatively fine sediments that bury the coarse materials and the bases of trees. These deeper sediments raise the shoreline, which changes the flood and scour regimes. The result is that protected areas of Cobble Bar Forest succeed to other types of floodplain forest, at least until flooding scours the shoreline in the natural course of river meandering.

Vegetation Description: All floodplain forest communities in Massachusetts have silver maple in the canopy, but associated plant species vary depending on the intensity and duration of flooding and on geographic location. In Cobble Bar Forests, sycamore (*Platanus occidentalis*) and cottonwood (*Populus deltoides*) may be more abundant than silver maple (*Acer saccharinum*) in the canopy. Slightly inland from the disturbed river edge, green ash (*Fraxinus pennsylvanica*) and American elm (*Ulmus americana*) often occur. The shrub layer, usually with scattered plants, may be dominated by dense cover of invasive species such as common privet (*Ligustrum vulgare*), Japanese knotweed (*Fallopia japonica*), Japanese barberry (*Berberis thunbergii*), multiflora rose (*Rosa multiflora*), and bush honeysuckle (*Lonicera* spp.). The herbaceous layer is diverse, with plants growing between cobbles and patches of



sand. The typically sparse herbaceous layer includes native and exotic disturbance-adapted species and annuals as well as perennials: sedges (*Carex* spp.), deer-tongue grass (*Dichanthelium clandestinum*), sensitive fern (*Onoclea sensibilis*), horsetail (*Equisetum* spp.), and false Solomon's seal (*Maianthemum racemosum*). Vines can be dense particularly at open edges where grapes (*Vitis* spp.), Oriental bittersweet (*Celastrus orbiculatus*), Virginia creeper (*Parthenocissus quinquefolia*), and poison ivy (*Toxicodendron radicans*) can cover tree and shrub foliage and tie them into impenetrable masses.

Differentiating Occurrences: Cobble Bar Forests are limited to cobble and other coarse substrates along high-energy rivers where little deposition of finer materials occurs and flooding and ice flows scour the surface. These narrow bands of forest are close to the river edge where flood waters recede quickly after the flood events, not behind berms that retain flood waters. Other floodplain communities, including High-Terrace, Major-river, Transitional, and Small-river Floodplain Forests, generally occur on silt and mixed mineral and organic soil substrates. Major-river, Transitional, and Small-river Floodplain Forests are behind low berms that slow flood waters and detain them causing alluvial silt deposition. Cobble Bar Forests are the only floodplain forests with abundant sycamore (*Platanus occidentalis*), although other floodplain forest species, particularly cottonwood (*Populus deltoides*) and silver maple (*Acer saccharinum*), are present as associates. High-Energy Riverbank Communities also occur within the zone of active erosion on cobble and sand substrates along steep-gradient, fast-flowing rivers, but have sparse, open low vegetation with no trees.

Associated Fauna: Provide habitat for riverine odonates.

Public Access: Robinson State Park, Agawam; Westfield River Access, Westfield.

Threats: This is a high-disturbance habitat and non-native taxa are abundant.

Management Needs: Maintenance of normal flooding intensity is needed to maintain community.

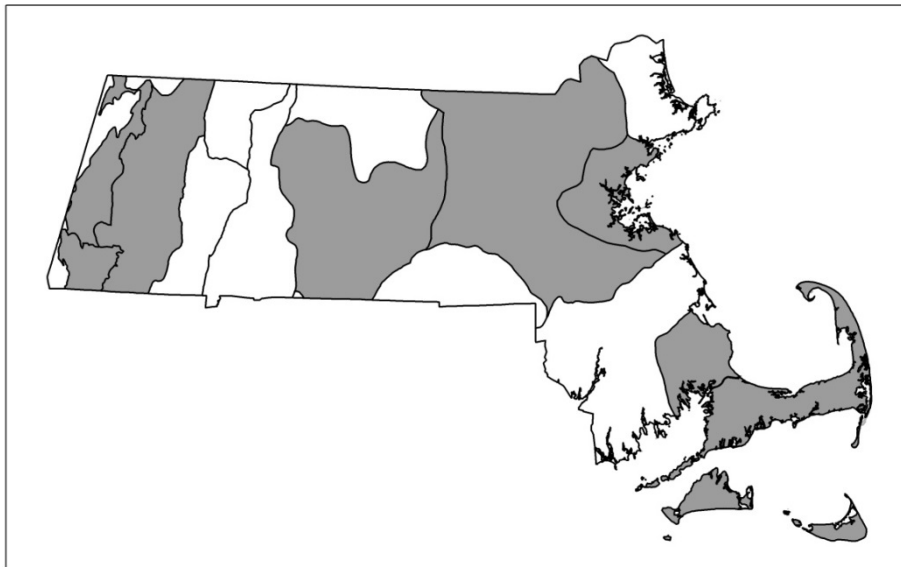
USNVC/NatureServe: Close to: *Platanus occidentalis* - (*Fraxinus pennsylvanica*, *Celtis laevigata*, *Acer saccharinum*) Temporarily Flooded Forest Alliance: *Platanus occidentalis* - *Fraxinus pennsylvanica* Forest (CEGL006036).



Deep Emergent Marsh

Community Code: CP2A0A1200

State Rank: S4



Concept: Tall graminoid/emergent herbaceous wetlands occurring on saturated, mucky mineral soils that are seasonally inundated and permanently saturated.

Environmental Setting: Deep Emergent Marshes occur along rivers and streams, lakes, artificial impoundments, and other waterbodies. Deep Emergent Marshes are generally flooded with half a foot to 3 feet of water year round, though water depth may vary not only during the growing season, but from year to year. Vegetation is primarily herbaceous and graminoid; species type and abundance vary with water depth. There may be areas of open water with little or no vegetation, except for aquatic plants. Deep Emergent Marshes often occur as patches in intergrading complexes of forested and shrub swamps and open water. The soils are a mixture of organic and mineral components, typically with a layer of well-decomposed organic muck at the surface overlying mineral soil. The movement of ice following thaws can disturb vegetation within marshes, particularly adjacent to open water. Depending on the amount of open water, wave action due to wind or boating may affect vegetation and sediment deposits.

Vegetation Description: Tall graminoids, like broad-leaved cattail (*Typha latifolia*) and phragmites (*Phragmites australis*), often form extensive dense stands. Narrow-leaved cattail (*Typha angustifolia*) occurs in more alkaline sites or in saline areas along roads. Other characteristic graminoids include wool-grass (*Scirpus cyperinus*), common threesquare (*Schoenoplectus pungens*), Canada bluejoint (*Calamagrostis canadensis* var. *canadensis*), reed canary-grass (*Phalaris arundinacea*), rice cut-grass (*Leersia oryzoides*), and tussock-sedge (*Carex stricta*). Herbaceous associates include arrow-leaf tearthumb (*Persicaria sagittata*), bulblet water-hemlock (*Cicuta*



bulbifera), swamp-candles (*Lysimachia terrestris*), beggar-ticks (*Bidens* spp.), bedstraw (*Galium* spp.), common arrowhead (*Sagittaria latifolia* var. *latifolia*), slender-leaved goldenrod (*Euthamia caroliniana*), and marsh-fern (*Thelypteris palustris* var. *pubescens*). Nutrient-rich sites in Berkshire County typically have cattails mixed with soft-stemmed bulrush (*Schoenoplectus tabernaemontani*), hard-stemmed bulrush (*S. acutus*), river-horsetail (*Equisetum fluviatile*), marsh-cinquefoil (*Comarum palustre*), sweet-flag (*Acorus calamus*), bristly sedge (*Carex comosa*), lakeside sedge (*C. lacustris*), and giant bur-reed (*Sparganium eurycarpum*), among others. Short shrubs including sweet-gale (*Myrica gale*), meadowsweet (*Spiraea alba* var. *latifolia*), and hardhack (*S. tomentosa*) may be scattered among tall graminoids. Tall shrubs such as speckled and smooth alders (*Alnus incana* and *A. serrulata*), and highbush blueberry (*Vaccinium corymbosum*) are generally sparse, totaling <25% cover. Invasive species include purple loosestrife (*Lythrum salicaria*) and common reed (*Phragmites australis*).

Differentiating Occurrences: The physical and biological characteristics of emergent marsh, wet meadow, shrub swamp, and shoreline communities overlap and intergrade. The vegetation for all these types is broadly defined and understudied: focused surveys might establish which dominant species and hydrological situations define identifiable community types, or might determine that there is a continuum of types that require arbitrary separation. Deep Emergent Marshes are tall graminoid wetlands often dominated by cattails, phragmites, and wool-grass growing in water from a half foot to 3 ft. deep. Shallow Emergent Marshes are short graminoid/herbaceous wetlands and usually have shallow (averaging <6" deep) surface water all year. Shallow Emergent Marsh vegetation composition is similar to Deep Emergent Marsh, except that shorter grasses, sedges and rushes dominate. Shrub Swamps have >25% cover of shrubs. Wet Meadows are graminoid wetland subtypes of emergent marshes, typically with a single sedge or grass species dominating. Standing water is not present throughout the growing season as in emergent marshes. Kettlehole Wet Meadows occur in small basins on mucky peat. Coastal Plain Pondshore Communities and Coastal Plain Pondshore Communities - Inland Variant are generally on sand in closed basins that intersect groundwater. The exposed shoreline supports herbaceous species not generally dominated by dense graminoids. Acidic Pondshores/Lakeshores are broadly defined, variable shorelines around open water, not explicitly included in calcareous or coastal plain pondshores. The shoreline is often not distinct, merging into emergent marsh or other wetlands. Bogs and fens are peatlands, with peat instead of mucky mineral soil; however, gradations do exist.

Associated Fauna: Deep Emergent Marsh is the primary nesting habitat for a suite of secretive marshbirds (rails, bitterns, grebes, and moorhens). This habitat also provides important nesting habitat for other birds of high conservation interest, such as Marsh Wren, Northern Harrier, and a variety of ducks. Deep Emergent Marsh habitat supports many species of frogs and salamanders, especially leopard, pickerel, green, and bull frogs, and some vernal-pool obligate species, such as wood



frogs and spotted salamanders, may use areas of Deep Emergent Marsh for egg-laying if the areas are fish free.

Public Access:

Hop Brook WMA, Tyringham; Quaboag River WMA, East Brookfield/Brookfield/West Brookfield; Pantry Brook WMA, Sudbury.

Threats:

Deep Emergent Marshes are threatened by filling and dredging, impoundments that alter natural water-level fluctuations, and by nutrient inputs from adjacent roads, fields, or septic systems. Invasive species are a significant threat. Reed canary-grass (*Phalaris arundinacea*) can collect sediments that alter water depths and reduce habitat variability. Common reed (*Phragmites australis*) can also form monocultural stands that out-compete native species. Purple loosestrife (*Lythrum salicaria*) has a similar range of water depth requirements as cattails, and will gradually invade and become abundant in such systems.

Management Needs:

Control of exotics. Maintain normal water level and fluctuation.

USNVC/NatureServe:

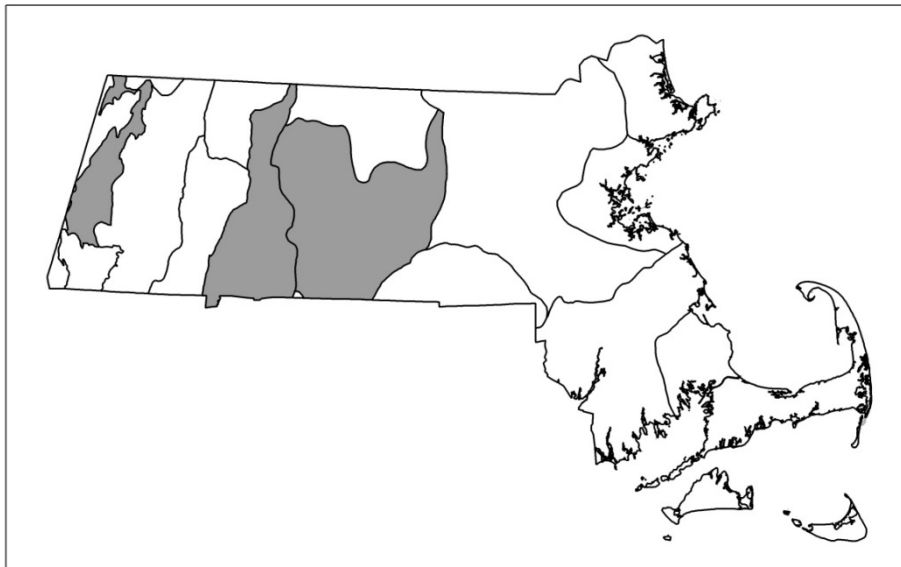
G125. Eastern North American Freshwater Marsh: A1436 *Typha angustifolia* - *Typha latifolia* - *Schoenoplectus* spp. Deep Marsh Herbaceous Alliance - *Typha* (*angustifolia*, *latifolia*) - (*Schoenoplectus* spp.) Eastern Herbaceous Vegetation [CEGL006153]; A3664 *Schoenoplectus acutus* - *Schoenoplectus fluviatilis* - *Schoenoplectus tabernaemontani* Deep Marsh Herbaceous Alliance - *Schoenoplectus* (*tabernaemontani*, *acutus*) Eastern Herbaceous Vegetation [CEGL006275]; *Schoenoplectus fluviatilis* Herbaceous Vegetation [CEGL006366]; Calcareous *Schoenoplectus acutus* - *Carex lasiocarpa* Herbaceous Vegetation [CEGL006358]; A3669 *Peltandra virginica* - *Pontederia cordata* - *Sagittaria* spp. Herbaceous Alliance - CEGL006191 *Pontederia cordata* - *Peltandra virginica* - *Sagittaria latifolia* Herbaceous Vegetation. G556. Northern and Central Ruderal Wet Meadow and Marsh - A1431 *Phragmites australis* ssp. *australis* Ruderal Herbaceous Alliance - *Phragmites australis* Eastern North America Temperate Ruderal Herbaceous Vegetation [CEGL004141]; A1381 *Phalaris arundinacea* Herbaceous Alliance ALSO Shallow Emergent Marsh - *Phalaris arundinacea* Eastern Herbaceous Vegetation [CEGL006044].



Freshwater Mud Flat Community

Community Code: CP2A0B2100

State Rank: S4



Concept: Sparsely vegetated herbaceous community dominated by low, usually annual, herbs, developing on recently exposed muddy pond or river-bottom sediments.

Environmental Setting: Freshwater Mud Flat Communities develop over the summer as water levels go down and sediments are exposed in low-gradient stream channels, backwaters, abandoned channels, beaver ponds, oxbow ponds, and other ponds that are usually flooded during winters or other times of high water. The mucky, silty mineral soils are poorly drained and may remain saturated even when the surface is exposed. Succession to other communities occurs at all sites, notably in abandoned beaver ponds, when flooding is removed.

Vegetation Description: Often sparsely vegetated, mudflat vegetation is typically dominated by annuals or herbaceous perennials such as water-purslane (*Ludwigia palustris*), smartweeds (*Persicaria* spp.), rice cut-grass (*Leersia oryzoides*), swamp-candles (*Lysimachia terrestris*), ditch-stonecrop (*Penthorum sedoides*), or little spike-rush (*Eleocharis acicularis*). Mudflat spike-rush (*Eleocharis intermedia*) is restricted to calcareous or circumneutral mudflats. In oxbows, trees such as silver maple (*Acer saccharinum*) or American elm (*Ulmus americana*) may overhang these communities providing partial cover. In ponded situations, mud flat communities may include floating and emergent aquatic plants, such as yellow water-lily (*Nuphar variegata*), duckweeds (*Lemna* spp.), and bladderworts (*Utricularia* spp.), stranded when the water receded.

Differentiating Occurrences: Freshwater Mud Flat Communities have low, sparse, annual herbaceous vegetation on recently exposed muddy (fine mixed organic and mineral materials) sediments in



rivers and ponds, where they may include stranded aquatic vegetation. They are closely related to Low-energy Riverbank Communities, which are on slopes of river banks composed of a mix of relatively fine mineral materials (clay, silt, or sand). The stream bottoms of Low-energy Riverbanks can merge into Freshwater Mud Flats; separation depends on patch size and connectedness. High-energy Riverbank Communities occur along the shores of fast-flowing, high energy rivers with sparse plants growing in sediment caught between rock cobbles. Riverine Pointbar and Beach Communities are along higher energy rivers on sand or gravel. Deep and Shallow Emergent Marshes have dense graminoid emergent plants on mucky sediments, often with standing water at the base of the plants. In tidal areas, mud flats are considered to be parts of adjacent Fresh/Brackish Tidal Marshes. Mud flats in coastal plain ponds are treated as parts of the Coastal Plain Pondshore Community. Mud flats that emerge from human-mediated water lowering in lakes or rivers, including for dam repair or removal, or for nuisance plant control, are usually temporary and would develop River and Lake Drawdown Communities that might be extensions of naturally occurring mud flat communities.

Associated Fauna:

Shorebirds, such as Spotted Sandpiper (*Actitis macularius*) and Solitary Sandpiper (*Tringa solitaria*), forage on mud flats throughout their breeding season and those and additional shorebirds such as Greater Yellowlegs (*Tringa melanoleuca*) stop at mud flats during migration.

Public Access:

Hop Brook WMA, Lee.

Threats:

True forget-me-not (*Myosotis scorpioides*) and moneywort (*Lysimachia nummularia*) are mat-forming, non-native plant species that can appear to be crowding out native plants. Purple loosestrife (*Lythrum salicaria*) can also occur in these habitats.

Management Needs:

Exotic control where practical.

USNVC/NatureServe:

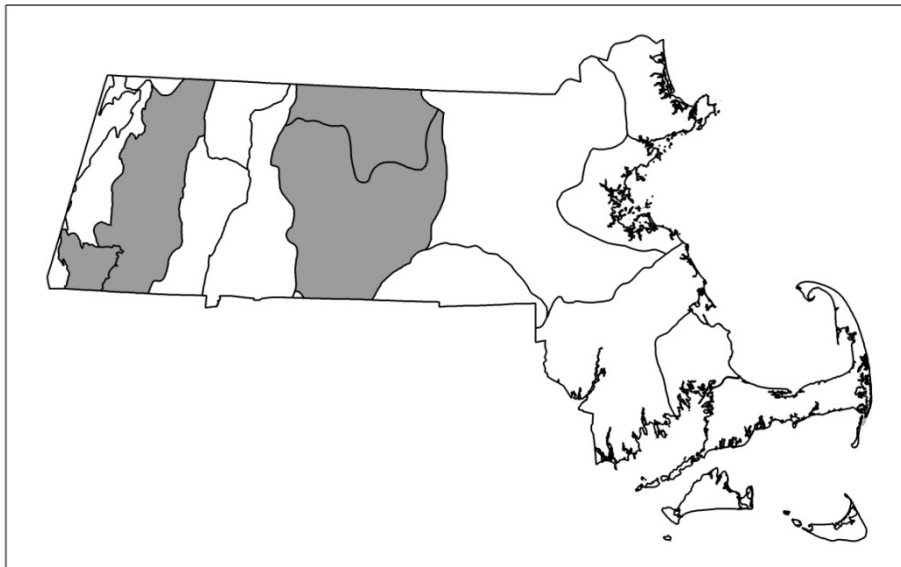
River Mudflats Sparse Vegetation [CEGL002314]; Lake Mudflats Sparse Vegetation [CEGL002313].



Hemlock Swamp

Community Code: CP1A12A000

State Rank: S4



Concept: Acidic forested swamps where eastern hemlock is dominant or co-dominant in the canopy.

Environmental Setting: Hemlock Swamps are characterized by a dense tree canopy dominated by mature eastern hemlock, allowing little light to reach the forest floor. Due to the nearly closed and mostly coniferous canopy, the understory is usually low in overall plant diversity, with patches of ferns and extensive areas of sphagnum mosses. Hemlock Swamps tend to occur in large or long depressions and often contain standing water and small intermittent streams; there is a hummock-hollow topography with trees growing on the hummocks. The hollows have wetter, organic peaty soils and are saturated throughout the year.

Vegetation Description: Eastern hemlock (*Tsuga canadensis*) is the dominant tree species in Hemlock Swamps. Hemlock forms stands with dense canopies alone or mixed with lower amounts of white pine (*Pinus strobus*), red maple (*Acer rubrum*), or yellow birch (*Betula alleghaniensis*). The hemlock-dominated canopy allows little light through to support plants in lower strata, resulting in a patchy subcanopy that is usually comprised of the overstory species growing in occasional canopy gaps created by windthrows. The poorly developed shrub layer has sparse and patchy cover with hemlock most characteristic: the saplings may persist in the understory for many decades, to be released to grow into maturity when canopy gaps occur. Typical shrubs include winterberry (*Ilex verticillata*), mountain laurel (*Kalmia latifolia*), highbush blueberry (*Vaccinium corymbosum*), currants (*Ribes* spp.), mountain holly (*Nemopanthus mucronatus*), alders (*Alnus* spp.), witch hazel (*Hamamelis virginiana*), and maleberry (*Lyonia ligustrina*). Ferns are common, especially



cinnamon fern (*Osmundastrum cinnamomeum*), along with goldthread (*Coptis trifolia*), partridgeberry (*Mitchella repens*), and wild sarsaparilla (*Aralia nudicaulis*). The hummocky ground layer is covered with sphagnum moss and the liverwort *Bazzania trilobata*; the moss *Thuidium delicatulum* is often present.

Differentiating Occurrences: Many swamps have eastern hemlock (*Tsuga canadensis*) as a component of the canopy, but Hemlock Swamps are differentiated by having eastern hemlock as the dominant canopy species throughout the community. Red Maple Swamps and named variants such as Red Maple-Black Gum Swamps often have pockets of hemlock or scattered hemlocks, but overall those community types are dominated by deciduous trees, particularly red maple, and hemlocks are present in low overall percentages as part of the normal variation within the community. Red Maple Swamps have more species diversity in all the layers, as well as denser shrubs and herbaceous layers, than do Hemlock Swamps. In northern and western portions of the state at higher elevations, Hemlock Swamps grade into Red Spruce Swamps, differentiated by the dominance of red spruce and the addition of species typical of colder or northern areas. In the western portion of the state in areas with calcium-enriched seepage waters, Hemlock Swamps grade into Rich Conifer Swamps which are characterized by less abundance of hemlock and a much more diverse floral assemblage, including elm (*Ulmus* sp.), spicebush (*Lindera benzoin*), poison ivy and poison sumac (*Toxicodendron radicans* and *vernix*), marsh marigold (*Caltha palustris*), spotted touch-me-not (*Impatiens capensis*), jack-in-the-pulpit (*Arisaema triphyllum*), Pennsylvania bittercress (*Cardamine pensylvanica*), water avens (*Geum rivale*), wood-sorrel (*Oxalis montana*), green wood orchid (*Platanthera clavellata*), blue marsh violet (*Viola cucullata*), and hemlock parsley (*Conioselinum chinense*). In the southeast part of the state, hemlock mixes with Atlantic white cedar (*Chamaecyparis calyculata*) and other species typical of the coastal plain or more southern areas, grading into Atlantic white cedar swamps, with type determined by the overall dominant tree species.

Associated Fauna: Hemlock Swamps are part of habitat of large mobile animals. Ground-level browsers, including white-tailed deer (*Odocoileus virginianus*), snowshoe hare (*Lepus americanus*), and New England cottontail (*Sylvilagus transitionalis*), use shrubby areas in the community. Conifer swamps tend to have dense shade and are relatively cool in the summer, making them preferred areas for moose (*Alces alces*), animals that get too hot and have trouble controlling their body temperature. Birds that nest or forage in canopies or mid-sections of conifers don't differentiate on whether the site is wet or not: many birds of upland conifer forest also use Hemlock Swamps. Areas of Hemlock Swamps where water remains standing for 2-3 months and that lack fish can function as vernal pool habitat for amphibian breeding.

Public Access: Three Mile Pond WMA, Sheffield; Appalachian Trail Corridor, Tyringham; Otis State Forest, Otis; Ware River Watershed, Rutland; Wolf Swamp WMA, Brookfield.

Threats: Invasive exotic insect pests (e.g., hemlock woolly adelgid (*Adelges tsugae*) and elongate hemlock scale (*Fiorinia externa*)); altered hydrology.



Management Needs:

More information is needed to assess the management needs for Hemlock Swamps. The use of undisturbed natural buffers around the best occurrences of the community reduces the potential for impacts from changes in the surrounding environment.

USNVC/NatureServe:

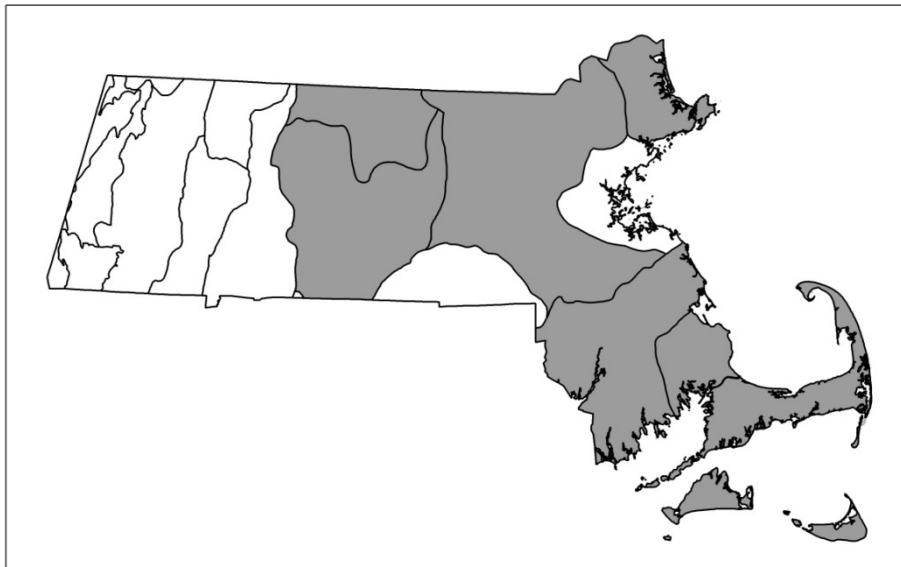
Tsuga canadensis Saturated Forest Alliance - *Tsuga canadensis* *Betula alleghaniensis*/*Ilex verticillata*/*Sphagnum* spp. Forest [CEGL006226].



Highbush Blueberry Thicket

Community Code: CP2B0C2000

State Rank: S4



Concept: Acidic peatlands dominated by dense highbush blueberry bushes on hummocky sphagnum moss.

Environmental Setting: Highbush Blueberry Thickets occur as a border thicket around more open peatlands or coastal plain ponds, and within small basins or seasonally flooded zones in larger wetlands. This community is influenced by a strongly fluctuating water table with flooded conditions in spring and early summer, followed by a drop in the water table below soil surface usually by late summer. The sphagnum mat is variable: it can be thick and stable on peat, or as a shallow organic layer often over sand, or there may be moss on hummocks at the base of shrub stems, with unstable muck in the surrounding hollows.

Vegetation Description: Highbush Blueberry Thickets are tall-shrub peatlands dominated by dense highbush blueberries (*Vaccinium corymbosum*) with swamp azalea (*Rhododendron viscosum*), winterberry (*Ilex verticillata*), sweet pepper-bush (*Clethra alnifolia*), and scattered red maple (*Acer rubrum*) as common associates. Typical short shrubs include leatherleaf (*Chamaedaphne calyculata*), sheep laurel (*Kalmia angustifolia*), and dwarf huckleberry (*Gaylussacia bigeloviana*). The variable herbaceous layer tends to be sparse, but can be locally abundant. Ferns can be the most common herbs present, including cinnamon fern (*Osmundastrum cinnamomeum*), royal fern (*Osmunda regalis*), marsh fern (*Thelypteris palustris*), sensitive fern (*Onoclea sensibilis*), and Virginia chain-fern (*Woodwardia virginica*), along with pitcher plants (*Sarracenia purpurea*) or other herbs of fens including marsh St. John's-wort (*Triadenum virginicum*), three-leaved Solomon's seal (*Maianthemum trifolium*), wild calla (*Calla palustris*), northern water-horehound (*Lycopus uniflorus*), and threeway



sedge (*Dulichium arundinaceum*). A layer of peatmoss is common and varies in cover.

Differentiating Occurrences: The physical and biological characteristics of Highbush Blueberry Thickets, Acidic Shrub Fen, Shrub Swamp, and Fresh/ Brackish Tidal Shrubland overlap and intergrade. They all lack tree cover (<25% canopy cover); they are all dominated by dense shrubs on wet substrates. Highbush Blueberry Thickets are tall-shrub fens, dominated by highbush blueberries or other members of the blueberry family, on peat or at least have sphagnum at the base of the shrubs. Acidic Shrub Fens are dominated by low-growing shrubs, along with sphagnum moss and herbaceous species of varying abundance on wet, often weak, peat. Shrub Swamps lack peat, are often quite diverse, and are not dominated by blueberries or other ericaceous plants. Fresh/Brackish Tidal Shrubland are dense to open shrublands along tidal sections of coastal rivers.

Associated Fauna: Moats of wet, ponded areas associated with highbush blueberry thickets provide important amphibian breeding habitat and function as vernal pools if they have two to three months of ponding and lack fish.

Public Access: Punkhorn Parklands (town-owned), Brewster; Briar Swamp - Dogtown Commons (town-owned), Rockport; Quaboag WMA, East Brookfield.

Threats: Hydrologic alterations and nutrient enrichment from road and lawn runoff may impact this community. More information is needed.

Management Needs:

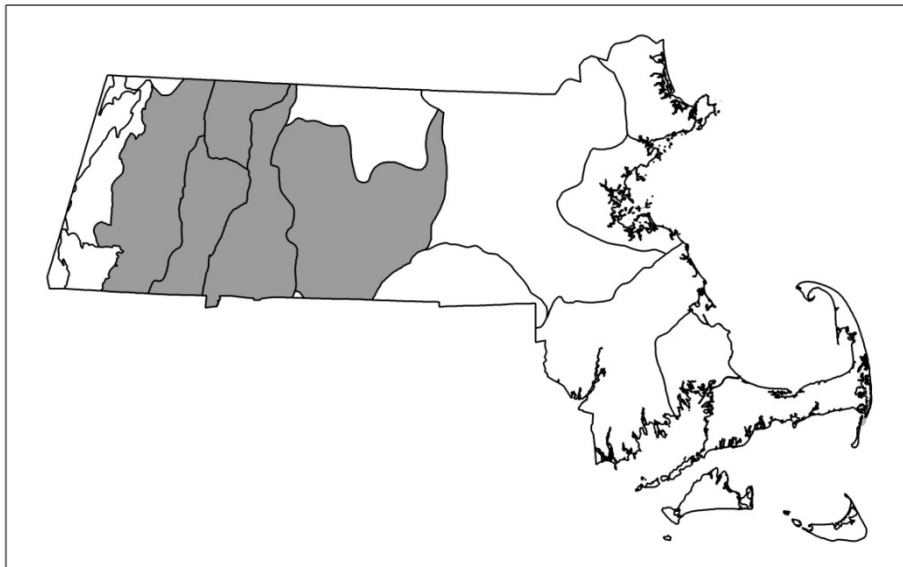
USNVC/NatureServe: A1018 *Vaccinium corymbosum* Peat Thicket Alliance - *Vaccinium corymbosum*/*Sphagnum* spp. Shrubland [CEGL006190]; *Vaccinium corymbosum* - *Rhododendron viscosum* - *Clethra alnifolia* Shrubland [CEGL006371].



High-energy Riverbank Community

Community Code: CP2A0B2400

State Rank: S3



Concept: Sparse, open, herbaceous/graminoid communities occurring on cobble and sand substrates of steep-gradient, fast-flowing rivers that experience severe flooding and ice scour.

Environmental Setting: High-energy Riverbank Communities occur within the zone of active erosion and sedimentation of steep-gradient, fast-flowing rivers, and are shaped by continued annual flood events and winter ice scour. They are characterized by cobble and sand substrates and sparse, open vegetation. High-energy Riverbank Communities occur as both narrow rocky zones along riverbanks and as large areas on the exposed, upstream ends of riverine islands. They are broadly defined communities with variation in structure and dominant species, occurring both among rivers and among sites within rivers. Differences in severity of scouring and flooding create a gradient of substrate types from the river's edge to the upland transition that can correlate to changes in vegetation.

Vegetation Description: Vegetation zonation within High-energy Riverbank communities corresponds to substrate type and severity of flooding. On open cobbles, a usually sparse mix of native and non-native species dominates: false dragonhead (*Physostegia virginiana*), cocklebur (*Xanthium strumarium*), beggar's-ticks (*Bidens* spp.), and lady's thumb (*Persicaria maculosa*) are dominant, growing with colt's-foot (*Tussilago farfara*), wild heal-all (*Prunella vulgaris*), and scattered riverside-sedge (*Carex torta*). Along the Connecticut River, there is typically a distinct band of switchgrass (*Panicum virgatum*) with mixed grasslands of switchgrass, big and little bluestem (*Andropogon gerardii* and *Schizachyrium scoparium*), Indian grass (*Sorghastrum nutans*), and goldenrods (*Solidago* sp.) in the sandier areas with



dense patches of sandbar willow (*Salix exigua* ssp. *interior*) and sandbar cherry (*Prunus pumila* var. *depressa*). Intense flooding and ice scour prevent establishment and growth of trees or tall shrubs. Short shrubs such as shadbush (*Amelanchier* spp.), silky dogwood (*Swida amomum*), willows (*Salix sericea* and *S. lucida* ssp. *lucida*), and sapling sycamores (*Platanus occidentalis*) form a vegetation zone on the sandiest sections, typically bordering floodplain forests that occupy siltier soils.

Differentiating Occurrences: On river islands, the presence of zones of switch grass (*Panicum virgatum*), big bluestem (*Andropogon gerardii*), and Indian grass (*Sorghastrum nutans*), along with sandbar willow (*Salix exigua* ssp. *interior*) and/or sandbar cherry (*Prunus pumila* var. *depressa*) are indicative of High-energy Riverbank Communities. Along rivers, High-energy Riverbank Communities have, on average, sparser vegetation and more and drier, barer ground than do High-energy Rivershore Meadows or Riverside Seeps. As the percentages of sand, silt, and moisture increase, hemp dogbane (*Apocynum cannabinum*), riverside-sedge (*Carex torta*), Canadian burnet (*Sanguisorba canadensis*), and water horsetail (*Equisetum fluviatile*), as a group characteristic of High-energy Rivershore Meadows, become denser and dominant. Riverside Seep Communities occur at the base of steep riverbanks where mineral-enriched groundwater seeps out of the bottom of the upland slope; they are wetter than associated High-energy Rivershore Meadows and High-energy Riverbank Communities. Muskflower (*Mimulus moschatus*), Canadian burnet (*Sanguisorba canadensis*), and golden alexanders (*Zizia aurea*) as a group are good indicator species of Riverside Seeps. Low-energy Riverbank Communities are open herbaceous/graminoid communities occurring on sandy or silty mineral soils of river and stream banks, which do not experience severe flooding or ice scour. The vegetation is often dominated by reed canary-grass (*Phalaris arundinacea*), Canada bluejoint grass (*Calamagrostis canadensis*), or other dense grasses, with some of the same species typical of disturbed areas as High-energy Riverbanks. Cobble bars that have a tree canopy (cover >30%) are classified separately as Cobble Bar Forests.

Associated Fauna: High-energy Riverbank Communities are very open. They provide habitat for migrating shorebirds, including Solitary and Spotted Sandpipers, and for other birds of open habitats such as Killdeer. Dragonfly and tiger beetle larvae live in burrows in sand between cobbles and boulders; adult tiger beetles forage on sand above the high-water mark.

Public Access: Gilbert A. Bliss State Forest/Chesterfield Gorge Reservation (The Trustees of Reservations), Chesterfield; Tolland State Forest, Otis/Sandisfield/Tolland; Sunderland Islands WMA, Deerfield/Sunderland; Green River WMA, Colrain/Leyden; Mohawk Trail State Forest, Charlemont/Florida/Hawley/Savoy.

Threats: The two major threats to high-energy river communities are alteration of natural flooding regimes due to river control projects, and the invasion of non-native plant species. High-energy riverbank environments are created by severe flooding and ice scour, and these natural disturbance regimes are necessary to maintain the community. Because of the community's exposure to flooding, it is susceptible to



colonization by exotic plants, such as Japanese knotweed (*Fallopia japonica*), purple loosestrife (*Lythrum salicaria*), colt's-foot (*Tussilago farfara*), and lady's thumb (*Persicaria maculosa*) that have their seeds washed in from upstream sources. Trampling from campers and boaters creates further disturbance and favors fast-growing exotic plants.

Management Needs:

Where possible, highly invasive exotic plants should be mechanically removed. Management to reduce non-native plant species throughout a drainage basin will help preserve the native plant communities of high-energy riverbanks. Natural hydrologic regimes should be maintained.

USNVC/NatureServe:

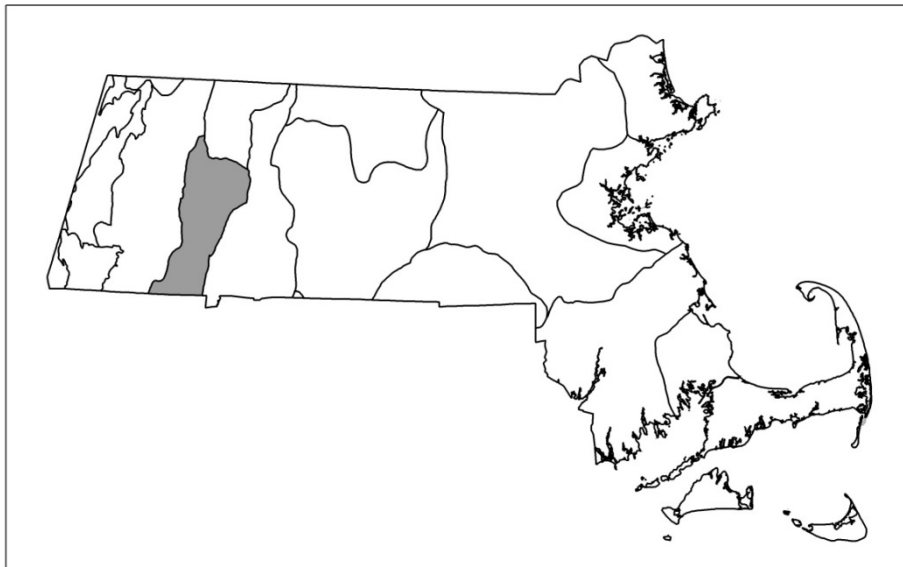
CEGL006536 *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. herbaceous vegetation (Northeastern Temperate Cobble Scour Rivershore).



High-energy Rivershore Meadow

Community Code: CP2A0B2410

State Rank: S2



Concept: Variably sized and occurring in about 10m-wide bands along medium to high-energy river channels, High-energy Rivershore Meadows occur in areas that are kept open by flooding and ice scouring.

Environmental Setting: High-energy Rivershore Meadows are level to gently sloping communities in frequently flooded areas just above the summer low water levels of high-energy rivers. The narrow communities extend to shrubby or tree covered uplands. Frequent flooding and occasional extreme events contribute to the occurrence and persistence of extensive High-energy Rivershore Meadow communities, although the impacts of storm events on individual rivershore meadows and plant populations are highly variable. Vegetation structure and composition vary considerably within rivershore meadows, with some zonation apparently related to differences in elevation, substrate, frequency of flooding, and degree of ice scour. Unlike more northern rivers where deep ice may accumulate annually, ice depth and persistence into early spring along the rivershore meadows in Massachusetts is apparently highly variable. Because they are along high-energy rivers, the community substrate tends to be large sediments along the river, such as cobbles, with sand and smaller materials accumulating only where water slows, often in gradients towards the upland bank. The fairly dense plants and their roots contribute to slowing flood waters, and the finer sediments collect in vegetated areas.

Vegetation Description: Rivershore meadows are dominated by perennial graminoid and forb species. Narrow, low-lying areas near the river's edge and scoured or eroded depressions with moist, mineral substrates are characterized by sparse to moderate cover of



low sedges and rushes, especially brown beak-rush (*Rhynchospora capitellata*), spike-rushes (*Eleocharis* spp.), and rush species (*Juncus* spp.). Above this zone, riverside-sedge (*Carex torta*) dominates along with hemp dogbane (*Apocynum cannabinum*); associates include groundnut (*Apios americana*), deer-tongue (*Dichanthelium clandestinum*), swamp candles (*Lysimachia terrestris*), fringed loosestrife (*L. ciliata*), field-mint (*Mentha* sp.), blue monkey-flower (*Mimulus ringens*), obedient plant (*Physostegia virginiana*), small purple-fringed orchis (*Platanthera psycodes*), Canadian burnet (*Sanguisorba canadensis*), grass-leaf flat-topped goldenrod (*Euthamia graminifolia*), and New York aster (*Symphotrichum novi-belgii*). Higher areas are characterized by tall forbs and grasses, including big bluestem (*Andropogon gerardii*), Canada bluejoint (*Calamagrostis canadensis*), tall flat-topped white aster (*Doellingeria umbellata*), riverbank wild rye (*Elymus riparius*), spotted joe-pye-weed (*Eutrochium maculatum*), sunflower (*Helianthus* sp.), reed canary-grass (*Phalaris arundinacea*), and goldenrods (*Solidago* spp.). The highest portions of the rivershore meadows, just below the adjacent woodlands, are often dominated by ferns and shrubs, especially interrupted fern (*Osmunda claytoniana*), speckled alder (*Alnus incana*), glossy buckthorn (*Frangula alnus*), and Japanese knotweed (*Fallopia japonica*).

Differentiating Occurrences: On cobble shores along high-energy rivers, High-energy Rivershore Meadows intergrade with High-energy Riverbank and Riverside Seep communities. High-energy Rivershore Meadows are densely vegetated with a characteristic group of dominant plants (hemp dogbane, riverside-sedge and Canadian burnet) in a mix with other forbs and graminoids. Riverside Seeps occur at the base of steep riverbanks where groundwater seeps out of the bottom of the upland slope; they are wetter than associated High-energy Rivershore Meadows and High-energy Riverbank Communities. Muskflower, Canadian burnet, and golden alexanders as a group are good indicator species of Riverside Seeps. High-energy Riverbank Communities have, on average, sparser vegetation and more bare ground than do High-energy Rivershore Meadows or Riverside Seeps.

Associated Fauna: High-energy Rivershore Meadows filter water coming from surrounding uplands, improving water quality for the fish and other animals of the stream. As they are small communities, they are part of the habitat of wide-ranging riverine and upland animals.

Public Access: Gilbert A. Bliss State Forest, Chesterfield.

Threats: Invasive species, particularly large patches of *Fallopia japonica* on the upland edge, and *Lythrum salicaria*, *Phalaris arundinacea*, and *Frangula alnus* scattered throughout. Japanese Knotweed poses by far the greatest threat to rivershore meadows where it often occurs as dense monocultures, dominating continuous linear patches that extend for tens or hundreds of meters. In some instances, recent or ongoing expansion of Japanese Knotweed clones actively threatens rivershore meadows.

Management Needs: Control of invasive species, particularly *Fallopia*.



USNVC/NatureServe:

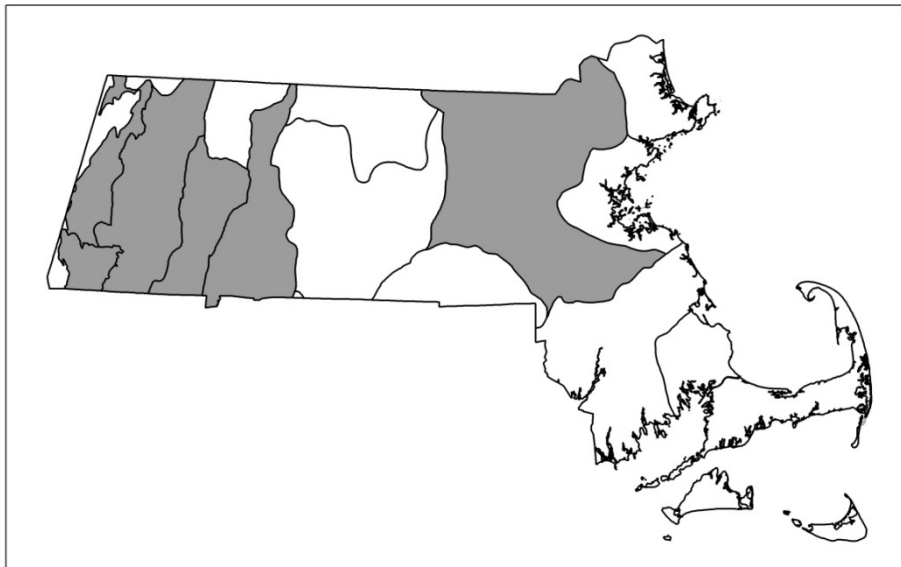
CEGL006536: Northeastern Temperate Cobble Scour Rivershore (*Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation).



High-terrace Floodplain Forest

Community Code: CP1A2B4000

State Rank: S2



Concept: Mesic, deciduous hardwood forests of high alluvial terraces above the zone of annual flooding. This community type also occurs along riverbanks of high-gradient, northern rivers.

Environmental Setting: High-terrace Floodplain Forests occur on raised banks adjacent to rivers and streams, on steep banks bordering high-gradient rivers in the western parts of the state, on high alluvial terraces, and on raised areas within Major-river and Small-river Floodplain Forests. In general, these communities are within the 100-year flood zone of rivers, and thus are river-influenced, but they typically are not flooded annually, as indicated by the presence of a distinct surface soil organic layer. Soils are typically silt loams. As with other types of floodplain forests and Rich, Mesic Forests, the rich soils and moist conditions make disturbed areas in them prone to invasions by exotic plant species.

Vegetation Description: These floodplain forests typically have more structural and species diversity than other floodplain forests. They have a mix of species that includes many that also occur in lower floodplain forests and others from mesic, deciduous hardwood forests, particularly Rich, Mesic Forests. The canopy may include red, silver, and sugar maples (*Acer rubrum*, *A. saccharinum*, and *A. saccharum*) growing with birches (*Betula* spp.), hickories (*Carya cordiformis*, *C. glabra*, and *C. ovata*), ashes (*Fraxinus* spp.), butternut (*Juglans cinerea*), sycamore (*Platanus occidentalis*), cottonwood (*Populus deltoides*), black cherry (*Prunus serotina*), basswood (*Tilia americana*), and elms (*Ulmus* spp.). Large hackberry (*Celtis occidentalis*) trees grow in High-terrace Floodplain Forests along the southern Housatonic River. Ironwood (*Carpinus caroliniana*) is characteristically in an open subcanopy that may also



include species from the canopy. The shrub layer varies from sparse to well-developed, with northern arrowwood (*Viburnum dentatum* var. *lucidum*), nannyberry (*V. lentago*), and winterberry (*Ilex verticillata*) commonly mixed with variable amounts of non-native shrubs, including Japanese Knotweed (*Fallopia japonica*), Japanese barberry (*Berberis thunbergii*), and buckthorns (*Frangula alnus* and *Rhamnus cathartica*). The herbaceous layer is a mixture of the characteristic floodplain forest plants - sensitive fern (*Onoclea sensibilis*), ostrich fern (*Matteuccia struthiopteris*), and wood-nettle (*Laportea canadensis*) - and rich upland herbs, such as lady fern (*Athyrium filix-femina*), zigzag goldenrod (*Solidago flexicaulis*), white snakeroot (*Ageratina altissima*), jack-in-the-pulpit (*Arisaema triphyllum*), and bellwort (*Uvularia sessilifolia*). Other characteristic herbaceous taxa include honewort (*Cryptotaenia canadensis*), floodplain avens (*Geum laciniatum*), jumpseed (*Persicaria virginianum*), trilliums (*Trillium* spp.), trout-lily (*Erythronium americanum*), enchanter's nightshade (*Circaea canadensis* ssp. *canadensis*), and the grasses bottlebrush grass (*Elymus hystrix*) and Wiegand's wild rye (*E. wiegandii*). Vines, very dense in places, include grape (*Vitis riparia*), prickly cucumber (*Echinocystis lobata*), moonseed (*Menispermum canadense*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), and the invasive Oriental bittersweet (*Celastrus orbiculatus*).

Differentiating Occurrences: Occurrences of High-terrace Floodplain Forests tend to be relatively small, narrow forests on high alluvial terraces that flood only occasionally (not annually) and for a shorter duration than other types of floodplain forests. Less flooding typically results in more structural and species diversity than found in other floodplain forests. High-terrace Floodplain Forests are most closely related to Transitional Floodplain Forests, Small-river Floodplain Forests, and Rich Mesic Forests. They are sometimes seen as a hybrid between floodplain and upland forests, as the vegetation composition of all layers of this forest type is a mixture of floodplain taxa, such as red and silver maple (*Acer rubrum* and *A. saccharinum*), and mesic, deciduous hardwoods including sugar maple (*A. saccharum*), shagbark hickory (*Carya ovata*), black cherry (*Prunus serotina*), American elm (*Ulmus americana*), and basswood (*Tilia americana*). Ironwood (*Carpinus caroliniana*) typically forms an open subcanopy. They have more litter accumulated than other floodplain forests. Alluvial Red Maple Swamps along low-gradient rivers flood annually and are slow to drain. Silver maple is often a codominant with red maple, without the mix of upland species. Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple. Major-river, Transitional, and Small-river Floodplain Forests flood annually, are dominated by silver maple, and lack the upland forest species. Rich, Mesic Forests lack silver maple and other species of floodplain forests. They are not associated with river flooding.

Associated Fauna: High-terrace Floodplain Forests can contain low wet depressions that function as vernal pools and provide important amphibian breeding habitat. Being small communities, they are part of the habitat of wide-ranging riverine and upland



animals. Changes in water quality and quantity will alter herbaceous, and eventually tree, species, changing habitat for birds and browsers, such as deer and rabbits.

Public Access:

George L. Darey Housatonic Valley WMA, Lenox; Knightville WMA, Huntington/Chesterfield; Arcadia Wildlife Sanctuary (Massachusetts Audubon Society), Northampton; Bolton Flats WMA, Bolton/Lancaster.

Threats:

Most high terraces have been converted to agriculture. Remaining examples are typically small and disturbed by selective logging and trail clearing. The lack of natural vegetated buffers makes these communities highly susceptible to non-native plant invasions. Most known examples have non-native plant species comprising a substantial percentage of overall plant cover. Because these communities fall outside of wetland boundaries, they are not subject to wetland regulations making them targets for selective logging and clearing for agriculture.

Management Needs:

Removal of non-native species.

USNVC/NatureServe:

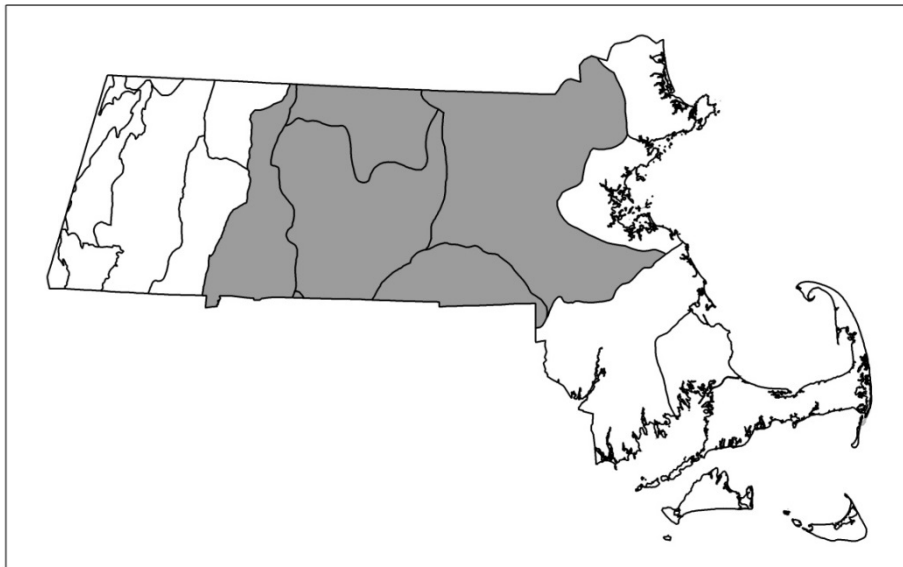
Acer saccharum - *Carya cordiformis* Temporarily Flooded Forest Alliance -- *Acer saccharum* - *Fraxinus* spp. - *Tilia americana*/*Matteuccia struthiopteris* - *Ageratina altissima* Forest [CEGL006114].



Inland Atlantic White Cedar Swamp

Community Code: CP1B1A2000

State Rank: S2



Concept: Inland basin or seepage swamps dominated by Atlantic white cedar in the overstory. Hemlock, spruce, red maple, and yellow birch co-occur, and coastal indicator species are lacking.

Environmental Setting: Inland Atlantic White Cedar Swamps generally occur in the central part of the state in basins or seepage wetlands at a wide range of elevations. As in all Atlantic white cedar swamps, water-saturated peat overlies the mineral sediments (sand and gravel, glacial lake sediments, or till deposits), and standing water generally occurs for half of the growing season or longer. There is typically some surface water movement, and some sites receive groundwater seepage from nearby steep till deposits. The water and soil are nutrient-poor, and particularly low in nitrogen and phosphorus. Soil pH is acidic (3.1-5.5) and leaf litter decomposition is slow. When conifers dominate the canopy, occurrences may be dark and have limited understory growth. Fallen and tipped trees are common and the resultant openings become tangles with dense shrub and sapling growth around downed trunks.

Vegetation Description: Atlantic white cedar swamps are defined as having >25% cover of Atlantic white cedar in the canopy. Associated canopy trees in Inland Atlantic White Cedar Swamps differ depending on elevation. In sites lower than 700 ft. elevation, Atlantic white cedar (*Chamaecyparis thyoides*) is mixed with hemlock (*Tsuga canadensis*), red maple (*Acer rubrum*), and yellow birch (*Betula alleghaniensis*). At elevations above 700 ft., Atlantic white cedar is mixed with hemlock and spruce (*Picea* spp.). The low-elevation sites typically have sweet pepper-bush (*Clethra alnifolia*) and winterberry (*Ilex verticillata*) in the shrub layer, and high-elevation sites have abundant mountain holly (*Ilex mucronata*). The herb layer of both low- and



high-elevation sites is similar, with cinnamon fern (*Osmundastrum cinnamomeum*), starflower (*Lysimachia borealis*), and Canada mayflower (*Maianthemum canadense*) common. High-elevation sites also have northern species such as creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Chamaepericlymenum canadense*).

Differentiating Occurrences: Although each of the Atlantic white cedar swamp community types has a characteristic vegetation structure and composition, as with all natural communities, transitions and mixes do occur. Coastal Atlantic White Cedar Swamps generally occur below 60 ft. elevation and in southeastern Massachusetts (the Cape and Islands, Plymouth and Bristol Counties). In Coastal Atlantic White Cedar Swamps, pitch pine (*Pinus rigida*) is an occasional canopy associate seldom found in other Atlantic white cedar swamp types. Other species that are found in greater abundance in coastal sites than elsewhere include greenbrier (*Smilax rotundifolia*), the shrubs inkberry (*Ilex glabra*), dangleberry (*Gaylussacia frondosa*), sheep laurel (*Kalmia angustifolia*), and fetterbush (*Eubotrys racemosa*), and the ferns Virginia chain-fern and netted chain-fern (*Woodwardia virginica* and *W. areolata*). Inland Atlantic White Cedar Swamps typically occur at elevations > 60 ft. above sea level and not in southeast Massachusetts. Yellow birch (*Betula alleghaniensis*) is more common than in Coastal Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps have lower abundance of coastal indicators than Coastal Atlantic White Cedar Swamps. High-elevation Inland Atlantic White Cedar Swamps also have northern species such as creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Chamaepericlymenum canadense*). Northern Atlantic White Cedar Swamps are codominated by northern conifers such as black and red spruce (*Picea mariana* and *P. rubens*) and balsam fir (*Abies balsamea*). Shrubs and herbs are similar to those found in high-elevation Inland Atlantic White Cedar Swamps, along with Labrador tea (*Rhododendron groenlandicum*) and rhodora (*Rhododendron canadense*). Northern Atlantic White Cedar Swamps are restricted to basins at high elevations, with the single documented example at >1100 ft. Atlantic white cedar also occurs in Atlantic White Cedar Bogs, relatively open peatland communities with canopy cover <25%. Alluvial Atlantic White Cedar Swamps are along streams. The vegetation is highly variable. Atlantic white cedar and red maple dominate the tree layer, and highbush blueberry and sweet pepperbush occur in the shrub layer along with silky dogwood (*Swida amomum*). The herb layer includes sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), bugleweed (*Lycopus* spp.), and marsh St. John's-wort (*Hypericum virginicum*). In Alluvial Red Maple Swamps, silver maple is often a codominant with red maple. If Atlantic white cedar is present, it is well under 25% cover. Red Maple Swamps in basins in southeastern Massachusetts are often former Atlantic white cedar swamps that were cut in the past. Many have small patches of Atlantic white cedar; however, Atlantic white cedar needs to be dominant in the overstory for the community to be classified as an Atlantic white cedar swamp. Mapping of relatively large dense patches of Atlantic white cedar as Atlantic white cedar swamp communities may be useful within a Red Maple Swamp to indicate a mosaic of wetland communities.



Associated Fauna:	Inland Atlantic White Cedar Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
Public Access:	Boxford State Forest, Boxford; Westborough Cedar Swamp (DCR and Sudbury Valley Trustees), Westborough; Douglas State Forest, Douglas; Hodges Village Dam Flood Risk Management Project (US Army Corps of Engineers), Oxford; Cedar Swamp Conservation Area, Monson.
Threats:	The two greatest threats to Atlantic white cedar swamps are land clearing for agricultural, commercial and residential development, and interference of normal hydrological functioning as a result of development. Atlantic white cedar has been cut extensively for posts and shingles for over three centuries. In an extensive statewide vegetation inventory funded by NHESP in 1990, no uncut stands were found, but several sites contained cedars that were 100-200 years old. Selective cutting is detrimental to the persistence of Atlantic white cedar swamps, because hardwoods, such as red maple, outcompete and replace Atlantic white cedar. Any alteration to the natural hydroperiod of Atlantic white cedar swamps threatens their persistence.
Management Needs:	Due to the limited distribution of Atlantic white cedar swamps, it is recommended that no clearing or filling of these wetlands be allowed. Atlantic white cedar will regenerate best following catastrophic disturbance events such as hurricanes and fires. Data suggest that in the absence of disturbance, red maple and shrubs increase in abundance at the expense of Atlantic white cedar. Fire suppression negatively threatens the long-term persistence of Atlantic white cedar swamps, and controlled burning practices may be an appropriate restoration tool in many areas. Controlled burning should be accompanied by small-patch clearcuts to be most effective. By clear-cutting small patches (generally 20 m x 20 m) and removing the slash and competing vegetation, pure, even-aged stands of Atlantic white cedar are able to regenerate. Atlantic white cedar swamps require a natural cycle of wet and dry periods for their survival and reproduction. Standing water for much of the year is unfavorable for both seed germination and seedling survival, and young seedlings are killed by both drowning and drought. It is recommended that any alterations in water levels be avoided. This includes development and road construction in uplands surrounding Atlantic white cedar swamps which can alter water levels. Where cedar wetlands are associated with river systems, it is important to maintain normal hydrologic regime of the river.
USNVC/NatureServe:	<i>Chamaecyparis thyoides</i> Saturated Forest Alliance - <i>Chamaecyparis thyoides</i> - (<i>Tsuga canadensis</i> , <i>Betula alleghaniensis</i>)/ <i>Clethra alnifolia</i> Forest (CEGL006189); includes much of <i>Chamaecyparis thyoides</i> / <i>Rhododendron maximum</i> Forest (CEGL006355) except for lacking dominant <i>Rhododendron maximum</i> .



Interdunal Marsh/Swale

Community Code: CP2A0A1100

State Rank: S2



Concept: Graminoid- or shrub-dominated coastal community occurring in shallow basins (swales) between sand dunes.

Environmental Setting: Interdunal Marshes/Swales form in barrier beach systems in low, shallow depressions between sand dunes. The best examples are complexes of multiple swales with varied conditions. Soils generally have a thin (1 cm) organic layer over coarse sand. The substrate may be seasonally flooded or permanently inundated, with water coming from groundwater and precipitation, with occasional brackish overwash from storms. The water regime controls the vegetation. The community is usually graminoid- or shrub-dominated. One variant has a pitch pine canopy.

Vegetation Description: Interdunal swale vegetation ranges from graminoid-dominated to low shrub-dominated, with or without scattered patches of tall shrubs or, occasionally, a canopy of pitch pine. The most common type is dominated by large cranberry (*Vaccinium macrocarpon*; often with > 90% cover) on sphagnum moss. Typical associates include various rushes (*Juncus pelocarpus*, *J. canadensis*, etc.), spatulate-leaved and thread-leaved sundews (*Drosera intermedia* and *D. filiformis*), beaksedges (*Rhynchospora capitellata* and *R. alba*), yellow-eyed grasses (*Xyris* spp.), St. John's-worts (*Triadenum* spp.), southern bog clubmoss (*Lycopodiella appressa*), and several orchid species such as rose pogonia (*Pogonia ophioglossoides*), grass-pink (*Spiranthes cernua*), and nodding ladies-tresses (*Spiranthes cernua*) and occasional arethusa (*Arethusa bulbosa*) and ragged fringed orchis (*Platanthera lacera*). Graminoid-dominated swales are characterized by a mixture of rushes (*Juncus* spp.), beaksedges (*Rhynchospora* spp.) and other graminoids. Some interdunal swales have large numbers of Plymouth gentian (*Sabatia kennedyana*).



Scattered pitch pine (*Pinus rigida*), eastern red cedar (*Juniperus virginiana*), bayberry (*Morella pensylvanica*), sheep laurel (*Kalmia angustifolia*) or other wetland shrubs can also occur.

Differentiating Occurrences: Occurrence in shallow, wet basins in dune systems is the defining characteristic of Interdunal Marsh/Swales. They are graminoid-, shrub-, or pitch pine-dominated communities growing on shallow peat over sand. Acidic Graminoid Fens and Sea-level Fens are differentiated by location; they are not in barrier beach systems. They both generally have deeper peat than Interdunal Marshes/Swales, but all share many species.

Associated Fauna: Interdunal swales can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these swales provide important amphibian breeding habitat, particularly for toads such as American toad, Fowler's toad, and eastern spadefoot. Interdunal swales are part of the habitat of mobile animals for food, cover, and nesting sites. They can be an important source of freshwater in the generally very dry and exposed dune systems.

Public Access: Several dune systems on public lands have trails and/or boardwalks that intersect interdunal swales. If visited, care should be taken not to create trails across the peat surface or in the easily damaged surrounding dunes. Cape Cod National Seashore, multiple areas; Parker River National Wildlife Refuge, Newburyport, multiple areas; Sandy Neck Beach Conservation Area (town-owned), Barnstable; Demarest Lloyd State Park, Dartmouth.

Threats: Invasion of non-native species (especially phragmites (*Phragmites australis*) and purple loosestrife (*Lythrum salicaria*)).

Management Needs: Control the spread of phragmites and purple loosestrife.

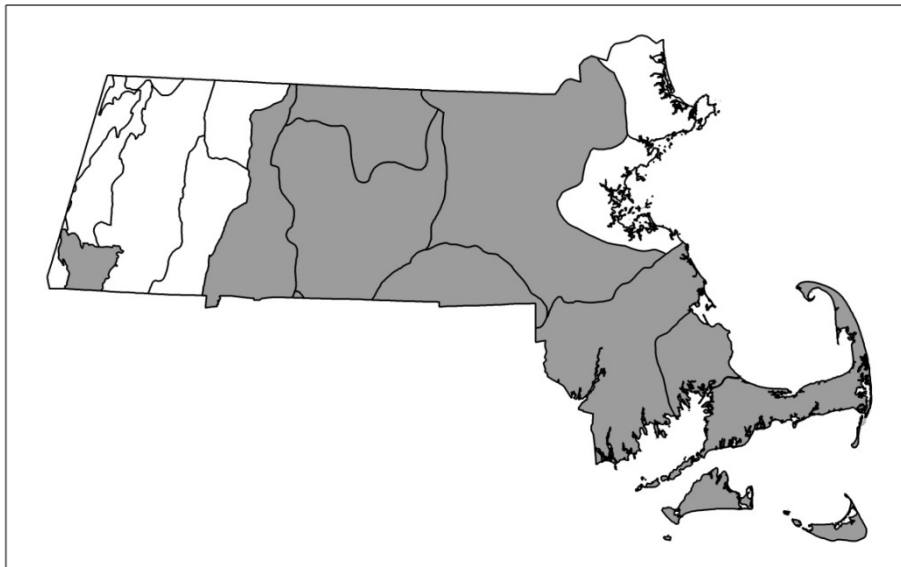
USNVC/NatureServe: *Vaccinium macrocarpon*-*Myrica pensylvanica* Dwarf-shrubland [CEGL006141]; *Spartina patens* Seasonally Flooded Herbaceous Vegetation [CEGL006342]. *Cladium mariscoides*/*Vaccinium macrocarpon* - *Morella pensylvanica* Dwarf-shrubland (CEGL006141, G2G3) (?); ?A0580 *Pinus rigida* Saturated Woodland Alliance - *Pinus rigida*/*Vaccinium macrocarpon* Woodland [CEGL006127].



Kettlehole Level Bog

Community Code: CP2B0C1100

State Rank: S2



Concept: A variant of level bogs occurring in kettle depressions in sandy glacial outwash. Vegetation is typically zoned in rings.

Environmental Setting: Kettlehole Level Bogs are a subset of Level Bogs that occur in iceblock depressions (commonly called kettleholes) in sandy glacial outwash. They are typically small (< 3 acres) and round, and they lack inlets and outlets. Kettlehole Level Bogs are peatlands: wetlands with incompletely decomposed plant material (peat) that accumulates when saturated year-round by water that is cool, acidic, poorly oxygenated, and low in nutrients. The peat isolates the vegetation from the water table, making the communities the most acidic (pH range 3 to 4), and nutrient-poor of peatland communities. The word "level" differentiates Massachusetts bogs from the raised bogs of more northern latitudes, where peat becomes so thick that precipitation is the only source of nutrients. Massachusetts' climate is not cold enough to develop raised bogs; the state is at the southern limit of the geographic range of peatlands.

Vegetation Description: Sphagnum moss (*Sphagnum* spp.) is the most common plant in all acidic peatlands, forming a mat that the vascular plants grow on and producing most of the peat that underlies the community. Kettlehole level bogs have similar vegetation to level bogs, except that the vegetation is typically in a ringed zonation pattern. Often the outer wet moat is dominated by a mixture of highbush blueberry (*Vaccinium corymbosum*) and swamp azalea (*Rhododendron viscosum*), bordered to the interior by a ring of rhodora (*Rhododendron canadense*). The mat has a mixture of tall and short shrubs that are predominantly ericaceous (members of the Heath family). Leatherleaf (*Chamaedaphne calyculata*) is dominant. Other typical ericaceous



shrubs include rhodora, sheep laurel (*Kalmia angustifolia*), bog laurel (*Kalmia polifolia*), bog-rosemary (*Andromeda polifolia* var. *glaucophylla*), Labrador tea (*Rhododendron groenlandicum*), and low-growing large and small cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*). Scattered, stunted coniferous trees (primarily tamarack (*Larix laricina*) and black spruce (*Picea mariana*)) occur throughout. A mixture of specialized bog plants grow on the hummocky sphagnum surface, including carnivorous pitcher plants (*Sarracenia purpurea*) and sundews (*Drosera rotundifolia* and *D. intermedia*). Many of the kettlehole bogs observed in the state have drier and more stable sphagnum mats than Level Bogs that are not in kettleholes, and they have abundant bog laurel and three-leaved Solomon's seal (*Maianthemum trifolium*).

Differentiating Occurrences: Natural communities on acidic peatlands all occur on sphagnum peat. The depth, density, and strength of the underlying peat control the structure and composition of each type of peatland community because plants growing on it are isolated from nutrients carried by groundwater. In Level Bogs, the sphagnum peat tends to be deep and well-developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Kettlehole Level Bogs are a subset of Level Bogs that occur in kettleholes in sandy glacial outwash. They are typically small (<3 acres) and round, and they lack inlets and outlets. Kettlehole Level Bogs have similar vegetation to Level Bogs, except that the vegetation is typically in a ringed zonation pattern. Atlantic White Cedar Bogs have a sparse canopy cover of Atlantic white cedar trees over sphagnum on peat. Acidic Graminoid Fens are dominated by graminoid and herbaceous species and lack extensive shrubs. Spruce-Tamarack Bogs are acidic forested peatlands with an overstory of black spruce and tamarack.

Associated Fauna: Due to the extended periods of saturation, the lack of nutrients, and the high acidity and low oxygen content of the water, acidic peatlands are inhospitable to many animal species. Winged animals and large terrestrial animals can use peatlands as part of their habitat and then move on when conditions are unfavorable. Moose and white-tailed deer use acidic peatlands for browsing and grazing, and their trails are often evident across the peat mat. Bears are attracted to the cranberries and blueberries in season. Many bird species use peatlands for part of the year as nesting or foraging habitat. Massachusetts birds that can be found in acidic peatlands include Swamp and White-tailed Sparrows, Common Yellowthroat, Olive-sided and Alder Flycatchers, Red-winged Blackbirds, and Gray Catbirds. The acidity and low oxygen content of the water in Kettlehole Level Bogs make them poor habitat for most amphibians and reptiles, although some species can breed in the shallow pools that form among the sphagnum hummocks. Many species of dragonflies and damselflies inhabit acidic peatlands, especially where there is adjacent open water.

Public Access: Bog surfaces are damaged by trampling; sites with boardwalks are best suited to visitation.

Threats: Hydrologic alteration and nutrient enrichment from road and lawn runoff. Trampling from humans affects peat mat integrity.



Management Needs:

The public should be encouraged to visit only those sites with established boardwalks. Signs need to be posted along boardwalks encouraging visitors to stay off the peat mat. Monitor the impact of salt and other nutrient runoff into bogs, and work to minimize runoff. Remove phragmites where it has become established.

USNVC/NatureServe:

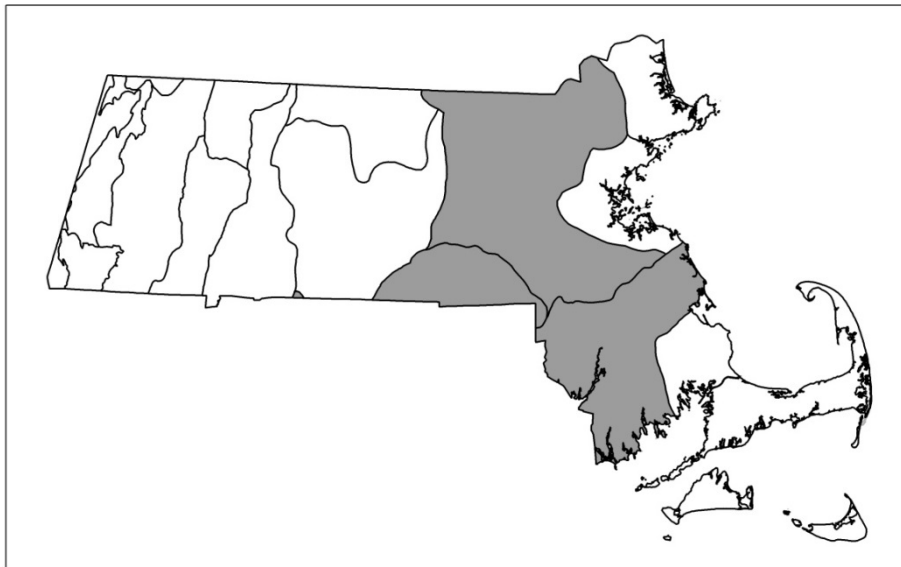
Includes *Vaccinium corymbosum*/*Sphagnum* spp. Shrubland; *Picea mariana*/*Kalmia angustifolia*/*Sphagnum* spp. Forest; *Picea mariana*/*Sphagnum* spp. (Lower New England/Northern Piedmont, North Atlantic Coast) Woodland; *Kalmia angustifolia*-*Chamaedaphne calyculata* (*Picea mariana*)/*Cladina* Dwarf-shrubland.



Kettlehole Wet Meadow

Community Code: CP2A0A2100

State Rank: S3



Concept: Graminoid/emergent herbaceous or mixed shrub/herbaceous communities that are restricted to small (<5 acres), seasonally inundated kettle depressions in sandy glacial outwash.

Environmental Setting: The Kettlehole Wet Meadow community is a variation of both Wet Meadow and Shallow Emergent Marsh communities. It occurs in depression basins (kettleholes in glacial sediments) that are seasonally inundated by local runoff and groundwater fluctuations and often have no stream inlet or outlet. In the winters of most years, they may be shallow ponds that then dry down to mucky peaty sediments through the summer; emergent, usually graminoid, vegetation, becomes dense as the growing season progresses. Deep peat does not develop due to the seasonal drawdown of water. A series of plant associations occur along a gradient from the higher, drier margins to the lower, wetter centers.

Vegetation Description: Kettlehole Wet Meadows are typically fringed with shrubs, such as leatherleaf (*Chamaedaphne calyculata*), highbush blueberry (*Vaccinium corymbosum*), buttonbush (*Cephalanthus occidentalis*), and water willow (*Decodon verticillatus*), and trees including tupelo (*Nyssa sylvatica*), swamp white oak (*Quercus bicolor*), and red maple (*Acer rubrum*), often with sphagnum moss (*Sphagnum* spp.) under them. By the end of the summer, with lowered water, the basin is covered by a dense growth of emergents graminoids, often in zones or patches of single species. The dominants may be bulrushes, sedges, or rushes, or, occasionally, grass. Wool-grass (*Scirpus cyperinus*) can be close to a monoculture when present. Other species present may include different *Scirpus* species (such as dusky wool-grass (*S. atrocinctus*), meadow bulrush (*S. hattorianus*), red-stemmed bulrush (*S.*



microcarpus), and Torrey's bulrush (*Schoenoplectus torreyi*)), sedges including tussock-sedge (*Carex stricta*), rushes (such as marsh rush (*Juncus canadensis*), bayonet rush (*J. militaris*), and pondshore rush (*J. pelocarpus*)), and grasses (including panic-grasses (*Dichanthelium* and *Panicum* spp.), creeping bentgrass (*Agrostis stolonifera*), and mannagrass (*Glyceria pallida* and *G. acutiflora*)) ferns including marsh fern (*Thelypteris palustris*), and forbs such as beggar's ticks (*Bidens* spp.).

Differentiating Occurrences: Kettlehole Wet Meadows are a specialized type of Shallow Emergent Marsh in small basins that have dense graminoid marshes on mucky peat. They are temporarily inundated after storms as well from high groundwater. Wet Meadows, related graminoid communities, are in lake basins, backwaters, and sloughs along rivers. Shallow Emergent Marshes are graminoid wetlands in broad, flat areas bordering rivers or along pond margins and are seasonally flooded. Coastal Plain Pondshore Communities and Coastal Plain Pondshores - Inland Variant are generally on sand around ponds in closed basins that intersect groundwater affecting the pond levels. The seasonally fluctuating water table typically leaves an exposed shoreline by late summer that supports herbaceous species. Sediments are sandy or mucky, but not peaty, and late summer vegetation is not dominated by tall dense graminoids.

Associated Fauna: Because they are small, Kettlehole Wet Meadows are parts of the habitat of wide-ranging species, including wetland nesting birds. Kettlehole Wet Meadows often function as vernal pools: with standing water in the winter and spring, and drawdown to the sediments in most summers, the areas provide important breeding habitat for amphibians that live in surrounding forests during the rest of the year.

Public Access: Douglas State Forest, Douglas; Minute Man National Historical Park, Concord; Demarest Lloyd State Park, Dartmouth.

Threats: Alterations to natural water-level fluctuations. The sites for which there are vegetation data have surprisingly few non-native plant species, and exotics may not currently threaten these communities.

Management Needs: More information is needed on the physical and hydrological processes associated with Kettlehole Wet Meadows in order to make educated management recommendations. It is known that seasonal water level fluctuations play an important role in the occurrence of the community. Spring high-water levels prevent encroachment of woody shrubs and trees, and late-summer low-water levels allow characteristic narrow-leaved emergents to appear. Any alteration in natural water level fluctuations, such as groundwater withdrawal, would negatively affect the community. Kettlehole Wet Meadows may be prone to burning during low-water periods, but the role of fire in community dynamics is not known.

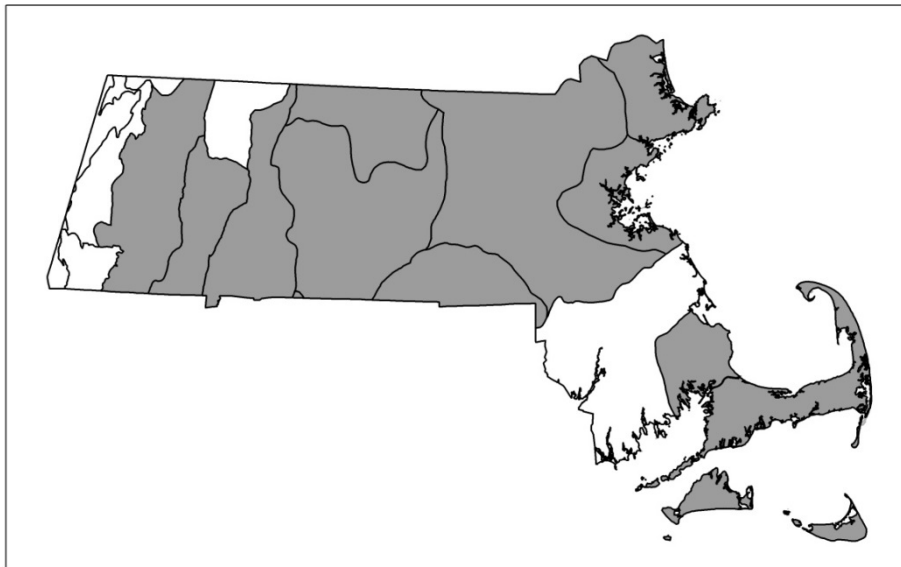
USNVC/NatureServe: A.1386 - *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance, *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation [CEGL006349]; (part of) A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Herbaceous Alliance, *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation [CEGL006412].



Level Bog

Community Code: CP2BOC1000

State Rank: S3



Concept: Acidic, dwarf ericaceous shrub peatlands, generally with pronounced hummock-hollow topography. Level Bogs are the most acidic and nutrient-poor of Massachusetts peatland communities.

Environmental Setting: Level Bogs are peatlands: wetlands with incompletely decomposed plant material (peat) that accumulates when saturated year-round by water that is cool, acidic, poorly oxygenated, and low in nutrients. They receive little or no stream flow and they are isolated from the water table, making them the most acidic (pH range 3 to 4), and nutrient-poor of peatland communities. Level Bogs develop along pond margins, at the headwaters of streams, and in pockets within large basins. Level Bogs that develop in isolated valley bottoms without inlet or outlet streams are classified as Kettlehole Level Bogs, a subset of Level Bog. The word "level" is used to differentiate Massachusetts bogs from the raised or domed bogs of more northern latitudes, where peat becomes so thick that the surface of the bog is actually domed, and the only way nutrients enter the system is through precipitation. Massachusetts' climate is not cold enough for raised bogs to develop; the state is at the southern limit of the geographic range of peatlands.

Vegetation Description: Sphagnum moss (*Sphagnum* spp.) is the most common plant in all acidic peatlands, forming a mat that the vascular plants grow on and producing most of the peat that underlies the community. Level Bogs are characterized by a mixture of tall and short shrubs that are predominantly in the heath family. Leatherleaf (*Chamaedaphne calyculata*) is dominant with other shrubs, typically including rhodora (*Rhododendron canadense*), sheep laurel (*Kalmia angustifolia*), bog laurel (*K. polifolia*), bog rosemary (*Andromeda polifolia* var. *glaucophylla*), Labrador tea



(*Rhododendron groenlandicum*), highbush blueberry (*Vaccinium corymbosum*), and low-growing large and small cranberry (*Vaccinium macrocarpon* and *V. oxycoccos*). Scattered, stunted trees (primarily tamarack (*Larix laricina*) and black spruce (*Picea mariana*), with red maple (*Acer rubrum*) saplings) occur throughout. A mixture of specialized bog plants grow on the hummocky sphagnum surface, including carnivorous pitcher plants (*Sarracenia purpurea*) and sundews (*Drosera rotundifolia* and *D. intermedia*).

Differentiating Occurrences: Natural communities on acidic peatlands all occur on sphagnum peat. The depth, density, and strength of the underlying peat control the structure and composition of each type of peatland community because plants growing on it are isolated from nutrients carried by groundwater. Level Bog communities receive little or no stream flow and they are isolated from the water table, making them the most acidic (pH ~ 3 to 4) and nutrient-poor of peatland communities. The sphagnum peat tends to be deep and well-developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Kettlehole Level Bogs are a subset of Level Bogs that occur in iceblock depressions (commonly called kettleholes) in sandy glacial outwash. They are typically small (<3 acres) and round, and they lack inlets and outlets. Atlantic White Cedar Bogs have a sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat. Atlantic White Cedar Bogs share many species and characteristics with other acidic peatlands, including Level Bogs. Acidic Graminoid Fens are differentiated by the dominance of graminoid and herbaceous species and lack of extensive shrubs. Threeway sedge (*Dulichium arundinaceum*) and buckbean (*Menyanthes trifoliata*) are characteristic of the wet, nutrient-enriched edges of Acidic Graminoid Fens. Sea-level Fens occupy the interface between estuarine marshes and upland seepage slopes, and therefore have a distinct species assemblage including both estuarine and palustrine species. Regionally, three species have been identified as diagnostic: saltmarsh straw-sedge (*Carex hormathodes*), saltmarsh spike-sedge (*Eleocharis rostellata*), and saltmarsh threesquare (*Schoenoplectus americanus*). Twig-sedge (*Cladium mariscoides*) at the edges of salt marshes is also used as an indicator of Sea-level Fens. Interdunal Marshes/Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands. Spruce - Tamarack Bogs are acidic forested peatlands, with an overstory of black spruce and tamarack and an understory of heath shrubs on sphagnum moss.

Associated Fauna: Due to the extended periods of saturation, the lack of nutrients, and the high acidity and low oxygen content of the water, acidic peatlands are inhospitable to many animal species. Winged animals and large terrestrial animals can use peatlands as part of their habitat and then move on when conditions are



unfavorable. Moose and white-tailed deer use acidic peatlands for browsing and grazing, and their trails are often evident across the peat mat. Bears are attracted to the cranberries and blueberries in season. Many bird species use peatlands for part of the year as nesting or foraging habitat. Massachusetts birds that can be found in acidic peatlands include Swamp and White-tailed Sparrows, Common Yellowthroat, Olive-sided and Alder Flycatchers, Red-winged Blackbirds, and Gray Catbirds. The acidity and low oxygen content of Level Bogs make them poor habitat for most amphibians and reptiles, although some species can breed in the shallow pools that form among the sphagnum hummocks. Many species of dragonflies and damselflies inhabit acidic peatlands, especially where there is adjacent open water.

Public Access:

Bog surfaces are damaged by trampling; sites with boardwalks are best suited to visitation, such as Ponkapoag Bog (DCR), Canton; Poutwater Pond (DCR), Sterling; Black Pond Nature Preserve (TNC), Norwell; Hawley Bog, Hawley.

Threats:

Hydrologic alteration and nutrient enrichment from road and lawn runoff. Trampling from humans affects peat mat integrity.

Management Needs:

The public should be encouraged to visit only those sites with established boardwalks. Signs need to be posted along boardwalks encouraging visitors to stay off the peat mat. Monitor the impact of salt and other nutrient runoff into bogs, and work to minimize runoff. Remove phragmites where it has become established.

USNVC/NatureServe:

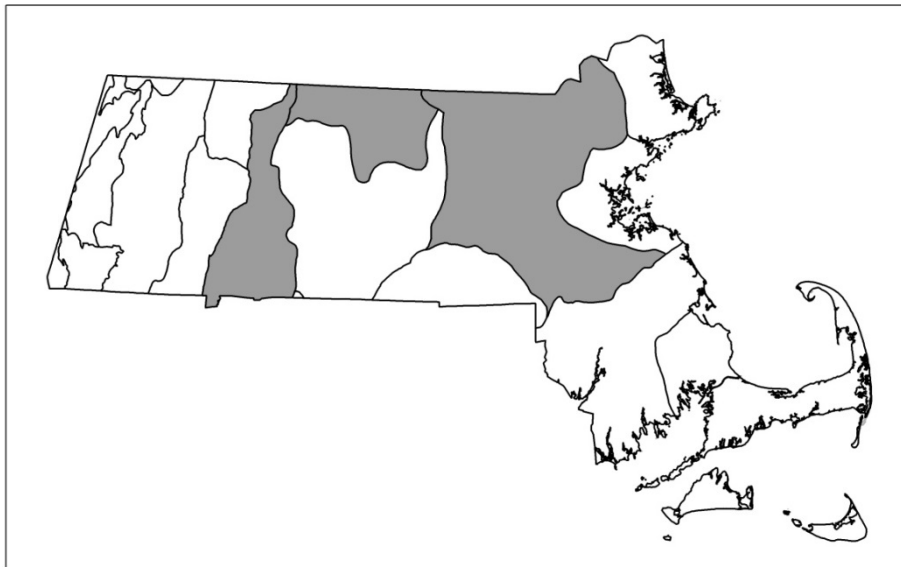
A3451 *Sphagnum rubellum* - *Rhynchospora alba* Sub-boreal Peat Lawn Alliance - *Sphagnum rubellum* - *Vaccinium oxycoccos* Nonvascular Vegetation [CEGL006135]; and in part A3450 *Chamaedaphne calyculata* Sub-boreal Dwarf-shrub Acidic Peatland Alliance - *Chamaedaphne calyculata* - (*Gaylussacia bigeloviana*) - *Decodon verticillatus*/*Woodwardia virginica* Dwarf-shrubland [CEGL006008]. Probably A3481 *Chamaedaphne calyculata* - *Kalmia polifolia*/*Carex oligosperma* Acidic Shrub Bog and Fen Alliance - *Chamaedaphne calyculata*/*Eriophorum virginicum*/*Sphagnum rubellum* Dwarf-shrubland [CEGL006513] and *Rhododendron canadense* - *Chamaedaphne calyculata* Dwarf-shrubland [CEGL006514].



Low-energy Riverbank Community

Community Code: CP2A0B2300

State Rank: S4



Concept: Open herbaceous/graminoid communities occurring on sandy or silty mineral soils of river and streambanks that do not experience severe flooding or ice scour.

Environmental Setting: Low-energy Riverbank Communities are on low-gradient sections of rivers of various sizes that flood but do not experience severe scouring; they often occur between higher gradient sections of the river where there are rapids and rocky shorelines. The linear, often narrow, community develops on gravelly bars and shorelines just above summer low-water levels but below spring high-water levels. The riverbanks are fine-grained material (sand, silt, and possibly clay) with the vegetation growing on mineral soil, rather than the peaty or mucky soil that characterizes marshes and wet meadows.

Vegetation Description: The structure of Low-energy Riverbank Communities is generally an open mixture of herbaceous and graminoid species with occasional scattered shrubs that may dominate locally and trees at the inland margin. The species composition is variable and diverse. Common graminoids are reed canary-grass (*Phalaris arundinacea*), cockspur-grass (*Echinochloa muricata*), fall panic-grass (*Panicum dichotomiflorum*), rice cut-grass (*Leersia oryzoides*), and Canada bluejoint (*Calamagrostis canadensis* var. *canadensis*). Broad-leaf herbs commonly include devil's pitchforks (*Bidens frondosa*), smartweeds (*Persicaria* and *Polygonum* spp.), orange jewelweed (*Impatiens capensis*), cardinal flower (*Lobelia cardinalis*), various goldenrods (*Solidago* spp.), and sensitive and royal ferns (*Onoclea sensibilis* and *Osmunda regalis*). Species typical of disturbed areas (such as cocklebur (*Xanthium strumarium* var. *canadense*)) including non-native purple loosestrife (*Lythrum salicaria*) and/or Japanese knotweed (*Fallopia japonica*) are common and may be abundant. Shrubs



occur in local patches with the most common species including speckled alder (*Alnus incana* ssp. *rugosa*), dogwoods (*Swida* spp.), black elderberry (*Sambucus nigra* ssp. *canadensis*), and highbush blueberry (*Vaccinium corymbosum*).

Differentiating Occurrences: Low-energy Riverbank Communities are on the slopes of riverbanks which are composed of a mix of relatively fine mineral materials (clay, silt, or sand) and lack both the cobble substrate of high-energy areas and the organic materials of marshes. Freshwater Mud Flat Communities have low, sparse, annual herbaceous vegetation on recently exposed muddy (mucky, silty mineral) sediments in ponds and streams. Mud flats at the base of banks may be included in a bank community if they are very small and an extension of the riverbank, and do not extend much into the stream channel. High-energy Riverbank Communities occur along the shores of fast-flowing, high-energy rivers with sparse plants growing in sediment caught between rock cobbles. Low-energy Riverbank communities have sparser vegetation than marshes and wet meadows. Shallow and Deep Emergent Marshes are dominated by perennial graminoids and are permanently saturated. Unlike Low-energy Riverbanks with a mineral substrate, marshes typically have a layer of well-decomposed organic muck at the surface overlying mineral soil. Wet Meadows have dense mixed herbaceous/graminoid vegetation growing on permanently saturated mucky sediments.

Associated Fauna: Few animals are restricted to these narrow, linear, riverside communities, but many wide-ranging riverine and upland animals include low-energy riverbanks as part of their habitats. Muskrats (*Ondatra zibethicus*), beavers (*Castor canadensis*), and river otters (*Lontra canadensis*) build burrows in banks. Turtles nest in flatter parts at the top of banks. Riverine dragonflies hunt over and rest in Low-energy Riverbank Communities.

Public Access: Millers River WMA, Athol/Phillipston; Bolton Flats WMA, Harvard/Lancaster/Bolton.

Threats: Invasion by non-native plant species is the greatest threat to the community.

Management Needs: Non-native plant species removal.

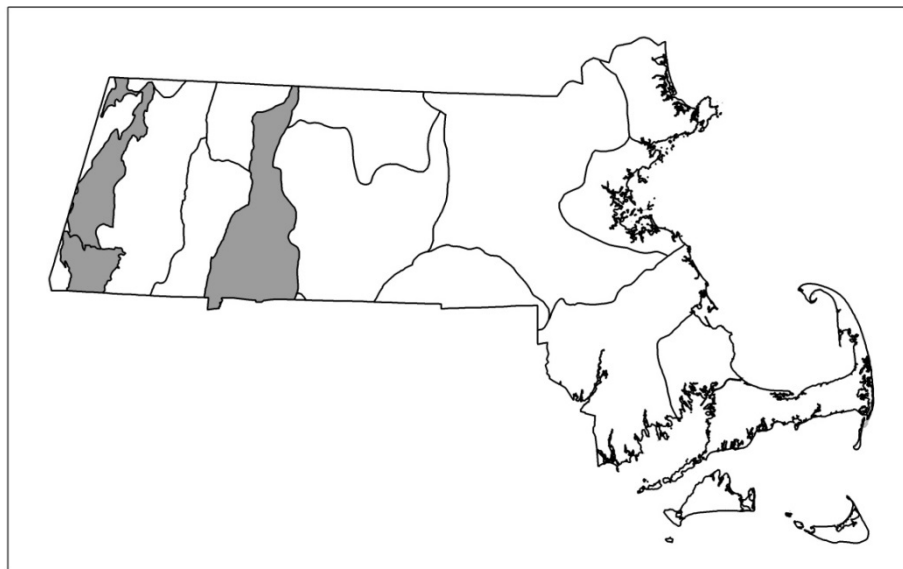
USNVC/NatureServe: Includes *Calamagrostis canadensis* *Phalaris arundinacea* Herbaceous Alliance [CEGL005174] and *Phalaris arundinacea* Eastern Herbaceous Vegetation [CEGL006335]. Clay Bank Sparse Vegetation NVC CEGL002584.



Major-river Floodplain Forest

Community Code: CP1A2B1000

State Rank: S2



Concept: Silver maple-dominated forest community of alluvial floodplains of the Connecticut, Deerfield and Housatonic Rivers.

Environmental Setting: Floodplain forests are deciduous forested wetland communities, which develop next to rivers and streams and receive annual (or semi-annual) overbank flooding and alluvial silt deposition. Three floodplain forest communities can be viewed as points on a continuum from most severely scoured and well-drained (major-river type) to least severely scoured and poorly drained (small-river type). Major-river Floodplain Forests occur along mainstem sections of large rivers (the Connecticut, Housatonic, and Deerfield Rivers in Massachusetts). Soils are predominantly sandy loams without soil mottles and without a surface organic layer. Flooding at these sites occurs annually and is usually severe. An island variant of Major-river Floodplain Forests (Type I in Kearsley, 1998) occurs on elevated sections of riverine islands and riverbanks of major rivers, where there are high levels of both natural and human disturbance.

Vegetation Description: All floodplain forest communities in Massachusetts have silver maple (*Acer saccharinum*) as the defining tree, but associated plant species vary depending on the intensity and duration of flooding and on geographic location. Major-river Floodplain Forests have silver maple (*Acer saccharinum*) strongly dominant in the overstory (>60% cover) mixed with lesser amounts of cottonwood (*Populus deltoides*). American elm (*Ulmus americana*) and/or slippery elm (*U. rubra*) occur in the subcanopy. Shrubs are generally lacking. The herbaceous layer is usually dominated by a 3-6 ft. (1-2 m) tall, dense cover of wood-nettles (*Laportea canadensis*). Ostrich fern (*Matteuccia struthiopteris*) is sometimes abundant. White



cut-grass (*Leersia virginica*) is consistently represented, but in low amounts (typically <5% cover). Other regular associates are common woodreed (*Cinna arundinacea*) and jack-in-the-pulpit (*Arisaema triphyllum*). An island variant of Major-river Floodplain Forests (Type I in Kearsley, 1998) has similar species, but silver maple is not dominant in the overstory and the herbaceous layer is typically strongly dominated by ostrich fern. The overstory is an even mix of silver maple, cottonwood, sycamore (*Platanus occidentalis*), and American ash (*Fraxinus americana*), with box elder (*Acer negundo*) and hackberry (*Celtis occidentalis*) common in the subcanopy on the Housatonic River. Species typical of disturbed areas, such as staghorn sumac (*Rhus typhina*) and the non-native bittersweet (*Celastrus orbiculatus*), are also common in this variant, as are the vines riverbank grape (*Vitis riparia*) and Virginia creeper (*Parthenocissus quinquefolia*).

Differentiating Occurrences: Floodplain forest communities occur within the zone of active flooding of rivers and streams on mineral soils that receive annual silt deposition. They differ in the size of river on which they occur and in the severity of flooding. Small-river, Transitional, and Major-river Floodplain Forests can be viewed as points on a continuum from least severely scoured and poorly drained (small-river type) to most severely scoured and well-drained (major-river type). Mixes of floodplain forest communities can occur as a riparian community complex at a single site. For example, a Major-river Floodplain Forest might occur on a level floodplain with small-river vegetation along tributaries entering the major-river floodplain, High-terrace Floodplain Forests on abandoned river terraces above the active floodplain, and Alluvial Red Maple Swamps in poorly drained, seasonally flooded depressions within the level floodplain, with associated High-energy Riverbanks on well-scoured, riverine gravel bars. Major-river Floodplain Forests occur along mainstem sections of large rivers (the Connecticut, Housatonic, and Deerfield Rivers in Massachusetts). Soils are predominantly sandy loams without soil mottles and without a surface organic layer. Flooding at these sites is usually severe. Transitional Floodplain Forests occur on third-order or smaller tributaries of the Connecticut River, on portions of the Housatonic River, and in depressions within Major-river Floodplain Forests of the Connecticut and Deerfield Rivers. Soils are intermediate in severity of flooding, soil texture, and drainage between Major-river and Small-river Floodplain Forests. Soils are either silt loams or very fine sandy loams, and soil mottling is generally present within 60 cm (2 ft.) of soil surface. A surface organic layer is typically absent. Small-river Floodplain Forests occur on third-order or smaller tributaries of the Connecticut and Nashua Rivers, on small rivers of eastern Massachusetts where banks are low and overbank flooding occurs (Ipswich, Assabet, Concord, Shawsheen, and Three Mile rivers), and on edges of riverine islands of the Merrimack River. Annual flooding occurs, but the water volume and degree of scour are much less than in Major-river Floodplain Forests. Soils are hydric silt loams and fine sandy loams with soil mottling within the top 60 cm (2 ft.) and sometimes with a surface organic layer. Major-river Floodplain Forests are the least likely type of floodplain forest to have shrubs, or even saplings of the canopy trees. The herbaceous layer of the major-river types is often essentially a monoculture of wood nettles, sometimes with dense ostrich fern. Other species are



scattered. Occurrences of High-terrace Floodplain Forests tend to be relatively small narrow forests on high alluvial terraces that flood only occasionally (not annually) and for a shorter duration than other types of floodplain forests. They are sometimes seen as a hybrid between floodplain and upland forests, and include upland species lacking in other types of floodplain forest. They have more litter accumulated than other floodplain forests. Alluvial Red Maple Swamps along low-gradient rivers flood annually and are slow to drain. Silver maple is often a codominant with red maple. They have dense shrub and diverse herbaceous layers. Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple.

Associated Fauna:

Floodplain forests are often part of the habitat of wide-ranging riverine and upland animals, providing sheltered riverside corridors for deer and migratory songbirds. Floodplain forests are insect-rich habitats that attract warblers, thrushes, and other songbirds. Raptors such as Bald Eagles use riverbank trees as nest and perch sites. In spring floods, Wood Ducks and Hooded Mergansers like the shady edges of floodplain forests and the interior meander scar pools. Eastern comma butterflies feed on elm, nettles, and hops, and the shady riverbanks are patrolled by several dragonfly species such as ocellated and fawn darners. Where vernal pools occur in floodplain forests, such as in meander scars or backwater sloughs, leopard, pickerel and green frogs, American toads, and mole salamanders can be found. Changes in water quality and quantity alter herbaceous, and eventually tree, species, changing habitat for birds and browsers such as deer and rabbits.

Public Access:

Fannie Stebbins Memorial Wildlife Refuge, Longmeadow; Rainbow Beach WMA, Northampton; Robinson State Park, Agawam; George L. Darey Housatonic Valley WMA, Pittsfield; Canoe Meadows Wildlife Sanctuary (Massachusetts Audubon Society), Pittsfield.

Threats:

Current threats include alteration of natural hydrology through damming, loss of vegetated buffer, disturbance by trail cutting and the subsequent invasion of non-native plant species. In a 1997 statewide floodplain forest community inventory, non-native plant species were observed at all floodplain forest sites surveyed, but they appeared to be localized to areas where the canopy was opened, the herbaceous layer was cleared, and the soil was disturbed. Non-native plant species were most abundant in the island variants of Major-river Floodplain Forests that are heavily used by campers and boaters for recreation. Japanese knotweed (*Fallopia japonica*) currently poses the greatest threat to Major-river Floodplain Forests because of its ability to spread rapidly and shade out all other herbaceous plants.

Management Needs:

The natural hydrologic regime that created these special communities and their natural closed-canopy forest structure must be maintained. It is extremely difficult and time-consuming to eradicate Japanese knotweed once it has established. The best way to avoid its spread is to prevent its establishment by avoiding all clearing and disturbance within floodplain forest areas, particularly on the sandier banks.



USNVC/NatureServe:

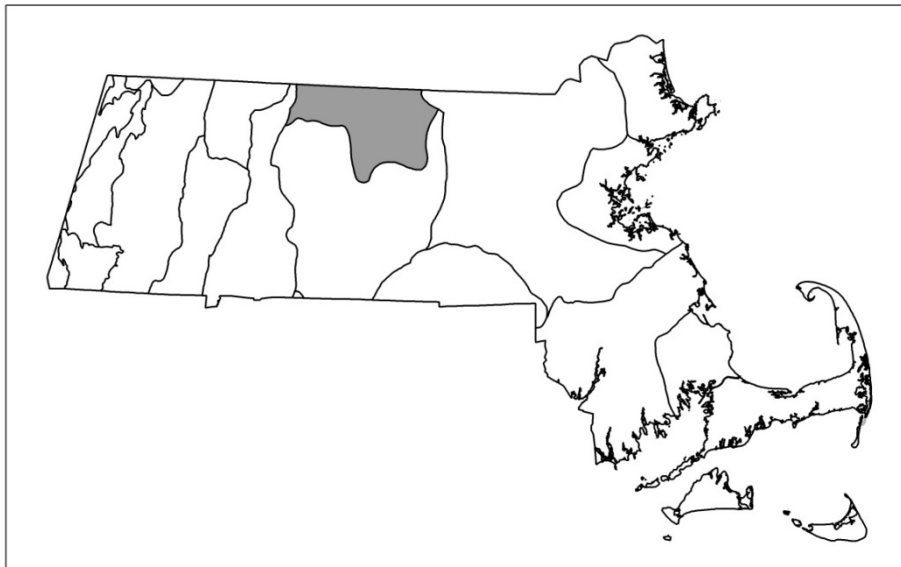
Acer saccharinum Temporarily Flooded Forest Alliance -- *Acer saccharinum*-*Populus deltoides*/*Matteuccia struthiopteris* Forest [CEGL006147].



Northern Atlantic White Cedar Swamp

Community Code: CP1B1A3000

State Rank: S1



Concept: A variant of spruce swamps in which Atlantic white cedar is an associate in the tree canopy.

Environmental Setting: Northern Atlantic White Cedar Swamps are restricted to basins at high elevations, over 1100 feet, the highest known elevation for Atlantic white cedar in the state. As with all Atlantic white cedar swamps, water-saturated peat overlies the mineral sediments, and standing water generally occurs for half of the growing season or longer. The water and soil are nutrient-poor, and particularly low in nitrogen and phosphorus. There is a high iron content in the soil; the iron (called "bog iron") was mined in the early days of manufacturing. Soil pH is acidic (3.1-5.5) and leaf litter decomposition is slow.

Vegetation Description: Atlantic white cedar swamps are defined as having >25% cover of Atlantic white cedar in the canopy; Atlantic white cedar is usually mixed with red maple (*Acer rubrum*). Most Atlantic white cedar swamp occurrences include highbush blueberry (*Vaccinium corymbosum*) and swamp azalea (*Rhododendron viscosum*). The ground layer is dominated by *Sphagnum* spp. mosses. Northern Atlantic White Cedar Swamps are dominated by northern conifers such as black and red spruce (*Picea mariana* and *P. rubens*) and balsam fir (*Abies balsamea*); Atlantic white cedar occurs as an associate. Shrubs and herbs also include species of cool northern areas, such as mountain holly (*Ilex mucronata*), creeping snowberry (*Gaultheria procumbens*), and bunchberry (*Chamaepericlymenum canadense*) (also found in the high-elevation variant of Inland Atlantic White Cedar Swamp). Labrador tea (*Rhododendron groenlandicum*) and rhodora (*Rhododendron canadense*) are



common in the single documented Northern Atlantic White Cedar Swamp occurrence.

Differentiating Occurrences: Although each of the Atlantic white cedar swamp community types has a characteristic vegetation structure and composition, as with all natural communities, transitions and mixes do occur. Northern Atlantic White Cedar Swamps are restricted to basins at high elevations with the single documented example at >1100 ft. Northern Atlantic White Cedar Swamps are codominated by northern conifers such as black and red spruce (*Picea mariana* and *P. rubens*) and balsam fir (*Abies balsamea*). Shrubs and herbs include typically northern species such as Labrador tea (*Rhododendron groenlandicum*) and rhodora (*Rhododendron canadense*), as well as creeping snowberry (*Gaultheria hispidula*) and bunchberry (*Chamaepericlymenum canadense*), that also are found in high-elevation variant Inland Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps typically occur at elevations <1000 ft. and lack the full set of northern species. Red Spruce Swamps may occur near Northern Atlantic White Cedar Swamps, but red spruce (*Picea rubens*) is dominant in the overstory and Atlantic white cedar is seldom present, and then <25% canopy cover. Atlantic White Cedar Bogs are relatively open peatland communities with tree canopy cover <25%. They may have scattered black spruce, but lack red spruce.

Associated Fauna: Atlantic white cedar swamps contribute variation to the habitats of wide-ranging wildlife species. Young Atlantic white cedar thickets provide excellent cover for deer, rabbits and birds. Atlantic white cedar foliage and twigs are preferred winter browse for white-tailed deer, while rabbits and mice can feed on cedar seedlings. Although no bird species appear to be restricted to Atlantic white cedar communities, dense conifer forests are important bird habitat. Swamps function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.

Public Access: Westminster State Forest, Westminster.

Threats: The two greatest threats to Atlantic white cedar swamps are land clearing for agricultural, commercial and residential development, and interference of normal hydrological functioning as a result of development. Atlantic white cedar has been cut extensively for posts and shingles for over three centuries. In an extensive statewide vegetation inventory funded by NHESP in 1990, no uncut stands were found, but several sites contained cedars that were 100-200 years old. Selective cutting is detrimental to the persistence of Atlantic white cedar swamps, because hardwoods, such as red maple, out-compete and replace Atlantic white cedar. Any alteration to the natural hydroperiod of Atlantic white cedar swamps threatens their persistence.

Management Needs: Due to the limited distribution of Atlantic white cedar swamps, it is recommended that no clearing or filling of these wetlands be allowed. Atlantic white cedar will regenerate best following catastrophic disturbance events such as hurricanes and fires. Data suggest that in the absence of disturbance, red maple and shrubs



increase in abundance at the expense of Atlantic white cedar. Fire suppression negatively threatens the long-term persistence of Atlantic white cedar swamps, and controlled burning practices may be an appropriate restoration tool in many areas. Controlled burning should be accompanied by small-patch clearcuts to be most effective. By clear-cutting small patches, generally 20 m x 20 m, and removing the slash and competing vegetation, pure, even-aged stands of Atlantic white cedar are able to regenerate. Atlantic white cedar swamps require a natural cycle of wet and dry periods for their survival and reproduction. Standing water for much of the year is unfavorable for both seed germination and seedling survival, and young seedlings are killed by both drowning and drought. It is recommended that any alterations in water levels be avoided; this includes development and road construction in uplands surrounding Atlantic white cedar swamps which can alter water levels. Where cedar wetlands are associated with river systems, it is important to maintain the normal hydrologic regime of the river.

USNVC/NatureServe:

Chamaecyparis thyoides Northern Peatland Alliance [A3400] -- *Chamaecyparis thyoides*-*Picea rubens*/*Gaylussacia baccata*/*Gaultheria hispida* forest [CEGL006363].



Red Maple – Black Ash – Bur Oak Swamp

Community Code: CP1B2B1000

State Rank: S2



Concept: Deciduous swamp forest occurring in areas with somewhat enriched circumneutral groundwater. The tree canopy is close to continuous.

Environmental Setting: Red Maple - Black Ash - Bur Oak Swamps are forested wetland communities on flat but hummocky terrain, characterized by a generally closed (but varying from continuous to scattered) canopy at 60 ft. or higher. The hummock - hollow topography supports a variety of species from herbaceous emergents in the hollows to shrubs and trees on the hummocks. The community occurs in western Massachusetts within the eastern edge of the range of bur oak, where somewhat nutrient-enriched circumneutral, but not calcareous, groundwater occurs. Soils are a mucky mix of mineral and organic, silt and sandy loams, with pH ranges generally 5.1 to 7.3. The sediments are saturated throughout the year; in the spring hollows are filled with water but by late summer many have dried to bare surfaces or leaf litter, supporting plants tolerant of the changing moisture regime.

Vegetation Description: The canopy is a variable mixture of deciduous and occasionally coniferous trees. Red maple (*Acer rubrum*), black ash (*Fraxinus nigra*), and bur oak (*Quercus macrocarpa*) are the most common. Swamp white oak and white oaks (*Q. bicolor* and *Q. alba*) are present and hybridize with bur oak. Associated tree species include green ash (*F. pennsylvanica*), slippery and American elms (*Ulmus rubra* and *U. americana*), sugar maple (*A. saccharum*), and yellow birch (*Betula alleghaniensis*). When present, eastern hemlock (*Tsuga canadensis*), tamarack (*Larix laricina*), and white pine (*Pinus strobus*) are generally scattered, but sometimes locally abundant. The subcanopy has a similar composition, often dominated by black ash. The shrub layer is generally patchy, with highbush blueberry (*Vaccinium corymbosum*),



winterberry (*Ilex verticillata*), hornbeam (*Carpinus caroliniana*), and black ash, with witch-hazel (*Hamamelis virginiana*) and spicebush (*Lindera benzoin*) near the edges. The herbaceous layer is variable and moderately diverse although dominated by tussock sedge (*Carex stricta*) and skunk cabbage (*Symplocarpus foetidus*). Other typical herbaceous layer species are common horsetail (*Equisetum arvense*), awned sedge (*Carex crinita*), sensitive fern (*Onoclea sensibilis*), cinnamon fern (*Osmunda cinnamomea*), royal fern (*Osmunda regalis*), foamflower (*Tiarella cordifolia*), goldthread (*Coptis trifolia*), marsh marigold (*Tiarella cordifolia*), and northern blue flag (*Iris versicolor*). Poison sumac (*Toxicodendron vernix*) is uncommon. Even in open areas, true calciphiles (calcium-loving) species are absent. Invasive species established in areas of past disturbances include the aggressive exotics Japanese barberry (*Berberis thunbergii*), glossy buckthorn (*Frangula alnus*), and phragmites (*Phragmites australis*).

Differentiating Occurrences: Red Maple - Black Ash - Bur Oak Swamps are similar in structure and species composition to Red Maple - Black Ash Swamps), but bur oak swamps occur in Berkshire County near marble/limestone bedrock and black ash swamps occur east of Berkshire County. Both are forested wetlands with fairly closed canopies, but only the bur oak swamps have bur oak or bur oak/swamp white oak hybrids. A detailed study would be needed to determine other differences or similarities between the two community types. Bur oak swamps are often geographically close to Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps (calcareous seepage swamps); however, bur oak swamps are more forest-like with taller trees and more closed canopies, with stands of bur oak or bur oak/swamp white oak hybrids more likely than in calcareous seepage swamps. The clearest differentiation may be that even in openings, bur oak swamps do not have the strong calciphiles found in calcareous seepage swamps. (Calciphiles include shrubby cinquefoil (*Dasiphora floribunda*), grass-of-Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), alder-leaf buckthorn (*Rhamnus alnifolia*), hemlock parsley (*Conioselinum chinense*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*).

Associated Fauna: Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.

Public Access: George L. Darey Housatonic Valley WMA, Lenox.

Threats: Logging, alteration of water levels, and invasive species are the primary threats. Beavers and windthrow are locally dominant processes that could lead to a shift to a shrubland if canopy dominants are not able to regenerate. Invasive species are established in areas of disturbances such as canopy opening and water level changes, including the aggressive exotics Japanese barberry (*Berberis thunbergii*), glossy buckthorn (*Frangula alnus*) and phragmites (*Phragmites australis*).

Management Needs: Removal/control of non-native plant species.



USNVC/NatureServe:

Fraxinus nigra - *Acer rubrum* Saturated Forest Alliance: CEG006502 *Acer rubrum* - *Fraxinus nigra* - (*Tsuga canadensis*)/*Tiarella cordifolia* Forest. Related to *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance CEG006630: *Acer (rubrum, saccharinum)* - *Fraxinus pennsylvanica*/*Ilex verticillata*/*Osmunda regalis*/Forest and Midwestern CEG002098- *Quercus macrocarpa* - *Quercus bicolor* - *Carya laciniosa*/*Leersia* spp.- *Cinna* spp. Forest.



Red Maple – Black Ash – Tamarack Calcareous Seepage Swamp

Community Code: CP1B2B0000

State Rank: S2



Concept: Mixed deciduous-coniferous forested swamps with a sparse canopy occurring in areas where there is calcareous groundwater seepage. The species-rich herbaceous layer is characterized by calcium-loving species. Calcareous seepage swamps can also be called forested fens.

Environmental Setting: Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps are wetland forests characterized by fairly short and sparse deciduous and coniferous trees and a diverse mix of shrub and herbaceous species. There are relatively high pH levels and high availability of calcium from surrounding limestone bedrock and soils. Distinctive characteristics include the presence of trees and high numbers of calcium-loving species. Otherwise, they grade into other types of wetlands and calcareous communities. These swamps generally occur in basins, but may have streams flowing through or adjacent to them. Soils usually have up to 12 inches of mucky organic material over mineral layers. Generally, the surface has a hummocky topography from tree tip-up mounds and mosses growing over shrub stems. The canopy may be open or somewhat closed with openings, so that light availability to the surface is variable across an occurrence.

Vegetation Description: A variable mixture of deciduous and coniferous trees forms the sparse canopy, but black ash (*Fraxinus nigra*), tamarack (*Larix laricina*), and red maple (*Acer rubrum*) are most common. Associated tree species may include yellow birch (*Betula alleghaniensis*), American elm (*Ulmus americana*), white pine (*Pinus strobus*), and eastern hemlock (*Tsuga canadensis*), depending on the site. At elevations above ~1000 ft., red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and Canada yew (*Taxus canadensis*) can also occur. Ironwood (*Carpinus caroliniana*) is characteristic



of the subcanopy. The shrub layer can be dense and diverse. Characteristic species are poison sumac (*Toxicodendron vernix*) and alder-leaf buckthorn (*Rhamnus alnifolia*), mixed with speckled alder (*Alnus rugosa*), gray dogwood (*Swida racemosa*), winterberry (*Ilex verticillata*), spicebush (*Lindera benzoin*), meadowsweet (*Spiraea alba* var. *latifolia*), and highbush blueberry (*Vaccinium corymbosum*). Shrubby cinquefoil (*Dasiphora floribunda*) often occurs in open areas. The herbaceous layer is diverse with many calciphilic (calcium-loving) species mixed in with other common wetland plants. Characteristic calciphiles are delicate sedge (*Carex leptalea*), brome-like sedge (*Carex bromoides*), long-stalked sedge (*Carex pedunculata*), rough-leaved goldenrod (*Solidago patula*), and golden ragwort (*Packera aurea*). Widespread species that usually occur in the herbaceous layer are skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), jewelweed (*Impatiens capensis*), naked mitrewort (*Mitella nuda*), and additional sedges such as lakeside sedge (*Carex lacustris*). At one site, more than 80 species were counted in the herbaceous layer. This community type also has a concentration of state-protected rare plant species.

Differentiating Occurrences: This calcareous seepage swamp is more of a sparse wet woodland than related swamps, but it is shrubbier with more scattered low trees than most calcareous fens. All calcareous wetlands include shrubby cinquefoil (*Dasiphora floribunda*). Most also have other calciphiles (calcium-loving plants) such as grass-of-Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), hemlock parsley (*Conioselinum chinense*), alder-leaf buckthorn (*Rhamnus alnifolia*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*). Within a given site, calcareous fen communities grade from one to another as conditions change. Red Maple - Black Ash -Tamarack Calcareous Seepage Swamps are dominated by sparse trees and tall shrubs. Small openings share many of the species and conditions of Calcareous Sloping Fens or Calcareous Seepage Marshes, either or both of which may occur in mosaics in the same wetland. Calcareous Seepage Marshes lack the tree cover of the calcareous seepage swamps. They share species with both Shallow and Deep Emergent Marshes, but contain more calciphiles. Calcareous Sloping Fens may have tall shrubs and short trees in scattered patches. A diverse herbaceous layer dominates the vegetation. They are on shallow to moderate slopes and peat is mostly restricted to sedge hummocks. Calcareous Basin Fens have deep (> 2.0 meters (6.5 ft.)) peat in basins. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. Red Maple - Black Ash - Bur Oak Swamps and Red Maple - Black Ash Swamps have more closed canopies and do not have the strong calciphiles found in the Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps. Stands of bur oak or bur oak/swamp white oak hybrids are more likely in Red Maple - Black Ash - Bur Oak Swamps than calcareous seepage swamps. Rich Conifer Swamps are high-elevation (>1000 ft.) forested wetlands that often include some calciphiles and other species found in calcareous seepage swamps but contain significant amounts of red spruce (*Picea rubens*) and/or balsam fir (*Abies balsamea*).



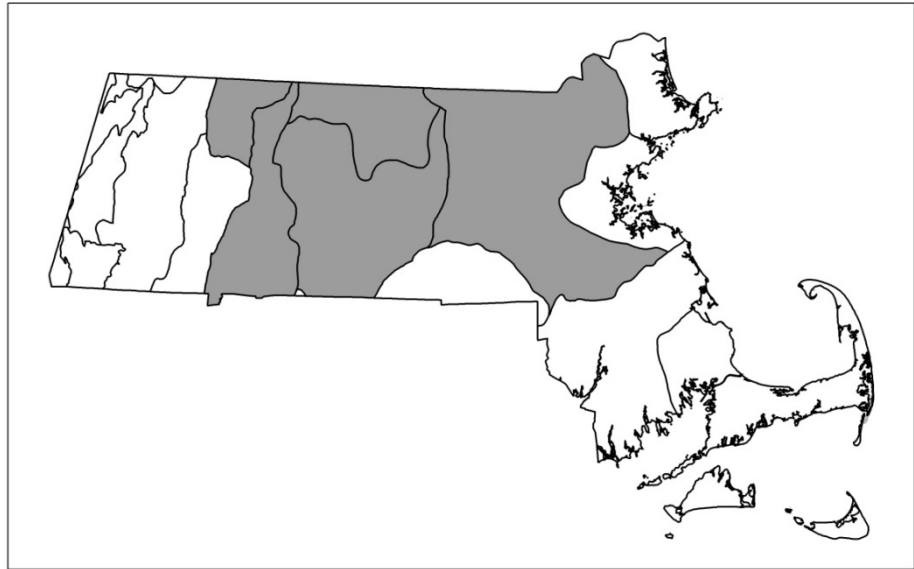
Associated Fauna:	Calcareous seepage swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
Public Access:	Due to the sensitivity of calcareous wetlands to damage from visitation, most land owners prefer not to publicize the locations.
Threats:	Logging, nutrient inputs such as road salts, damming by beavers, and alterations of water levels threaten this community. Water level disturbance can lead to the invasion by non-native plants, including the aggressive exotics purple loosestrife (<i>Lythrum salicaria</i>), Tatarian honeysuckle (<i>Lonicera tatarica</i>), and Morrow's honeysuckle (<i>Lonicera morrowii</i>). Phragmites (<i>Phragmites australis</i>) is also an aggressive exotic in disturbed forested fens.
Management Needs:	Removal/control of non-native plant species, especially phragmites.
USNVC/NatureServe:	<i>Fraxinus nigra</i> - <i>Acer rubrum</i> Saturated Forest Alliance -- <i>Fraxinus nigra</i> - <i>Acer rubrum</i> -(<i>Larix laricina</i>)/ <i>Rhamnus alnifolia</i> Forest [CEGL006009].



Red Maple – Black Ash Swamp

Community Code: CP1A2A2000

State Rank: S2



Concept: A rich variant of Red Maple Swamps in which black ash (*Fraxinus nigra*) is abundant in the canopy. Red Maple - Black Ash Swamps are associated with circumneutral groundwater seepage.

Environmental Setting: Red Maple - Black Ash Swamps are deciduous wetland forests characterized by a high diversity of tree species and dominated by red maple and black ash, with a relatively diverse herbaceous layer and many tall shrubs in the understory. They typically occur in areas with circumneutral groundwater seepage (the pH of black ash swamps in Essex County ranges between 7.0 and 7.4) and are relatively wet with seasonal inundation in depressions at or near the headwaters of streams, especially in the northern part of the state. Occasionally, they occur on sloping edges of river floodplains, adjacent to upland slopes where seepage input occurs or as small seepy pockets within larger Red Maple Swamp matrices. The surface topography is hummock and hollow, with fluctuating surface water levels in between the hummocks.

Vegetation Description: Red maple (*Acer rubrum*) and black ash (*Fraxinus nigra*) are prominent in the canopy and sub-canopy. Black ash trees do not usually grow very large in these wet environments and can be most abundant in the subcanopy. Common associates in the canopy include yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), and hemlock (*Tsuga canadensis*), all of which vary in abundance from site to site. The subcanopy is characterized by black ash and often American elm (*Ulmus americana*), with saplings of canopy tree species. The shrub layer is variable in cover, although relatively high in species diversity. The most characteristic shrub encountered in these swamps is winterberry (*Ilex verticillata*). Other common



associates include highbush blueberry (*Vaccinium corymbosum*), poison sumac (*Toxicodendron vernix*), speckled alder (*Alnus incana* ssp. *rugosa*), and spicebush (*Lindera benzoin*). Occasional shrubs include witch-hazel (*Hamamelis virginiana*), silky dogwood (*Swida amomum*), northern arrow-wood (*Viburnum dentatum* var. *lucidum*), and mountain holly (*Ilex mucronata*). In addition, saplings of most of the tree canopy species are also present in the shrub layer. The herbaceous layer is lush and diverse. Cinnamon fern (*Osmundastrum cinnamomeum*) and skunk cabbage (*Symplocarpus foetidus*) are usually the most abundant herbaceous species, with a high coverage of other ferns, including royal fern (*Osmunda regalis* var. *spectabilis*), marsh-fern (*Thelypteris palustris*), and sensitive fern (*Onoclea sensibilis*). Herbaceous associates include seep indicators like swamp saxifrage (*Micranthes pennsylvanica*), golden ragwort (*Packera aurea*), foamflower (*Tiarella cordifolia*), and golden saxifrage (*Chrysosplenium americanum*), as well as widespread forest wetland species such as jewelweed (*Impatiens capensis*), jack-in-the-pulpit (*Arisaema triphyllum*), water avens (*Geum rivale*), goldthread (*Coptis trifolia*), tussock sedge (*Carex stricta*), and fowl meadow-grass (*Glyceria striata*). Mosses (predominantly *Sphagnum* spp.), can be dense on the hummocks, although there is little buildup of peat.

Differentiating Occurrences: Red Maple - Black Ash Swamps (black ash swamps) are an enriched variant of Red Maple Swamps that are very similar in structure and general species composition. However, to be a black ash swamp, black ash must be of sufficient abundance to be close to codominant in the canopy/subcanopy in at least parts of the swamp; otherwise, the site would be considered to be within the variation of the broadly defined Red Maple Swamp which may include scattered black ash trees. Black ash swamps generally include more abundant indicators of enriched seepage than do Red Maple Swamps. Red Maple - Black Ash - Bur Oak Swamps (bur oak swamps) are similar in structure and species composition to Red Maple - Black Ash Swamps (black ash swamps), but bur oak swamps occur in Berkshire County near marble/limestone bedrock and black ash swamps occur east of Berkshire County. Both are forested wetlands with fairly closed canopies; but only the bur oak swamps have bur oak (*Quercus macrocarpa*) or bur oak/swamp white oak (*Q. bicolor*) hybrids. They also have more ironwood (*Carpinus caroliniana*) in the tall shrub layer. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps (calcareous seepage swamps) have sparser canopies than black ash swamps. The clearest difference may be that even in openings, black ash swamps do not have the strong calciphiles found in calcareous seepage swamps. Calciphiles include shrubby cinquefoil (*Dasiphora floribunda*), grass-of-Parnassus (*Parnassia glauca*), Kalm's lobelia (*Lobelia kalmii*), alder-leaf buckthorn (*Rhamnus alnifolia*), hemlock parsley (*Conioselinum chinense*), autumn and hoary willows (*Salix serissima* and *S. candida*), and slender cotton-grass (*Eriophorum gracile*). Rich Conifer Swamps also have closed canopies but with high proportions of eastern hemlock (*Tsuga canadensis*), red spruce (*Picea rubens*), or balsam fir (*Abies balsamea*) as important canopy species, along with variable amounts of hardwoods and white pine. Black ash is an occasional species rather than a co-dominant.



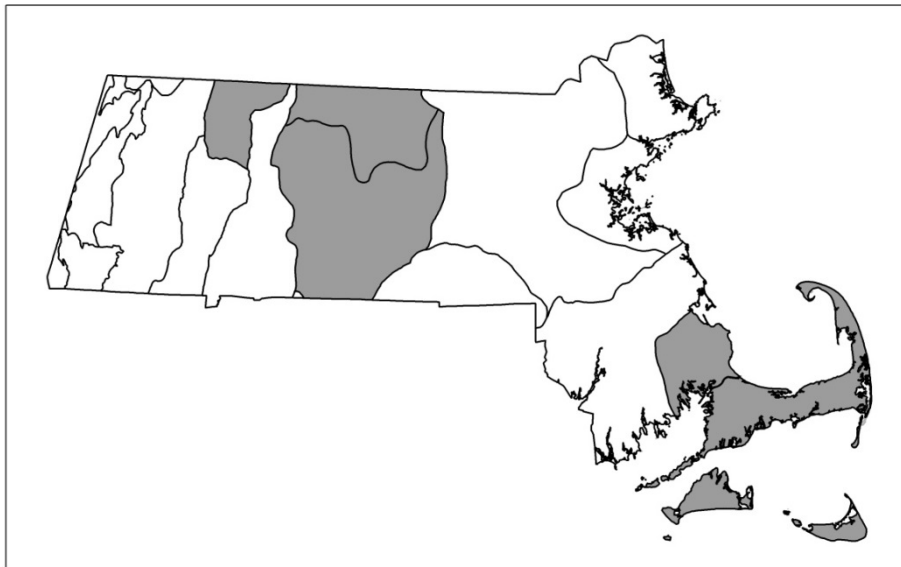
Associated Fauna:	Red Maple - Black Ash Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
Public Access:	Oxbow National Wildlife Refuge, Harvard; Tully Lake Reservation (US Army Corps of Engineers), Royalston; Satan's Kingdom WMA, Northfield; Mt. Holyoke Range State Park, South Hadley.
Threats:	Known threats include alteration of natural seepage and logging. More information is needed to determine the greatest threats to black ash swamps.
Management Needs:	More information is needed to assess the management needs of black ash swamps.
USNVC/NatureServe:	<i>Fraxinus nigra</i> - <i>Acer rubrum</i> Saturated Forest Alliance: <i>Acer rubrum</i> - <i>Fraxinus nigra</i> - (<i>Tsuga canadensis</i>)/ <i>Tiarella cordifolia</i> Forest (CEGL006502); Related to: <i>Acer rubrum</i> - <i>Fraxinus pennsylvanica</i> Seasonally Flooded Forest Alliance: <i>Fraxinus nigra</i> - <i>Acer rubrum</i> / <i>Nemopanthus mucronatus</i> - <i>Vaccinium corymbosum</i> Forest (CEGL006220).



Red Maple – Black Gum Swamp

Community Code: CP1B2A0000

State Rank: S2



Concept: Forested acidic basin swamps with accumulations of peat. Black gum is dominant or codominant with red maple in the canopy.

Environmental Setting: Red Maple - Black Gum Swamps (black gum swamps) are small-patch deciduous swamp forests characterized by abundant black gum (*Nyssa sylvatica*) in the canopy. Some black gum swamps contain large, very old (300 to > 500 years) black gum trees, left behind during tree harvests due to lack of interest in the wood by settlers and subsequent loggers. Black gum swamps in Massachusetts have relatively small watersheds and limited drainage with a small intermittent outlet channel, but usually have no defined inlet and are usually isolated from perennial streams. Most reported occurrences are in depressions at about 1000 ft. elevation, perched on hillside benches or concavities in glacial till soils. The acidic, nutrient-poor peat or muck hummocks and hollows are generally saturated and/or seasonally flooded.

Vegetation Description: Red Maple - Black Gum Swamps have pronounced hummock-hollow topography, with woody vegetation confined to the hummocks. The canopy is open, often in the 25-50% cover range. Black gum (*Nyssa sylvatica*) is abundant in the canopy, often codominant with red maple (*Acer rubrum*). Eastern hemlock (*Tsuga canadensis*) is often abundant. Associates with lower abundance include yellow birch (*Betula alleghaniensis*), white pine (*Pinus strobus*), red spruce (*Picea rubens*), and black ash (*Fraxinus nigra*). The shrub layer is often well-developed but is variable in cover; typical species include highbush blueberry (*Vaccinium corymbosum*), common and smooth winterberry (*Ilex verticillata* and *I. laevigata*), common mountain-holly (*I. mucronata*), mountain laurel (*Kalmia latifolia*), and wild raisin (*Viburnum nudum*



var. *cassinoides*). Cinnamon fern (*Osmundastrum cinnamomeum*) is usually the most abundant herbaceous species present, growing primarily on the mossy hummocks. Although the herbaceous component is generally not diverse, other species include royal fern (*Osmunda regalis* var. *spectabilis*), marsh-fern (*Thelypteris palustris*), Massachusetts fern (*Thelypteris simulata*), beggar-ticks (*Bidens frondosa*), goldthread (*Coptis trifolia*), northern water-horehound (*Lycopus uniflorus*), swamp-dewberry (*Rubus hispidus*), and marsh St. John's-wort (*Triadenum virginicum*). Wet hollows are typically lined with sedges including silvery bog-sedge (*Carex canescens*), bladder-sedge (*C. intumescens*), tussock-sedge (*C. stricta*), and three-seeded bog sedge (*C. trisperma*).

Differentiating Occurrences: Red Maple-Black Gum Swamps are generally in small, topographically constrained basins, surrounded by upland forests, as opposed to being part of a larger wetland. Besides being dominant or codominant in defined Red Maple - Black Gum Swamp communities, black gum occurs in a variety of other settings, including seepage swamps and along fringes of ponds or shorelines. Black gum needs to be dominant or codominant in large areas of the swamp for the occurrence to be considered a Red Maple - Black Gum Swamp. Red Maple Swamps: Black gum needs to be dominant or codominant in the canopy in large areas of the swamp for the community to be considered separate from a Red Maple Swamp. Most Red Maple Swamps have a more diverse herbaceous layer and many are in larger basins. However, the species overlap is great and it is the presence of many black gums in the canopy that provides the distinctive difference to black gum swamps. Another forested swamp in Massachusetts that contains black gum is the Black Gum-Pin Oak-Swamp White Oak Perched Swamp known only from the Connecticut River Valley in areas underlain by clays in sediments of glacial Lake Hitchcock. The presence of pin oak and swamp white oak in the canopy, in addition to the topographic setting distinguish the type. This Perched swamp is found at low elevations and often nested within larger wetland systems. Other related communities include Red Maple- Black Ash Swamps and Rich Conifer Swamps. These wetland forests have many of the same species present in the herb, shrub, or canopy layers, but black gum is only a minor component.

Associated Fauna: Red Maple - Black Gum Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.

Public Access: Oakham WMA, Oakham; Satan's Kingdom WMA, Northfield; Beebe Woods Conservation Area, Falmouth.

Threats: Hydrologic alterations threaten black gum swamps. Selective logging of trees other than black gum may have allowed the relative abundance of black gum to increase. More information is needed.

Management Needs: More information is needed to assess the management needs for black gum swamps.



USNVC/NatureServe:

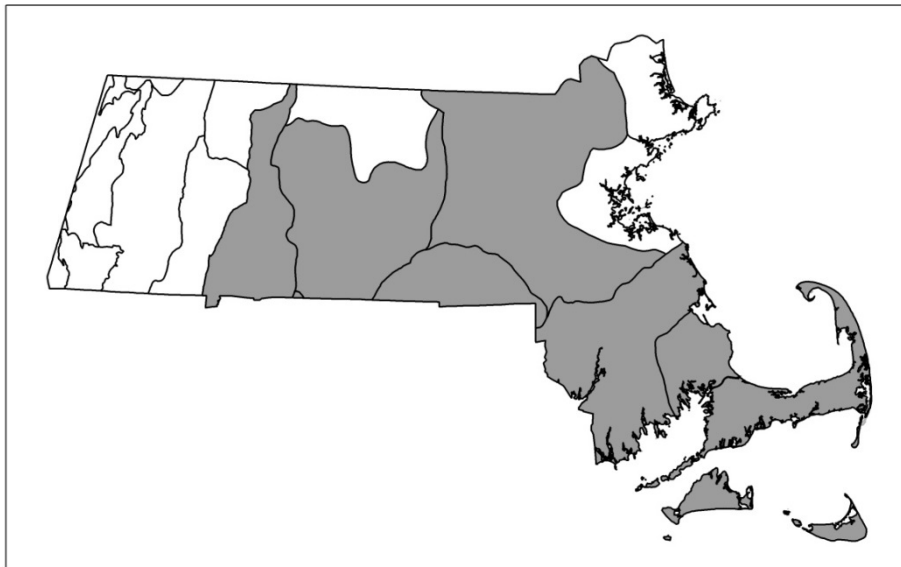
Acer rubrum - *Nyssa sylvatica* Saturated Forest Alliance -- *Acer rubrum*-*Nyssa sylvatica*-*Betula alleghaniensis*/*Sphagnum* spp. Forest [CEGL006014] and *Acer rubrum* - *Nyssa sylvatica*/*Rhododendron viscosum* - *Clethra alnifolia* Forest [CEGL006156].



Red Maple Swamp

Community Code: CP1A2A1000

State Rank: S5



Concept: Acidic forested swamps with red maple dominant in the overstory. Red Maple Swamps are the most common forested wetlands in Massachusetts.

Environmental Setting: Red Maple Swamps occur in many different physical settings. Golet et al. (1993) describe three basic types: hillside seeps and upland drainage ways fed primarily by groundwater seepage and overland flow; seasonally flooded basin swamps in undrained basins in till or stratified drift (or low-lying areas in outwash as on Cape Cod); and alluvial swamps on low-lying floodplains, oxbows, or river terraces. The last category is classified separately in Massachusetts; see the description for Alluvial Red Maple Swamp. Depending on the physical setting, Red Maple Swamps receive water through surface runoff, groundwater inputs, or stream and lake overflow. The hydrogeologic setting is the primary determinant of water regime and the plant community structure and composition. pH ranges from less than 4 to 7. Soils have shallow to thick organic layers overlying mineral sands/silts.

Vegetation Description: Red maple (*Acer rubrum*) is usually strongly dominant in the overstory, and often provides more than 90% of the canopy cover. A variable mixture of tree species co-occurs with red maple, including yellow birch (*Betula alleghaniensis*), black gum (*Nyssa sylvatica*), white ash (*Fraxinus americana*), white pine (*Pinus strobus*), American elm (*Ulmus americana*), hemlock (*Tsuga canadensis*), pin oak (*Quercus palustris*), and swamp white oak (*Quercus bicolor*). Atlantic white cedar (*Chamaecyparis thyoides*) is a common associate in coastal areas and locally at sites in central Massachusetts and the lower Connecticut Valley. When Atlantic white cedar is dominant in the overstory, the community is classified as an Atlantic white cedar swamp. The shrub layer of Red Maple Swamps is often dense and



well-developed, generally with >50% cover, but it can be variable. In eastern Massachusetts, sweet pepper-bush (*Clethra alnifolia*) and swamp azalea (*Rhododendron viscosum*) are the dominant shrubs, often dense and bound together by greenbriers (mainly *Smilax rotundifolia*). Other common shrubs are highbush blueberry (*Vaccinium corymbosum*) and common winterberry (*Ilex verticillata*), which are often dominant, along with spicebush (*Lindera benzoin*). In richer areas, northern arrow-wood (*Viburnum dentatum* var. *lucidum*), speckled alder (*Alnus incana* ssp. *rugosa*), nannyberry (*Viburnum lentago*), and poison sumac (*Toxicodendron vernix*) also occur. The herbaceous layer is highly variable, but ferns are usually abundant. Cinnamon fern (*Osmundastrum cinnamomeum*) is common; other ferns include sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), marsh fern (*Thelypteris palustris*), and spinulose wood fern (*Dryopteris carthusiana*). Skunk cabbage (*Symplocarpus foetidus*) is one of the most common herbaceous species. Graminoids are common, mixed with a variety of herbaceous species. Variants of Red Maple Swamps associated with groundwater seepage usually have a richer flora than depressional occurrences, with multiple species mixed in the canopy and an even more diverse herbaceous layer.

Differentiating Occurrences: Red Maple Swamp is a broadly defined red maple-dominated community type. Several fairly distinctive types have been defined separately. Alluvial Red Maple Swamps occur along low-gradient rivers and receive river flood waters. Silver maple is often a codominant with red maple. Alluvial Hardwood Flats are along small, flashy streams, usually have black cherry and white pine abundantly in the canopy, and have ironwood and alternate-leaved dogwood mixed with other shrub species. Red Maple - Black Ash Swamps are an enriched variant of Red Maple Swamps, with black ash close to codominant in the canopy/subcanopy in at least parts of the swamp. Red Maple - Black Ash - Bur Oak Swamps occur in Berkshire County and have bur oak or bur oak/swamp white oak hybrid trees. Red Maple - Black Gum Swamps are generally in small, topographically constrained basins surrounded by upland forests. Black gum needs to be abundant in large areas of the swamp. Black Gum - Pin Oak - Swamp White Oak Perched Swamps occur in the Connecticut River Valley on glacial Lake Hitchcock lakebed sediments. The presence of fairly high proportions of black gum, pin oak, and swamp white oak in the canopy, in addition to the topographic setting, distinguish the type. When Atlantic white cedar is dominant in the overstory, the community is classified as an Atlantic white cedar swamp.

Associated Fauna: Red Maple Swamps contribute variation to the habitats of many wide-ranging wildlife species. Songbirds of swamp forest are similar to the birds of structurally similar upland forests, but the dense shrub layers provide excellent nesting locations for birds of thickets. The amount of escape cover and water availability makes swamps important habitat for many species of small mammals. Ground-dwelling species, such as reptiles and amphibians, are affected by the presence of wet or moist soils in swamps, and tend to use them for breeding and feeding. Parts of Red Maple Swamps that have two or three months of ponding and



lack fish can function as vernal pools; these sections provide important amphibian breeding habitat.

Public Access:

Red Maple Swamps literally occur state-wide. Because they are so widespread and abundant, NHESP does not usually keep track of occurrences. Examples on public lands from the NHESP database are in the Quaboag WMA, West Brookfield, and Haskell Swamp WMA, Rochester.

Threats:

Conversion to agriculture; filling for development and highway construction; upland development adjacent to swamps impacting normal hydrology and geochemistry.

Management Needs:

Control of glossy buckthorn (*Frangula alnus*).

USNVC/NatureServe:

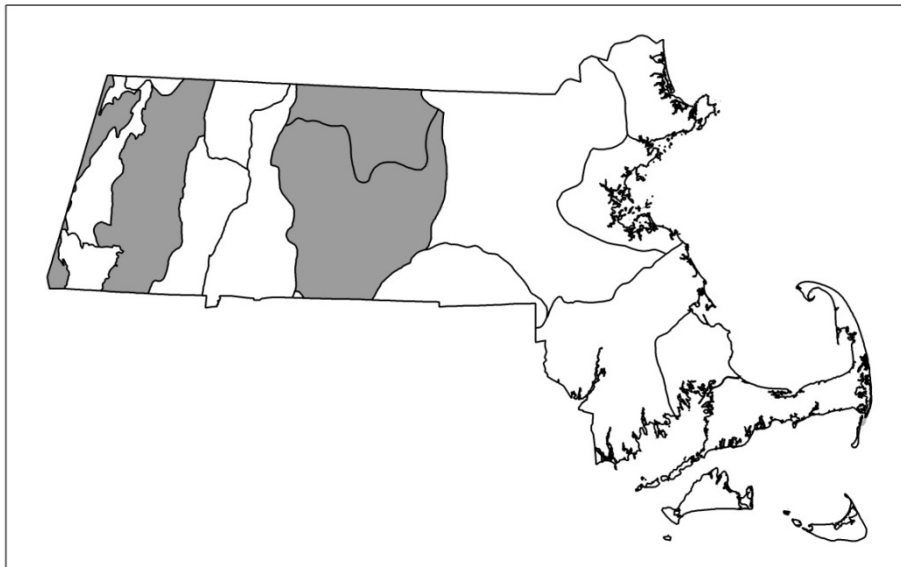
Acer rubrum/*Nemopanthus mucronatus* - *Vaccinium corymbosum* Forest (CEGL006220); *Acer rubrum*/*Carex stricta* - *Onoclea sensibilis* Woodland (CEGL006119); *Acer rubrum*/*Carex lacustris* Woodland (CEGL006105).



Red Spruce Swamp

Community Code: CP1A11A000

State Rank: S3



Concept: Forested wetlands, primarily of high elevations in western and north-central Massachusetts, dominated by red spruce.

Environmental Setting: Red Spruce Swamps are tall (>20 m) forested coniferous wetlands, typically found at higher elevations in the central and western parts of the state. They tend to occur in poorly drained basins with no obvious inlets and small intermittent outlets that may form stream headwaters. Deep (often >2m) organic sediments (peat or muck) in these swamps create acidic and nutrient-poor conditions.

Vegetation Description: The tree canopy in Red Spruce Swamps is typically closed and dominated by red spruce (*Picea rubens*); associates with variable but much lower abundance include white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), and yellow birch (*Betula alleghaniensis*). Black spruce (*Picea mariana*) may be present in low numbers. The subcanopy is usually low in percent cover and may be comprised of one or more of the canopy species. The shrub component is often fairly sparse and grows primarily on the tops and sides of the hummocks. A diagnostic shrub of these swamps is mountain holly (*Ilex mucronata*). Associated shrubs may include highbush blueberry (*Vaccinium corymbosum*), wild raisin (*Viburnum nudum* var. *cassinoides*), winterberry (*Ilex verticillata*), and occasionally swamp azalea (*Rhododendron viscosum*) or maleberry (*Lyonia ligustrina*). The herb layer may be prominent and dominated by cinnamon fern (*Osmundastrum cinnamomeum*) with bluebead-lily (*Clintonia borealis*), creeping snowberry (*Gaultheria hispidula*), Massachusetts fern (*Thelypteris simulata*), goldthread (*Coptis trifolia*), bunchberry (*Chamaepericlymenum canadense*), and small amounts of three-seeded bog sedge



(*Carex trisperma*). On the drier hummocks, starflower (*Lysimachia borealis*) and wild sarsaparilla (*Aralia nudicaulis*) may occur in small amounts. The ground is often a carpet dominated by sphagnum moss and the liverwort *Bazzania trilobata*.

Differentiating Occurrences: Red Spruce Swamps have tall, large-diameter trees, dominated by red spruce, generally with an open understory. Creeping snowberry (*Gaultheria hispidula*) and twinflower (*Linnaea borealis* ssp. *americana*) are good indicators of Red Spruce Swamps but do not occur in all examples. Rich Conifer Swamps are characterized by a canopy of mixed red spruce and hemlock, with balsam fir and deciduous trees including black ash (*Fraxinus nigra*), and species such as spicebush (*Lindera benzoin*) that indicate less acidic conditions, and pockets of moss rather than sphagnum lawns. Hemlock Swamps are dominated by eastern hemlock. Spruce - Tamarack Bogs have a dense tree canopy dominated by generally short (<40' tall) black spruce (*P. mariana*) and tamarack (*Larix laricina*), with bog-indicator species such as Labrador tea (*Rhododendron groenlandicum*) and bog laurel (*Kalmia polifolia*) in the often dense shrub layer.

Associated Fauna: Red Spruce Swamps are part of the habitat of large mobile animals. Conifer swamps tend to have dense shade and are relatively cool in the summer, making them preferred areas for animals that get hot, such as moose (*Alces alces*). Red Spruce Swamps can function as vernal pool habitat for amphibian breeding if water remains standing for 2-3 months and they lack fish. Also expected would be northern bird species that use conifer forests such as the declining Rusty Blackbird (*Euphagus carolinus*).

Public Access: Greylock State Reservation, Williamstown; Chalet WMA, Dalton; October Mountain State Forest, Washington; Cookson State Forest, New Marlborough; Warwick State Forest, Warwick; Tully Lake Reservation (US Army Corps of Engineers) and Birch Hill WMA, Royalston; Phillipston WMA, Phillipston; Ashburnham State Forest, Ashburnham.

Threats: Climate change; altered hydrology.

Management Needs: Timber harvesting should be prohibited at some sites to allow old-growth characteristics to develop.

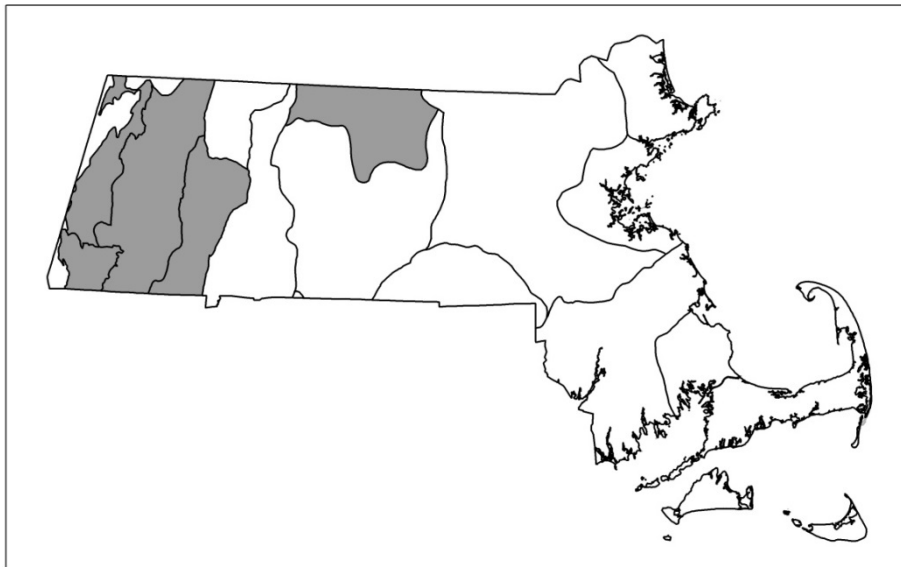
USNVC/NatureServe: *Picea rubens* - *Abies balsamea* Saturated Forest Alliance -- *Picea rubens*-*Abies balsamea*/*Gaultheria hispidula*/*Sphagnum* spp. [CEGL006312]; *Picea rubens* - *Acer rubrum*/*Nemopanthus mucronatus* Forest [CEGL006198].



Rich Conifer Swamp

Community Code: CP1A130000

State Rank: S3



Concept: Species-rich conifer swamps with eastern hemlock, balsam fir, or red spruce as important canopy species, along with variable amounts of hardwoods and white pine.

Environmental Setting: The canopies of Rich Conifer Swamps are dominated by mixed conifers with a high proportion of deciduous trees. Mineral-enriched water flows or seeps into the community and supports a high diversity of species in all strata. The surface is hummocky with areas of moss on the hummocks and bare soil or water in the hollows. Most plants grow on hummocks above deep pockets of muck. The substrate is saturated for much of the year.

Vegetation Description: The vegetation of Rich Conifer Swamps is variable. The canopy is dominated by conifers (eastern hemlock (*Tsuga canadensis*), balsam fir (*Abies balsamea*), or red spruce (*Picea rubens*), alone or together) mixed with red maple (*Acer rubrum*), yellow birch (*Betula alleghaniensis*), American elm (*Ulmus americana*), and black ash (*Fraxinus nigra*). Species indicative of mineral-enriched conditions are typical in the understory. Dense patches in the shrub layer may include spicebush (*Lindera benzoin*), witch hazel (*Hamamelis virginiana*), or hornbeam (*Carpinus caroliniana*). The variable and diverse herbaceous layer may include jack-in-the-pulpit (*Arisaema triphyllum*), foamflower (*Tiarella cordifolia* var. *cordifolia*), lesser mitrewort (*Mitella nuda*), wild oats (*Uvularia sessilifolia*), oak-fern (*Gymnocarpium dryopteris*), slender mannagrass (*Glyceria melicaria*), delicate sedge (*Carex leptalea* ssp. *leptalea*), swamp-saxifrage (*Micranthes pensylvanica*), northern horse-balm (*Collinsonia canadensis*), golden ragwort (*Packera aurea*), golden saxifrage (*Chrysosplenium*



americanum), rough-leaved goldenrod (*Solidago patula* var. *patula*), swamp-goldenrod (*S. uliginosa*), and purple avens (*Geum rivale*).

Differentiating Occurrences: Rich Conifer Swamps are characterized by a canopy of mixed red spruce and hemlock, with balsam fir and deciduous trees including black ash. Shrubs may be dense and include species such as spicebush that indicate less acidic conditions with greater nutrient availability. The surface has pockets of moss rather than sphagnum lawns. The canopy in Red Spruce Swamps is dominated by red spruce; lower strata are sparse. Sphagnum often forms a continuous ground cover. Although all types of forested wetlands can include scattered patches of eastern hemlock, only in Hemlock Swamps is it the dominant canopy species throughout the community. Lower strata are sparse in Hemlock Swamps where sphagnum may form a continuous ground cover. Red Maple Swamps and named variants such as Red Maple - Black Gum Swamps are dominated by deciduous trees, particularly red maple. Atlantic white cedar swamps are dominated by Atlantic white cedar trees.

Associated Fauna: Rich Conifer Swamps are part of the habitat of large mobile animals. Ground-level browsers, including white-tailed deer (*Odocoileus virginianus*), snowshoe hare (*Lepus americanus*), and New England cottontail (*Sylvilagus transitionalis*), use shrubby areas in the community. Conifer swamps tend to have dense shade and are relatively cool in the summer, making them preferred areas for moose (*Alces alces*), animals that get too hot and have trouble controlling their body's temperature. Birds that nest or forage in canopies or mid-sections of conifers do not differentiate on whether the site is wet or not; many birds of upland conifer forest also use Rich Conifer Swamps. Areas of Rich Conifer Swamps where water remains standing for 2-3 months and that lack fish can function as vernal pool habitat for amphibian breeding.

Public Access: Appalachian Trail Corridor, Sheffield; Agawam Lake WMA, Great Barrington; Hinsdale Flats WMA, Hinsdale; Savoy WMA and Notchview Reservation (The Trustees of Reservations), Windsor; Hiram H. Fox WMA, Chester; Otis State Forest, Sandisfield; Orange WCE, Orange.

Threats: Invasive exotic insect pests (e.g., hemlock woolly adelgid (*Adelges tsugae*) and elongate hemlock scale (*Fiorinia externa*)); altered hydrology.

Management Needs: Removal of invasive exotic plants where they are established. The use of undisturbed natural buffers around the best occurrences of the community reduces the potential for impacts from changes in the surrounding environment.

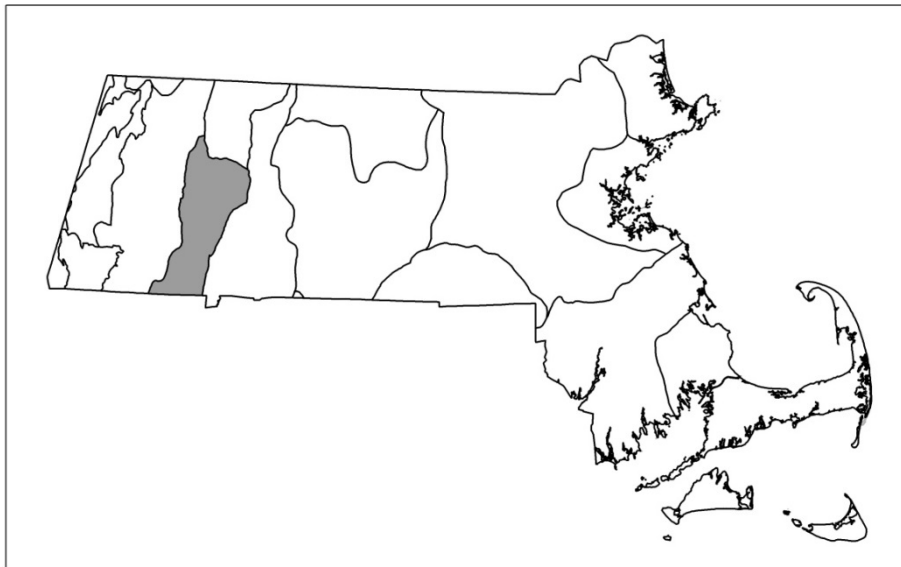
USNVC/NatureServe: *Tsuga canadensis* - *Acer rubrum* Saturated Forest Alliance (Eastern Hemlock - Red Maple Saturated Forest Alliance) - *Betula alleghaniensis* - *Acer rubrum* - (*Tsuga canadensis*, *Abies balsamea*)/*Osmunda cinnamomea* Forest [CEGL006380]; (Hardwood - Conifer Seepage Forest; *Picea mariana*/*Alnus incana*/*Sphagnum* spp. Forest (CEGL002452).



River and Lake Drawdown Community

Community Code: CP2A0B250A

State Rank: SNR



Concept: Sparsely to moderately vegetated exposed drawdown areas of reservoirs and behind dams.

Environmental Setting: River and Lake Drawdown Communities develop on sediments exposed when water levels are low in impounded waterbodies. They may be expansions of riverside beaches and pointbars, or mudflats exposed by drawdown for any reason including for dam repair or removal. There is wide variability in substrate type, with rocky or sandy sediments abutting beaches and pointbars where water regularly flows, or mudflats where impoundment water is slow or still. Large areas of bottom sediments may be exposed as a result of drawdown. Sites are submerged when impoundments are full.

Vegetation Description: The vegetation of the River and Lake Drawdown Community varies in space and time due to differences in substrate, flooding regime, length of time since flooding, geography, and other physical constraints. Vegetation is usually low-growing with cover varying from very sparse to dense (<10% to >80% cover). Weedy (opportunistic, non-competitive, short-lived, quick to reproduce) species quickly dominate recently exposed sediments. Early community development can be from species expanding ranges from beaches, pointbars, or backwater mudflats, or from growth of long-surviving seeds left in the seed bank after previous drawdowns. These pioneers are quickly supplemented by readily transported seeds and plant parts from surrounding areas. Typical species include smartweeds (*Polygonum* and *Persicaria* spp.), water purslane (*Ludwigia palustris*), false pimpernel (*Lindernia dubia*), and various graminoids such as sandbar-lovegrass (*Eragrostis hypnoides*), sand sedge (*Bulbostylis capillaris*), awned flatsedge (*Cyperus squarrosus*),



spike-rushes (*Eleocharis* spp.), and beak rushes or horned sedges (*Rhynchospora* spp.). Some stranded floating-leaved or emergent aquatic plants may temporarily survive in exposed sediments, including water lilies (*Nymphaea* or *Nuphar* spp.), bulrushes (*Bolboschoenus* spp.), and rushes (*Juncus* spp.). A wide range of other native and non-native species may occur.

Differentiating Occurrences: River and Lake Drawdown Communities occur on often large areas of exposed sediments of reservoirs and behind dams when water levels are lowered. Riverine Pointbar and Beach Communities are in high-energy stream channels on sand or gravel. Freshwater Mud Flat Communities have low, sparse, annual herbaceous vegetation on recently exposed muddy (fine mixed organic and mineral materials) sediments in river backwaters and ponds, where they may include stranded aquatic vegetation. The drawdown community shares many of the same opportunistic species of mud flats and pointbars, but may cover more extensive areas.

Associated Fauna: Wide-ranging animals include River and Lake Drawdown Communities opportunistically as part of their habitats. Shorebirds forage for invertebrates on the exposed sediments of these communities throughout their breeding season and during migration. Adult fish can normally swim to deeper water unless caught in isolated depressions; however, a year's reproductive class can be lost if fish have spawned on sediments that become exposed. If sediments become dewatered or desiccated, the mortality of the benthic-dwelling organisms, such as freshwater mussels or dragonfly larvae, would increase.

Public Access: The communities are ephemeral and depend on recent management. They are potentially statewide, in any ponded river or reservoir.

Threats:

Management Needs:

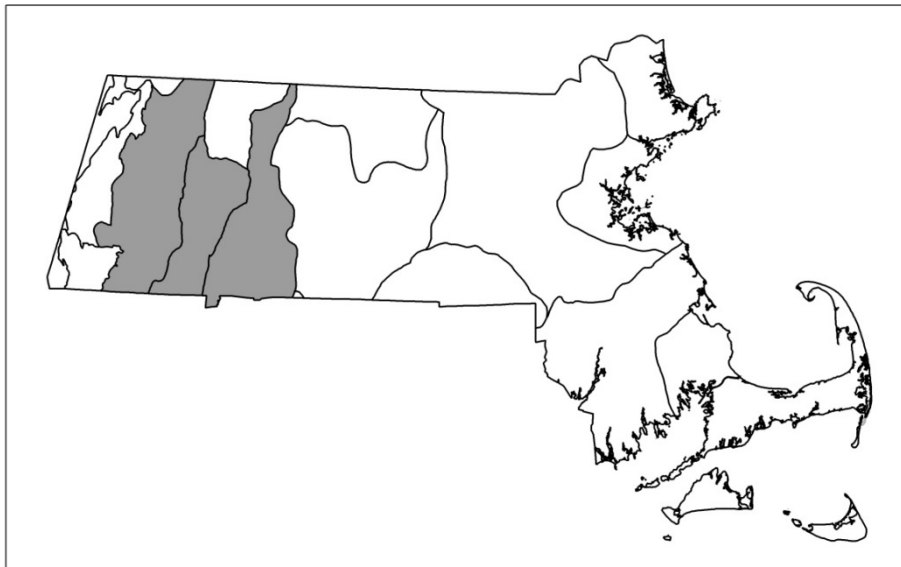
USNVC/NatureServe: Related to: River Mudflats Sparse Vegetation [CEGL002314]; Lake Mudflats Sparse Vegetation [CEGL002313]; Inland Freshwater Strand Beach Sparse Vegetation [CEGL002310]. Included in the broadly described: *Lysimachia ciliata* - *Apocynum cannabinum* Sparse Vegetation [CEGL006554]; Related concept to: Riverine Sand Flats - Bars Sparse Vegetation [CEGL002049].



Riverine Pointbar and Beach Community

Community Code: CP2A0B2500

State Rank: S4



Concept: Sparsely vegetated exposed sand/gravel beaches and pointbars of rivers and large streams.

Environmental Setting: Riverine Pointbar and Beach Communities occur on sands and gravels deposited in the channel below the streambank on the insides of meander curves. River currents move faster on the outside of a turn and more slowly on the inside. Coarser sediments settle on the outside, where velocity is higher, with finer sediments on the inside, nearer to the shoreline. These areas are scoured by ice in the spring and by periodic flooding during high-water periods following snow melt or after major storm events. Flooding and ice scour limit the extent to which woody vegetation can become established. Constant flooding, scouring, and deposition limit soil development. Pointbars and beaches can move around in the channel depending on water dynamics.

Vegetation Description: The vegetation tends to be sparse, with bare sand or gravel dominating, at least on the most recently exposed areas; it is patchy, flood-battered, and highly variable with seasonal and spatial zonation. Herbaceous and graminoid vegetation dominates in more frequently flooded areas, with woody vegetation where less frequently flooded. Plants start growing as water levels go down, so the areas closer to the uplands tend to start growing sooner in the spring, and lower areas may have young plants into the summer. Tall beggar's-ticks (*Bidens vulgata*) is typical but will be scattered. Other species include smartweeds (*Persicaria* and *Polygonum* spp.), cocklebur (*Xanthium strumarium*), soft-stemmed spike-sedge (*Eleocharis obtusa*), Smith's club-sedge (*Schoenoplectus smithii*), awned flatsedge (*Cyperus squarrosus*), pondshore-flatsedge (*Cyperus dentatus*), and lovegrasses (*Eragrostis* spp.). On



smaller rivers, cardinal flower (*Lobelia cardinalis*) often grows on pointbars. Non-native weedy species may include barnyard grass (*Echinochloa crus-galli*), crab-grass (*Digitaria sanguinalis*), chickweeds (*Myosoton aquaticum* and others), and members of the mustard family, along with purple loosestrife (*Lythrum salicaria*) and Japanese knotweed (*Fallopia japonica*).

Differentiating Occurrences: Riverine Pointbar and Beach Communities are in high-energy stream channels on sand or gravel. River and Lake Drawdown Communities develop on sediments exposed in reservoirs and behind dams when water levels are lowered. High-energy Riverbank Communities occur on the banks of fast-flowing, high-energy rivers with sparse plants growing in sediment caught between rock cobbles. Low-energy Riverbank Communities are on slopes of river banks composed of a mix of relatively fine mineral materials (clay, silt, or sand). The communities may include scattered shrubs or trees along with herbaceous species. Freshwater Mud Flat Communities have low, sparse, annual herbaceous vegetation on recently exposed muddy (fine mixed organic and mineral materials) sediments in river backwaters and ponds, where they may include stranded aquatic vegetation.

Associated Fauna: Few animals are restricted to these patchy, ephemeral communities, but wide-ranging animals include Riverine Pointbar and Beach Communities as part of their habitats. Shorebirds forage on pointbars and beaches throughout their breeding season and during migration. Turtles nest in drier parts of point bars and beaches. The larvae of several species of tiger beetle live in burrows in sandy point bars and beaches, and the adults hunt the same areas. Many river dragonflies include pointbars and beaches in their hunting territories.

Public Access: Robinson State Park, Agawam; Farmington River Watershed, Sandisfield; Tully Lake Reservation (US Army Corps of Engineers), Royalston.

Threats: Trampling from campers and boaters negatively impacts both the plant and animal communities of Riverine Pointbar and Beach Communities. Alterations to normal flooding regimes can impact alluvial deposition, resulting in expansion or reduction of beach size. The exotic invasive Japanese knotweed (*Fallopia japonica*) is a very aggressive colonizer of riverside communities and can displace native species where it becomes established.

Management Needs: Cocklebur (*Xanthium strumarium*) and Japanese knotweed (*Fallopia japonica*) removal may be necessary from areas used as larval habitat by Puritan tiger beetles. The two species grow quickly and shade large areas, thus eliminating habitat for the tiger beetles. More information is needed to assess the management needs for pointbars and beaches.

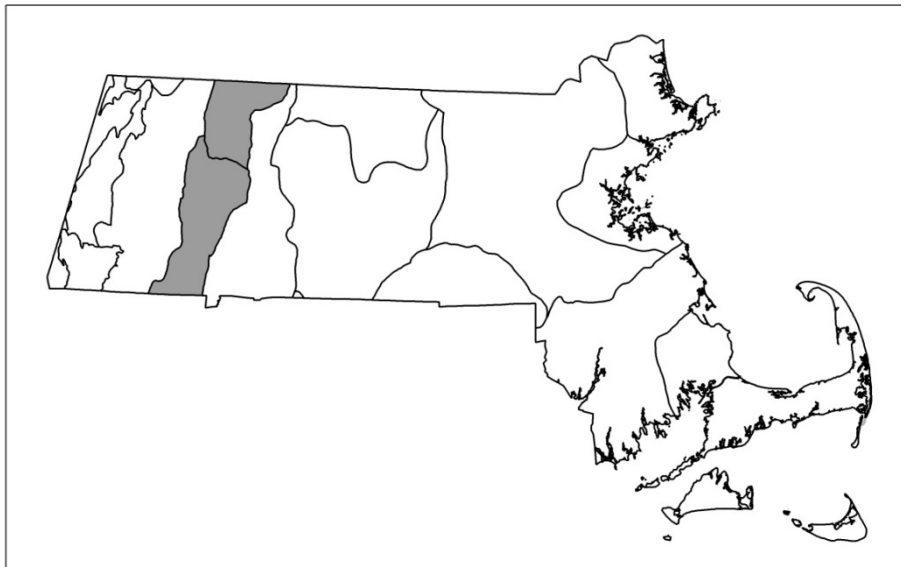
USNVC/NatureServe: Inland Freshwater Strand Beach Sparse Vegetation (CEGL002310). Included in the broadly described: *Lysimachia ciliata* - *Apocynum cannabinum* sparse vegetation (CEGL006554); Related concept to: Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049).



Riverside Seep Community

Community Code: CP2A0B2200

State Rank: S2



Concept: Mixed herbaceous community along river shores where groundwater discharge provides mineral enrichment, often kept open by flood and ice scour.

Environmental Setting: Riverside Seep Communities occur at the base of steep riverbanks where groundwater discharges from adjacent upland slopes. Groundwater discharge in seeps may be diffuse or concentrated in seepage rivulets, and groundwater flow appears to vary substantially among seeps; some seeps may dry out during the summer, others flow year-round. They are often associated with Riverside Rock Outcrop Communities or near rapids. Others may be at the base of talus slopes and associated with High-energy Riverbank Communities or gravel bars. Organic soils are seldom present except in sheltered areas. Mineral-rich seepage leads to a high species diversity of mostly herbaceous plants. Periodic flooding and, likely, ice scour from the river helps to prevent woody shrub encroachment.

Vegetation Description: The vegetation of Riverside Seep Communities is variable, apparently related to the flow and mineral content of groundwater. Seeps that dry during the summer months often have relatively sparse vegetation. The wettest parts of Riverside Seep Communities also have bare ground, including wet rocks and sometimes open water, but are typically mossy with a mixture of herbs and sedges. The general vegetation of Riverside Seep Communities that flow year-round is fairly dense and includes many graminoids (not all at each site) such as brown beak-rush (*Rhynchospora capitellata*), creeping spike-rush (*Eleocharis palustris*), scabrous sedge (*Carex scabrata*), sallow sedge (*C. lurida*), northern awned-sedge (*Carex gynandra*), wool-grass (*Scirpus cyperinus*), grass-leaf rush (*Juncus marginatus*), jointed rush (*J. articulatus*), marsh rush (*J. canadensis*), soft rush (*J. effusus*), Canada



bluejoint (*Calamagrostis canadensis*), fascicled panic-grass (*Dichanthelium acuminatum* ssp. *fasciculatum*), riverbank wild rye (*Elymus riparius*), upland bentgrass (*Agrostis perennans*), and green-fruited bur-reed (*Sparganium erectum*). Forbs include northern dwarf St. John's-wort (*Hypericum boreale*), swamp saxifrage (*Micranthes pensylvanica*), sensitive fern (*Onoclea sensibilis*), and marsh bellflower (*Campanula aparinoides*). Other characteristic herbs include spotted joe-pye-weed (*Eutrochium maculatum*), boneset (*Eupatorium perfoliatum*), orange jewelweed (*Impatiens capensis*), and fringed loosestrife (*Lysimachia ciliata*). Woody species such as speckled alder (*Alnus incana* ssp. *rugosa*) and willows (*Salix* spp.) are often present but not dominant. Muskflower (*Mimulus moschatus*), Canadian burnet (*Sanguisorba canadensis*), and golden alexanders (*Zizia aurea*) are indicative of minerotrophic conditions, and as a group are good indicator species of the community type. The non-native plants colt's foot (*Tussilago farfara*) and purple loosestrife (*Lythrum salicaria*) can also be abundant in the community. The vegetation described here is from sites in the western part of the state; eastern sites may be different.

- Differentiating Occurrences:** Riverside Seep Communities are small-patch communities that often occur with and grade into High-energy Rivershore Marshes and High-energy Riverbank Communities along high-energy rivers. Riverside Seep Communities occur at the base of steep riverbanks where groundwater discharges from the bottom of the upland slope; they are wetter than associated High-energy Rivershore Meadows and High-energy Riverbank Communities. Muskflower, Canadian burnet, and golden Alexanders as a group are good indicators of Riverside Seep Communities. High-energy Rivershore Meadows are densely vegetated with a characteristic group of dominant plants - hemp dogbane, riverside-sedge and Canadian burnet - in a mix with other forbs and graminoids. High-energy Riverbank Communities have, on average, sparser vegetation and more bare ground than do High-energy Rivershore Meadows or Riverside Seep Communities.
- Associated Fauna:** Because they are small communities, Riverside Seeps are part of the habitat of the wide-ranging riverine and upland animals.
- Public Access:** Gilbert A. Bliss State Forest, Chesterfield; Knightville Dam (US Army Corps of Engineers), Huntington; Catamount State Forest, Charlemont. These communities are disturbed by trampling from recreation which can lead to the invasion of non-native plant species already present at many sites.
- Threats:** It is not known to what extent dam construction and the resulting altered hydrology have affected the occurrence of riverside seep communities. These communities are disturbed by trampling from recreation, which leads to the invasion of non-native plant species. Purple loosestrife can be dominant where disturbance is high.
- Management Needs:** Removal of non-native plant species and maintenance of natural flooding regimes.



USNVC/NatureServe:

G792. Laurentian and Acadian Riverscours Vegetation. G755. Central Riverine Wetland Vegetation - Often occurs with A3647 *Carex torta* Riverscours Alliance - *Carex torta* - *Apocynum cannabinum* - *Cyperus* spp. Herbaceous Vegetation [CEGL006536].



Sea-level Fen

Community Code: CP2B0B3000

State Rank: S1



Concept: Herbaceous/graminoid peatlands that occur at the upland edges of tidal marshes. The combination of upland freshwater seepage and infrequent salt or brackish overwash produces a mixed plant community of freshwater and estuarine species.

Environmental Setting: Sea-level Fens are herbaceous/graminoid peatlands just above normal high tide at the upland edge of estuarine tidal marshes. Periodic brackish overwash mixed with freshwater seepage from sandy uplands produces a plant community of mixed freshwater and estuarine species on sedgy peat over sand or gravel. Sea-level Fens are near their northern limits in Massachusetts and are better developed to the south, where they include more specialized species.

Vegetation Description: Sphagnum moss (*Sphagnum* spp.) is common in all acidic peatlands, forming a mat that the vascular plants grow on, and producing much of the peat that underlies the community. In Sea-level Fens, sphagnum peat is mixed with peat derived from sedges. Three species diagnostic of Sea-level Fens are identified in regional descriptions: saltmarsh straw-sedge (*Carex hormathodes*), saltmarsh spike-sedge (*Eleocharis rostellata*), and saltmarsh threesquare (*Schoenoplectus americanus*). Twig-sedge (*Cladium mariscoides*) at the edges of salt marshes is also used as an indicator of Sea-level Fens. Other common species include New York aster (*Symphyotrichum novi-belgii*), spatulate-leaved sundew (*Drosera intermedia*), Canada rush (*Juncus canadensis*), pondshore-rush (*Juncus pelocarpus*), swamp-candles (*Lysimachia terrestris*), native and invasive exotic subspecies of common reed (*Phragmites australis*), white beak-sedge (*Rhynchospora alba*), swamp-rose (*Rosa palustris*), common threesquare (*Schoenoplectus pungens*), poison ivy (*Toxicodendron radicans*), marsh St. John's-wort (*Triadenum virginicum*),



and large cranberry (*Vaccinium macrocarpon*). Occasional shrubs include poison sumac (*Toxicodendron vernix*), swamp azalea (*Rhododendron viscosum*), bayberry (*Morella pensylvanica*), groundsel-tree (*Baccharis halimifolia*), and eastern red cedar (*Juniperus virginiana*).

Differentiating Occurrences: Natural communities on acidic peatlands all occur on sphagnum peat. The depth, density, and strength of the underlying peat control the structure and composition of each type of peatland community because plants growing on it are isolated from nutrients carried by groundwater. Sea-level Fens are most identifiable by location: they occupy the interface between estuarine marshes and upland seepage slopes, and therefore have a distinct species assemblage including both estuarine and palustrine species. Three species diagnostic of Sea-level Fens are identified in regional descriptions: saltmarsh straw-sedge (*Carex hormathodes*), saltmarsh spike-sedge (*Eleocharis rostellata*), and saltmarsh threesquare (*Schoenoplectus americanus*). Twig-sedge (*Cladium mariscoides*) at the edges of salt marshes is also used as an indicator of Sea-level Fens. Acidic Graminoid Fens are differentiated by the dominance of graminoid and herbaceous species and the lack of extensive shrubs. Threeway sedge (*Dulichium arundinaceum*) and buckbean (*Menyanthes trifoliata*) are characteristic of wet, nutrient-enriched edges of Acidic Graminoid Fens. Interdunal Marshes/Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands.

Associated Fauna: Few animals are likely to differentiate between Sea-level Fens and other wetlands. Species sensitive to salt would avoid Sea-level Fens during and after saltwater incursions; at other times, the fens would be part of the habitat of mobile wetland and upland animals. Songbirds use shrubby parts of the community for nesting and foraging, particularly when the surrounding areas also have dense shrubs.

Public Access: None of the known sites are entirely in conservation ownership. If visited, care should be taken not to create trails across the easily damaged peat surface.

Threats: Rozsa (2014) mentions that this community degrades every ~20 years (metonic cycle). During the first half of the metonic cycle, the tidal range increases about 6 cm. This causes the anaerobic peat-building phase. Then the tide range decreases and in the aerobic phase *Juncus* returns and becomes dominant. Finally, groundwater discharge washes away the decomposing peat. In some places, the eroded edge resembles a pedestrian path. Alteration to the natural hydrologic regime. Development in the uplands may have negative effects on upland seepage. Invasive phragmites, particularly in areas with native populations.

Management Needs: Maintain natural hydrology and upland buffer.



USNVC/NatureServe:

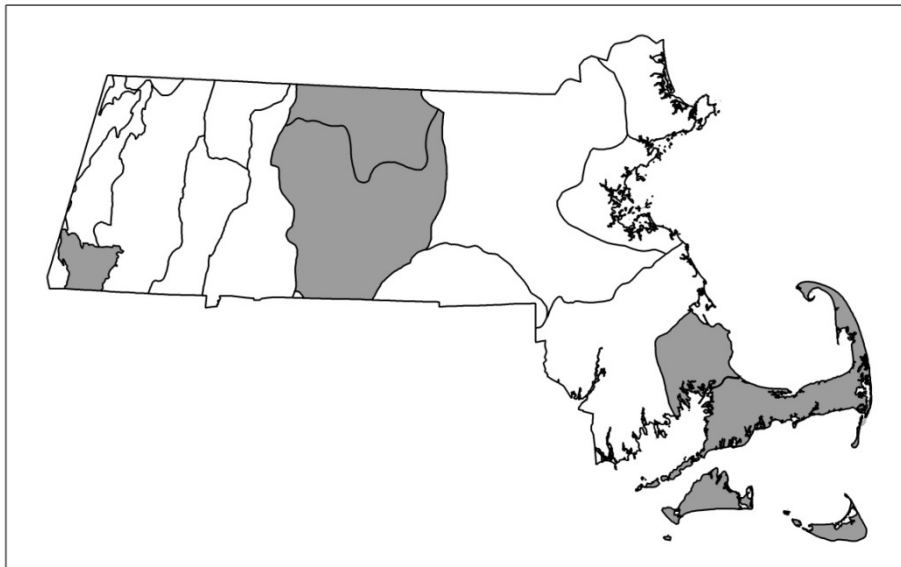
Cladium mariscoides-*Drosera intermedia*-*Eleocharis rostellata* herbaceous
vegetation [CEGL006310]. G1 (2014).



Shallow Emergent Marsh

Community Code: CP2A0A1300

State Rank: S4



Concept: Grass-, sedge-, and/or rush-dominated wetlands on mucky mineral soils that are seasonally inundated and permanently saturated.

Environmental Setting: Shallow Emergent Marshes occur in broad, flat areas bordering low-energy rivers and streams (often in backwater sloughs), or along pond and lake margins. There is standing or running water during the growing season and throughout much of the year, with water depth averaging less than about 15 cm (~6 in.). Shallow marshes commonly occur in abandoned beaver flowages, and in some states they are named abandoned beaver meadows or beaver flowage communities. The substrate is typically a layer of well-decomposed organic muck overlying mineral material.

Vegetation Description: Short grasses, sedges, and rushes mixed with scattered forbs (broad-leaved herbaceous plants) dominate Shallow Emergent Marshes. Tussock-forming species such as tussock sedge (*Carex stricta*) and Canada bluejoint (*Calamagrostis canadensis* var. *canadensis*) may form a hummock-hollow topography over broad areas. Forbs often include sensitive fern (*Onoclea sensibilis*), marsh fern (*Thelypteris palustris*), swamp-candles (*Lysimachia terrestris*), marsh St. John's-wort (*Triadenum virginicum*), Joe-Pye-weeds (*Eutrochium* spp.), bonesets (*Eupatorium* spp.), and water-horehound (*Lycopus* spp.). Low shrubs such as spiraea (*Spiraea* spp.), red osier dogwood (*Swida sericea*), leatherleaf (*Chamaedaphne calyculata*), and sweet gale (*Myrica gale*) may be present with <25% coverage. Areas with shallow water between or instead of tussocks typically have a mixture of bur-reeds (*Sparganium* spp.), sedges (*Carex* spp.), and rice cut-grass (*Leersia oryzoides*). Areas with more permanent open water often support floating-leaved plants like water-lilies (*Nymphaea odorata* and *Nuphar* spp.) and submerged plants like pondweeds



(*Potamogeton* spp.). Duckweed (*Lemna* spp.) is abundant in still water. It is common to see tussock sedge-dominated marshes in old beaver flowages mixed with scattered alder (*Eupatorium* spp.) and spiraea (*Spiraea* spp.). Sites with a history of severe disturbance may be dominated by or include an abundance of exotic species including purple loosestrife (*Lythrum salicaria*), reed canary-grass (*Phalaris arundinacea*), phragmites (*Phragmites australis*), or Japanese knotweed (*Fallopia japonica*). Cattails (*Typha* spp.), phragmites (*Phragmites australis*), and wool-grass (*Scirpus cyperinus*) (the dominants of Deep Emergent Marshes) often occur, but do not dominate. Tall shrubs and tree saplings are uncommon and when present are often clustered together.

Differentiating Occurrences: The physical and biological characteristics of emergent marsh, wet meadow, and shoreline communities overlap and intergrade. The vegetation for all these types is broadly defined and understudied: focused surveys might establish which dominant species and hydrological situations define identifiable community types, or might determine that there is a continuum of types that require arbitrary separation. Shallow Emergent Marshes are graminoid/herbaceous wetlands and usually have shallow (averaging <6 in deep) surface water all year. Shallow Emergent Marsh vegetation composition is similar to Deep Emergent Marsh except that shorter grasses, sedges and rushes dominate. Cattails, phragmites, and wool-grass (the dominants of Deep Emergent Marshes) can occur but never dominate Shallow Emergent Marshes. Deep Emergent Marshes are tall graminoid wetlands that are usually flooded with deeper water (averaging 6 in to 3 ft.). Shrub Swamps have >25% cover of shrubs. Wet Meadows are graminoid wetland subtypes of Shallow Emergent Marshes, typically with a single sedge or grass species dominating. Standing water is not present throughout the growing season as in emergent marshes. Kettlehole Wet Meadows occur in small basins on mucky peat. Coastal Plain Pondshore Communities and Coastal Plain Pondshores - Inland Variant are generally on sand in closed basins that intersect groundwater. The exposed shoreline supports herbaceous species not generally dominated by dense graminoids. Acidic Pondshores/ Lakeshores are broadly defined, variable shorelines around open water not explicitly included in calcareous or coastal plain pondshores. The shoreline is often not distinct, merging into marsh or other wetlands. Bogs and Fens are peatlands and have peat instead of mucky mineral soil; however, gradations do exist.

Associated Fauna: Shallow Emergent Marshes are excellent habitat for muskrats. Shallow Emergent Marsh habitat supports many species of frogs and salamanders, especially leopard, pickerel, green, and bull frogs, and some vernal pool obligate species, such as wood frogs and spotted salamanders, may use areas of Shallow Emergent Marsh for egg-laying if they are fish free.

Public Access: Wolf Swamp WMA, Brookfield/Sturbridge; Warwick State Forest, Warwick; Great Meadows National Wildlife Refuge, Concord area; Charles River Watershed (US Army Corps of Engineers), Dedham area; Neponset River Reservation, Canton area.



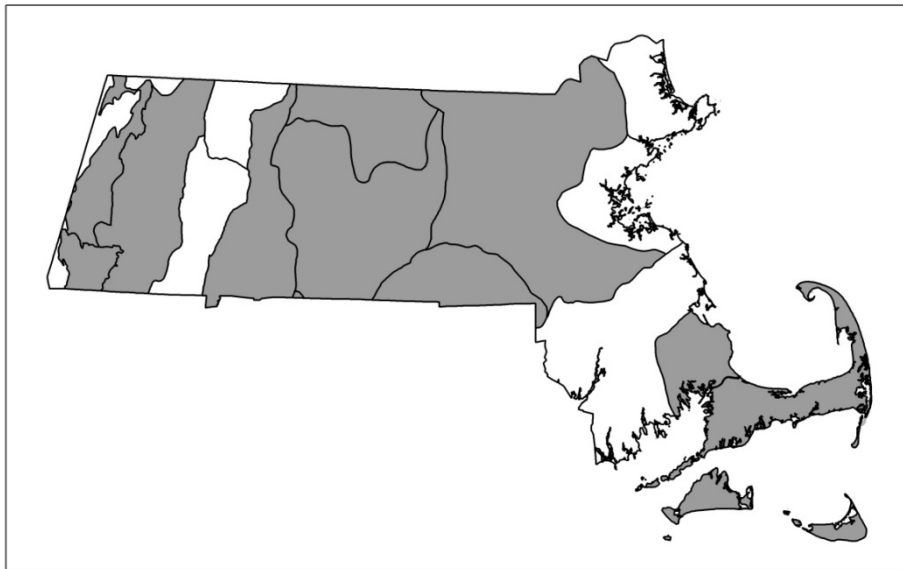
Threats:	Shallow Emergent Marshes are threatened by filling and dredging, impoundments that alter natural water-level fluctuations, and nutrient inputs from adjacent roads, fields, or septic systems. The invasion and spread of purple loosestrife (<i>Lythrum salicaria</i>) alters natural community structure and composition.
Management Needs:	Efforts are needed to control the spread of purple loosestrife.
USNVC/NatureServe:	G125. Eastern North American Freshwater Marsh: and G556. Northern and Central Ruderal Wet Meadow and Marsh.



Shrub Swamp

Community Code: CP2A0C0000

State Rank: S5



Concept: Shrub-dominated wetlands occurring on mineral or mucky mineral soils that are seasonally or temporarily flooded.

Environmental Setting: Wetland shrubs dominate Shrub Swamps. Shrub height may be from <1m to 5 meters, of uniform height or mixed. Shrub density can be variable, from dense (>75% cover) to fairly open (25-75% cover), with graminoid, herbaceous, or open water areas between shrubs. These common, widespread communities can be found where the water table is at or above the soil surface for most of the year, in lowlands, along the margins of rivers, streams and other waterbodies, and along or within forested or herbaceous-dominated wetlands. Soils may be mineral or well-decomposed organic material.

Vegetation Description: The species composition of Shrub Swamps is highly variable within and among sites. Possible dominant and codominant shrub species include speckled alder (*Alnus incana* ssp. *rugosa*), smooth alder (*A. serrulata*), meadowsweet (*Spiraea alba* var. *latifolia*), steeplebush (*S. tomentosa*), buttonbush (*Cephalanthus occidentalis*), maleberry (*Lyonia ligustrina*), swamp azalea (*Rhododendron viscosum*), silky dogwood (*Swida amomum*), winterberry (*Ilex verticillata*), sweet gale (*Myrica gale*), willows including pussy willow (*Salix discolor*) and black willow (*S. nigra*), arrowwood (*Viburnum dentatum*), and poison sumac (*Toxicodendron vernix*). Shrub swamps in areas with circumneutral water often have abundant spicebush (*Lindera benzoin*). Low-growing, weak-stemmed shrubs include dewberry (*Rubus hispidus*), water-willow (*Decodon verticillatus*), and Canadian burnet (*Sanguisorba canadensis*). Trees tend to be scattered and stunted and may include red maple (*Acer rubrum*), gray birch (*Betula populifolia*), white pine (*Pinus strobus*), or other



species found in either forested swamps or adjacent uplands. In general, a shrub community will have <25% cover of tree canopy. Since shrubs often form dense thickets, the herbaceous layer of shrub swamps is often sparse and species-poor. A mixture of the following species is typical: common arrowhead (*Sagittaria latifolia*), skunk cabbage (*Symplocarpus foetidus*), ferns (especially cinnamon fern (*Osmundastrum cinnamomeum*), sensitive fern (*Onoclea sensibilis*), royal fern (*Osmunda regalis*), and marsh fern (*Thelypteris palustris*)), sedges (*Carex* spp.), bluejoint grass (*Calamagrostis canadensis*), bur reed (*Sparganium* spp.), virgin's-bower (*Clematis virginiana*), swamp candles (*Lysimachia terrestris*), clearweed (*Pilea pumila*), and turtlehead (*Chelone glabra*). While nonvascular flora is not a major component, sphagnum has been recorded in substantial abundance in some occurrences. Invasive species include reed canary-grass (*Phalaris arundinacea*), glossy buckthorn (*Frangula alnus*), common buckthorn (*Rhamnus alnifolia*), and purple loosestrife (*Lythrum salicaria*).

Differentiating Occurrences: The physical and biological characteristics of Shrub Swamp, Acidic Shrub Fen, Highbush Blueberry Thickets, Fresh/ Brackish Tidal Shrubland, emergent marshes, and shoreline communities overlap and intergrade. They all lack tree cover (<25% canopy cover) and they are all on wet substrates. Shrub Swamps have >25% cover of tall shrubs with well-decomposed organic soils. If highbush blueberries (*Vaccinium corymbosum*) are dominant, the community is likely to be a Highbush Blueberry Thicket, a tall-shrub community occurring on peat. Acidic Shrub Fens are peatlands, dominated by low-growing shrubs with sphagnum moss and herbaceous species of varying abundance. Deep Emergent Marshes and Shallow Emergent Marshes are graminoid-dominated wetlands with <25% cover of tall shrubs. Acidic Pondshores/Lakeshores are broadly defined, variable shorelines around open water. Shorelines often merge into swamps or marshes. Fresh/Brackish Tidal Shrublands are dense to open shrublands along tidal sections of coastal rivers. Forested swamp communities such as Red Maple Swamp and its variants often contain a significant shrub component, and may include patches of shrub swamp where the tree canopy cover is <25%.

Associated Fauna: Many Shrub Swamps provide high-quality vernal-pool habitats. Relatively long hydroperiods ensure that amphibian larvae have plenty of time to develop, and the diverse vegetation structure provides both cover for larvae and egg-attachment substrates for breeding adults. Many species of migratory birds use the dense shrub thickets as protected nesting habitat. In the winter when the surface is frozen, browsers, including New England cottontail, have easy access to the shrubs and protection in the dense thickets. The larvae of many rare and common moth species feed on a variety of shrubs and associated herbaceous plants in Shrub Swamps throughout Massachusetts.

Public Access: Greenler Reservation (Essex County Greenbelt Association), Boxford; Tophet Swamp (Town of Westminster and North County Land Trust), Westminster; Jacobs Hill Reservation (The Trustees of Reservations), Royalston; Wekepeke WCE, Sterling; Nineteenth Hill WCE, Winchendon.



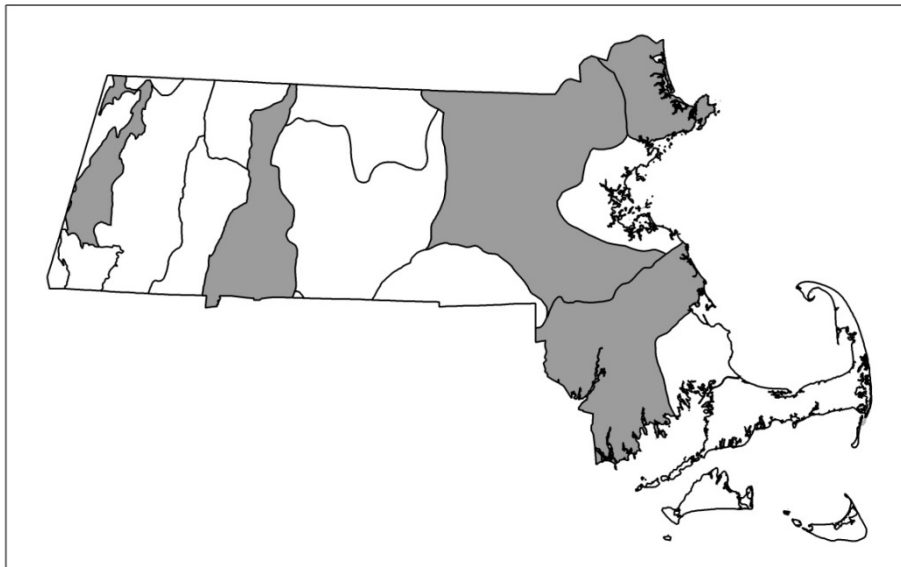
Threats:	Invasive species can include reed canary-grass (<i>Phalaris arundinacea</i>), common buckthorn (<i>Rhamnus alnifolia</i>), glossy buckthorn (<i>Frangula alnus</i>), and purple loosestrife (<i>Lythrum salicaria</i>).
Management Needs:	Maintain water quality and quantity, as well as natural hydroperiods. Control invasives where practical. Most types of shrub swamps are successional and need regular disturbance to be maintained in place, or they are maintained as parts of a larger area by disturbances moving over the landscape in time and space.
USNVC/NatureServe:	G167: Northern and Central Shrub Swamp - <i>Alnus incana</i> Swamp Shrubland [CEGL002381]; <i>Alnus serrulata</i> Eastern Shrubland [CEGL005082]; <i>Cephalanthus occidentalis</i> Semipermanently Flooded Shrubland [CEGL003908]; <i>Decodon verticillatus</i> Semipermanently Flooded Shrubland [CEGL005089]; <i>Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora</i> Ruderal Shrubland [CEGL006576]; <i>Cephalanthus occidentalis - Decodon verticillatus</i> Shrubland Northeastern Buttonbush Shrub Swamp [CEGL006069]; <i>Alnus incana - Cornus (amomum, sericea)/Clematis virginiana</i> Shrubland [CEGL006062]; <i>Alnus incana - Viburnum recognitum/Calamagrostis canadensis</i> Shrubland [CEGL006546].



Small-river Floodplain Forest

Community Code: CP1A2B3000

State Rank: S2



Concept: Silver maple/green ash-dominated forests occurring on alluvial soils of small rivers and streams.

Environmental Setting: Small-river Floodplain Forests occur on third-order or smaller tributaries of the Connecticut, Housatonic, and Nashua Rivers, on small rivers of eastern Massachusetts where banks are low and overbank flooding occurs such as the Ipswich, Assabet, Concord, Shawsheen, and Three Mile Rivers, and on edges of riverine islands of the Merrimack River. Annual flooding occurs, but the water volume and degree of scour are much less than in Major-river Floodplain Forests. Soils are hydric silt loams and fine sandy loams with soil mottling within the top 60 cm (2 ft.) and sometimes with a surface organic layer. Patches of the Small-river Floodplain Forest community type also occur in poorly-drained depressions within the level floodplain of other types of floodplain forests.

Vegetation Description: Small-river Floodplain Forests have been called a silver maple-green ash-false nettle-sensitive fern vegetation association. Silver maple (*Acer saccharinum*) is almost always dominant in the overstory, often with green ash (*Fraxinus pennsylvanica*) in the canopy or subcanopy. American or slippery elm (*Ulmus americana* and *U. rubra*), swamp white oak (*Quercus bicolor*) (in wetter areas), and red maple (*Acer rubrum*) often occur in low numbers. Pin oak (*Quercus palustris*) is a common canopy associate in the Connecticut River basin, and river birch (*Betula nigra*) typical in the Merrimack River basin. The shrub layer consists mainly of silky dogwood (*Swida amomum*) and buttonbush (*Cephalanthus occidentalis*). There is greater herbaceous plant diversity in Small-river Floodplain Forests than in Major-river and Transitional types. Sensitive fern (*Onoclea sensibilis*) and false



nettle (*Boehmeria cylindrica*) are most common, and associates include the moisture-loving plants water hemlock (*Cicuta maculata*), swamp candles (*Lysimachia terrestris*), and water parsnip (*Sium suave*). The non-native plant species moneywort (*Lysimachia nummularia*), forget-me-not (*Myosotis scorpioides*), and glossy buckthorn (*Frangula alnus*) are often prevalent in small disturbed areas. Other invasive species regularly include bush honeysuckles (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), and privet (*Ligustrum vulgare*).

Differentiating Occurrences: Floodplain forest communities occur within the zone of active flooding of rivers and streams on mineral soils that receive annual silt deposition. They differ in the size of river on which they are found and in the severity of flooding. Small-river, Transitional, and Major-river Floodplain Forests can be viewed as points on a continuum from least severely scoured and poorly drained (small-river type) to most severely scoured and well-drained (major-river type). Major-river Floodplain Forests occur along mainstem sections of large rivers (the Connecticut, Housatonic, and Deerfield Rivers in Massachusetts). Soils are predominantly sandy loams without soil mottles and without a surface organic layer. Flooding at these sites is usually severe. Transitional Floodplain Forests occur on third-order or smaller tributaries of the Connecticut River, on portions of the Housatonic River, and in depressions within Major-river Floodplain Forests of the Connecticut and Deerfield Rivers. Soils are intermediate in severity of flooding, soil texture, and drainage between Major-river and Small-river Floodplain Forests. Soils are either silt loams or very fine sandy loams, and soil mottling is generally present within 60 cm (2 ft.) of soil surface. A surface organic layer is typically absent. Small-river Floodplain Forests occur on third-order or smaller tributaries of the Connecticut and Nashua Rivers, on small rivers of eastern Massachusetts where banks are low and overbank flooding occurs (Ipswich, Assabet, Concord, Shawsheen, and Three Mile), and on edges of riverine islands of the Merrimack River. Annual flooding occurs, but the water volume and degree of scour are much less than in Major-river Floodplain Forests. Soils are hydric silt loams and fine sandy loams with soil mottling within the top 60 cm (2 ft.) and sometimes with a surface organic layer. Small-river Floodplain Forests, like all annually flooded forests, are dominated by silver maple, but with more other species mixed in than the other types. However, cottonwood (*Populus deltoides*) is typically absent in the canopy of the Small-river type. Small-river Floodplain Forests have a more substantial shrub layer than either Major-river and Transitional types, but less than Red Maple Alluvial Swamps. There is greater herbaceous plant diversity in Small-river Floodplain Forests than in Major-river and Transitional types, but again, the Alluvial Red Maple Swamps have a greater diversity. Occurrences of High-terrace Floodplain Forests tend to be relatively small narrow forests on high alluvial terraces that flood only occasionally (not annually) and for a shorter duration than other types of floodplain forests. They are sometimes seen as a hybrid between floodplain and upland forests, and include upland species lacking in other types of floodplain forest. They have more litter accumulated than other floodplain forests. Alluvial Red Maple Swamps along low-gradient rivers flood annually and are slow to drain. Silver maple is often a codominant with red maple. They have dense shrub and diverse herbaceous layers.



Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple.

Associated Fauna:

Small-river Floodplain Forests often contain meander scars or backwater sloughs that function as vernal pools and provide important amphibian breeding habitat. Because they are small communities, they are part of the habitat of wide-ranging riverine and upland animals, providing sheltered, riverside corridors for deer and migratory songbirds. Floodplain forests are insect-rich habitats that attract warblers, thrushes and other songbirds. Yellow-throated and Warbling Vireos nest in the canopies of riverside trees. In spring floods, Wood Ducks and Hooded Mergansers like the shady edges of floodplain forests and the interior meander scar pools. Eastern comma butterflies feed on elm, nettles and hops, and the shady riverbanks are patrolled by dragonflies. Changes in water quality and quantity alter herbaceous, and eventually tree, species, changing habitat for birds and browsers, such as deer and rabbits.

Public Access:

Bailey Conservation Area (Essex County Greenbelt Association), North Andover; Great Meadows National Wildlife Refuge, Concord; Oxbow National Wildlife Refuge, Ayer; Arcadia Wildlife Sanctuary (Massachusetts Audubon Society), Northampton; Hop Brook WMA, Lee.

Threats:

The non-native plant species, moneywort (*Lysimachia nummularia*), forget-me-not (*Myosotis scorpioides*), and glossy buckthorn (*Frangula alnus*), are most prevalent in Small-river and Transitional Floodplain Forest types, especially in disturbed areas. Other invasive species regularly include bush honeysuckles (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), and privet (*Ligustrum vulgare*).

Management Needs:

Removal of non-native plants is needed, especially in areas where they are competing with state-protected rare species.

USNVC/NatureServe:

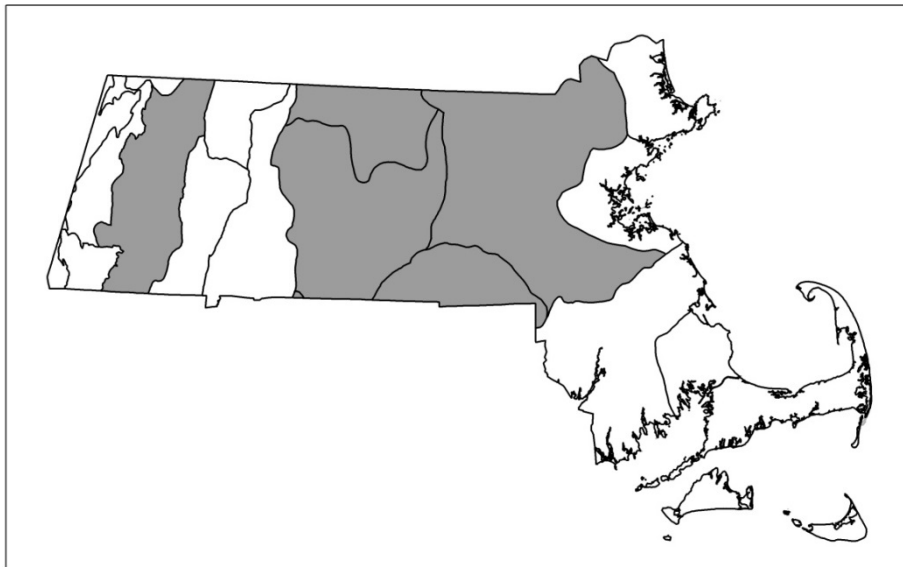
Similar to *Quercus palustris* - *Acer rubrum* Temporarily Flooded Forest Alliance -- *Quercus palustris*-*Acer rubrum*/*Carex grayi*-*Geum canadense* Forest [CEGL006185] and to *Acer saccharinum* Temporarily Flooded Forest Alliance -- *Acer saccharinum*/*Onoclea sensibilis* - *Boehmeria cylindrica* Forest (CEGL006176) (in areas with calcareous or sedimentary bedrock) and maybe CEGL006548 *Acer* (*rubrum*, *saccharinum*) - *Fraxinus pennsylvanica* - *Ulmus americana*/*Boehmeria cylindrica* Forest.



Spruce – Tamarack Bog

Community Code: CP1B1B1000

State Rank: S2



Concept: Acidic forested peatlands with a short overstory (usually) of black spruce and tamarack and an understory of heath shrubs on sphagnum moss.

Environmental Setting: Spruce - Tamarack Bogs are forested communities that occur on thick peat deposits, often as part of larger wetland complexes, usually in the older, more stable areas, that include other forested, shrub, and open community types. The forested bogs are late-successional peatlands that typically occur around more open bog mats. The layer of peat (dead and living moss and barely or partially decomposed roots and other plant material) isolates the plants from nutrients in groundwater. The forest canopy is >25% cover, often with dense small (<12m (40 ft.) and dbh <15cm (6in)) black spruce and tamarack trees, although northern/higher elevation occurrences may be more forest-like.

Vegetation Description: Spruce - Tamarack Bogs are forested peatlands dominated by spruce (usually black spruce, *Picea mariana*, sometimes red spruce, *P. rubens*) and tamarack (*Larix laricina*) and with substantial cover of sphagnum moss on the surface. Shrubs, often of the heath family (such as highbush blueberry (*Vaccinium corymbosum*)), swamp azalea (*Rhododendron viscosum*) and leatherleaf (*Chamaedaphne calyculata*) may form dense shrub layers. Spruce and tamarack are key indicators of this community, along with an extensive surface cover of sphagnum moss that may be hidden under shrubs. Lichens cover or drape branches, with the most obvious being old man's beard (*Usnea* spp.). Other tree species often present include red maple (*Acer rubrum*), white pine (*Pinus strobus*), and pitch pine (*Pinus rigida*). The species of the shrub layer, often dense and about 2m (6.5 ft.) tall, vary with geographic area. Labrador tea (*Rhododendron groenlandicum*), creeping snowberry (*Gaultheria*



hispidula), and, to some extent, bog laurel (*Kalmia polifolia*) are most likely in northern and western parts of the state; sweet pepperbush (*Clethra alnifolia*) tends to be more eastern and southern. Mountain holly (*Nemopanthes mucronatus*), wild raisin (*Viburnum nudum* var. *cassinoides*), leatherleaf (*Chamaedaphne calyculata*), winterberry (*Ilex verticillata*), highbush blueberry (*Vaccinium corymbosum*), mountain laurel (*Kalmia latifolia*), sheep laurel (*K. angustifolia*), fetterbush (*Eubotrys racemosa*), and maleberry (*Lyonia ligustrina*) may be present anywhere. The herbaceous layer can include three-seeded bog sedge (*Carex trisperma*), tussock sedge (*Carex stricta*), three-leaved Solomon's seal (*Maianthemum trifolium* WL), bluebead-lily (*Clintonia borealis*), goldthread (*Coptis trifolia*), pitcher plant (*Sarracenia purpurea*), sensitive fern (*Onoclea sensibilis*), marsh fern (*Thelypteris palustris*), cinnamon fern (*Osmundastrum cinnamomeum*), and water arum (*Calla palustris*). Dwarf mistletoe (*Arceuthobium pusillum*) has been found in some occurrences.

Differentiating Occurrences: Spruce - Tamarack Bogs have a tree canopy of >25%, dominated by black spruce and tamarack. Open (non-forested) acidic peatlands such as Level Bogs, Kettlehole Level Bogs, and Acidic Graminoid Fens may have clumps of trees, but with <25% canopy overall. Atlantic White Cedar Bogs have >25% tree canopy and the existing trees are dominated by Atlantic white cedar (*Chamaecyparis thyoides*). Atlantic White Cedar Bogs share many species with Spruce - Tamarack Bogs, but are generally found within Pitch Pine - Scrub Oak or Oak - Pine communities. Red Spruce Swamps have taller, larger diameter trees and are dominated by red rather than black spruce, generally with a more open understory (fewer shrubs). They share species with Spruce - Tamarack Bogs, but also contain balsam fir (*Abies balsamea*). Red Spruce Swamp occurrences are often larger than Spruce - Tamarack Bogs. Hemlock Swamps are dominated by eastern hemlock (*Tsuga canadensis*). Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps also contain tamarack, and may contain red spruce. However, these generally have much greater species diversity and occur in calcareous or circumneutral groundwater.

Associated Fauna: Small patch communities such as Spruce - Tamarack Bogs contribute variation to the habitats of large, mobile animals. Breeding birds include a suite of northern species typical of conifer forests.

Public Access: Cookson State Forest, New Marlborough; Otis State Forest, Otis; Muddy Brook WMA, Hardwick; Ware River Watershed (Dept. of Conservation and Recreation), Rutland and Oakham.

Threats: Nutrient input from surroundings would damage the peat. Changes in hydrology that might either flood or drain peatlands such as road construction or nearby water withdrawal.

Management Needs:

USNVC/NatureServe: A3418 *Picea rubens* Northern Appalachian Swamp Forest Alliance *Picea mariana*/(*Vaccinium corymbosum*, *Gaylussacia baccata*)/*Sphagnum* spp. Woodland



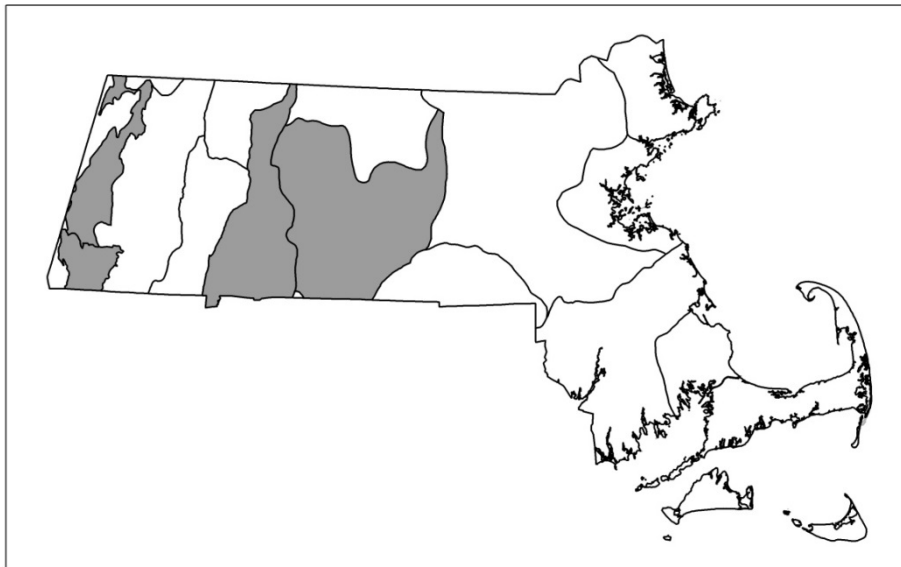
(CEGL006098); northern MA *Picea mariana* - (*Larix laricina*)/*Ledum groenlandicum*/*Sphagnum* spp. Forest. (CEGL005271) [NatureServe maps as further north].



Transitional Floodplain Forest

Community Code: CP1A2B2000

State Rank: S2



Concept: Silver maple-green ash-American elm forests occurring on alluvial soils. Transitional Floodplain Forests are intermediate in vegetation composition and soils between Major- and Small-river Floodplain Forest types.

Environmental Setting: Transitional Floodplain Forests are known to occur on third-order or smaller tributaries of the Connecticut River, on portions of the Housatonic River, and in depressions within Major-river Floodplain Forests of the Connecticut and Deerfield Rivers. Sites generally experience annual flooding. The severity of flooding, soil texture, and soil drainage of Transitional Floodplain Forests is intermediate between Major-river and Small-river Floodplain Forests. Soils are either silt loams or very fine sandy loams, and soil mottling is generally present within 60 cm (2 ft.) of soil surface. A surface organic layer is typically absent.

Vegetation Description: All floodplain forest communities in Massachusetts have silver maple (*Acer saccharinum*) as the dominant tree taxon, but associated plant species vary depending on the intensity and duration of flooding and on geographic location. Transitional Floodplain Forests have a vegetation association intermediate between Major-river and Small-river Floodplain Forests. Silver maple is dominant in the canopy, but unlike in major-river forests, cottonwood (*Populus deltoides*) is typically absent. Similar to Small-river Floodplain Forests, green ash (*Fraxinus pennsylvanica*) and American elm (*Ulmus americana*) are in the canopy and subcanopy. A shrub layer is generally lacking; however, saplings of overstory trees are common. Vines are abundant with hog peanut (*Amphicarpaea bracteata*) most common and poison ivy (*Toxicodendron radicans*) regularly present. The herbaceous layer is typically an even mixture of wood-nettle (*Laportea canadensis*), ostrich fern (*Matteuccia*



struthiopteris), sensitive fern (*Onoclea sensibilis*), and false nettle (*Boehmeria cylindrica*). Occasional associates include Gray's sedge (*Carex grayi*), cattail sedge (*Carex typhina*), and green dragon (*Arisaema dracontium*).

Differentiating Occurrences: Small-river, Transitional, and Major-river Floodplain Forests all occur along rivers with active annual flooding and silt deposition. They differ in the size of river on which they occur and in the flooding severity. They are points in a continuum of scouring and drainage. Transitional Floodplain Forest soils are intermediate in severity of flooding, soil texture, and drainage, usually without a surface organic layer. Cottonwood is usually absent, but ash and elm trees are present. Tree saplings are common but shrubs are generally absent. The herbaceous layer is a mix of species. Small-river Floodplain Forests occur on small rivers where banks are low and overbank flooding occurs annually, but with limited water volume and scour. Soils are hydric silt or fine sandy loams, sometimes with a surface organic layer. They also lack cottonwood and have ash and elm trees, but have a distinct shrub layer and a diverse herbaceous layer. Major-river Floodplain Forests occur along large rivers with severe flooding and scouring. Soils are predominantly not hydric and lack a surface organic layer. Cottonwood can be common in the canopy with silver maple, but few other trees are present. A shrub layer is usually absent and the herbaceous layer is often dominated by a near monoculture of wood nettle. High-terrace Floodplain Forests are on high alluvial terraces that do not flood annually and then only for a short duration. They have upland trees such as sugar maple as well as floodplain species. They have more litter accumulated than other floodplain forests. Alluvial Red Maple Swamps along low-gradient rivers flood annually and are slow to drain. Silver maple is often a codominant with red maple. Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year. Black cherry and white pine are abundant in the canopy with red maple, but not silver maple.

Associated Fauna: Floodplain forests are often part of the habitat of wide-ranging riverine and upland animals, providing sheltered, riverside corridors for deer and migratory songbirds. Floodplain forests are insect-rich habitats that attract warblers, thrushes and other songbirds. Yellow-throated and Warbling Vireos nest in the canopies of riverside trees. Raptors such as Bald Eagles use riverbank trees as nest and perch sites. In spring floods, Wood Ducks and Hooded Mergansers like the shady edges of floodplain forests and the interior meander scar pools. Eastern comma butterflies feed on elm, nettles and hops, and the shady riverbanks are patrolled by several dragonfly species such as ocellated and fawn darners. Where vernal pools occur in floodplain forests, such as meander scars or backwater sloughs, leopard, pickerel and green frogs, American toads, and mole salamanders can be found. Changes in water quality and quantity alter herbaceous, and eventually tree, species, changing habitat for birds and browsers, such as deer and rabbits.

Public Access: George L. Darey Housatonic Valley WMA, Lenox; Canoe Meadows Wildlife Sanctuary (Massachusetts Audubon Society), Pittsfield; Connecticut River Access–Montague (along the Sawmill River), Montague.



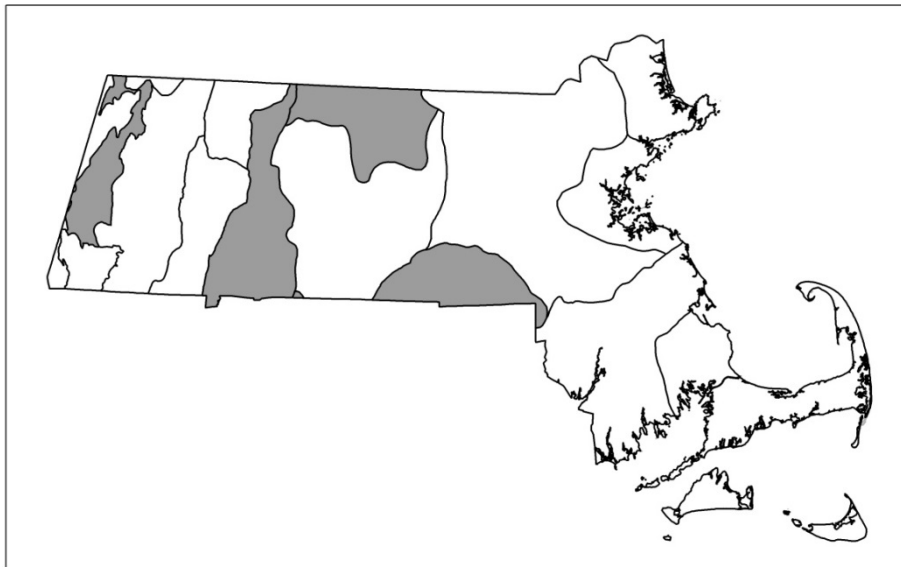
Threats:	Threats are similar to those for Major-river Floodplain Forests. Non-native plant species can be abundant in disturbed, open areas. The most common non-native plant species are moneywort (<i>Lysimachia nummularia</i>), forget-me-not (<i>Myosotis scorpioides</i>), and glossy buckthorn (<i>Frangula alnus</i>).
Management Needs:	All efforts should be made to mechanically remove non-native plant species and to prevent further clearing.
USNVC/NatureServe:	Similar to <i>Acer (rubrum, saccharinum) - Ulmus americana</i> Temporarily Flooded Forest Alliance -- <i>Acer saccharinum-Ulmus americana/Onoclea sensibilis</i> Forest [CEGL006001], and <i>Acer rubrum - Fraxinus pennsylvanica</i> Seasonally Flooded Forest Alliance <i>Acer (rubrum, saccharinum) - Fraxinus pennsylvanica - Ulmus americana/Boehmeria cylindrica</i> Forest [CEGL006548].



Wet Meadow

Community Code: CP2A0A2000

State Rank: S4



Concept: Graminoid/emergent herbaceous communities that are similar to Deep and Shallow Emergent Marshes, except that they are temporarily rather than seasonally flooded. The soil is saturated during the growing season but not generally inundated. Repeated disturbance, usually from grazing or mowing, keeps these communities open.

Environmental Setting: Wet Meadows occur in lake basins, wet depressions, along slow-moving streams, and in sloughs and other areas with impeded drainage along rivers. The mucky mineral soils are permanently saturated and flood occasionally, but standing water is not present throughout the growing season as in Deep and Shallow Emergent Marshes. As Wet Meadows flood only temporarily, woody plants could become established: many sites are managed using other forms of repeated disturbance, including grazing or mowing, to prevent succession to shrubs or woodland.

Vegetation Description: Wet Meadows are often uniform-appearing communities dominated by a single species from the sedge family or sometimes a rush or a grass. Tussock-forming sedges, such as tussock-sedge (*Carex stricta*) or lakeside sedge (*Carex lacustris*), often have over 50% cover, with variable proportions of other graminoids and herbaceous species. Canada bluejoint (*Calamagrostis canadensis* var. *canadensis*), wool-grass (*Scirpus cyperinus*), woolly-fruited sedge (*Carex lasiocarpa* ssp. *americana*), slender spike-sedge (*Eleocharis tenuis* var. *tenuis*), stalked wool-grass (*Scirpus pedicellatus*), rice cut-grass (*Leersia oryzoides*), and brown beak-sedge (*Rhynchospora capitellata*) are typical of wet meadows and may occasionally be dominant. Characteristic herbaceous associates include water smartweed (*Persicaria amphibia*), river-horsetail (*Equisetum fluviatile*), nodding bur-marigold



(*Bidens cernua*), spotted joe-pye-weed (*Eutrochium maculatum*), and northern blue flag (*Iris versicolor*). Calcareous wet meadows have additional lime-loving species, including red-footed spike-sedge (*Eleocharis erythropoda*), delicate sedge (*Carex leptalea* ssp. *leptalea*), and fen-sedge (*Carex tetanica*). Wet Meadows are called "sedge meadows" in many other states, but "wet meadow" is used in Massachusetts because of known occurrences of meadows dominated by rice cut-grass, Canada bluejoint, and other non-sedge species.

Differentiating Occurrences: The physical and biological characteristics of Wet Meadow, emergent marsh, and shoreline communities overlap and intergrade. The vegetation for all these types is broadly defined: focused surveys might establish which dominant species and hydrological situations define identifiable community types, or might determine that there is a continuum of types that require arbitrary separation. Wet Meadows are graminoid wetland communities similar to, and could be considered to be subtypes of, Shallow Emergent Marshes, but typically a single sedge or grass species dominates. Standing water is not present throughout the growing season as in emergent marshes. Kettlehole Wet Meadows, a specialized type of Shallow Emergent Marsh, are in small basins that have dense graminoid marshes on mucky peat. They are temporarily inundated after storms as well from high groundwater. Shallow Emergent Marshes are graminoid wetlands in broad, flat areas bordering rivers or along lake margins, are seasonally flooded, and usually have surface water all year. Coastal Plain Pondshore Communities and Coastal Plain Pondshores - Inland Variant are generally on sand around ponds in closed basins that intersect groundwater which affects pond levels. By late summer, an exposed shoreline supports herbaceous species that is not generally dominated by tall dense graminoids. Sediments are sandy or mucky, but not peaty. Acidic Pondshores/Lakeshores are broadly defined, variable shorelines around open water not explicitly included in calcareous or coastal plain pondshores. The shore line is often not distinct, merging into marsh or other wetlands.

Associated Fauna: Many animals, vertebrates, and invertebrates, common and rare, use Wet Meadows and marshes for feeding, nesting, roosting, cover, and movement corridors. The sedges, bulrushes and grasses of Wet Meadows provide a food resource for a variety of marsh birds. Large patches of Wet Meadow are the key habitat for such species as Wilson's Snipe and Sedge Wren. Inconspicuous ("secretive") water birds, such as rails and bitterns, nest in Wet Meadows and marshes that lack human disturbance.

Public Access: Hop Brook WMA, Lee; Ashburnham State Forest, Ashburnham.

Threats: Wet Meadows are threatened by filling and dredging, and by nutrient inputs from adjacent roads, fields, or septic systems. The invasion and spread of purple loosestrife (*Lythrum salicaria*) alters community structure and composition.

Management Needs: Efforts are needed to control the spread of purple loosestrife. Continue activities that have kept the community open, e.g., fall mowing.



USNVC/NatureServe:

G771, Includes: (part of) A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Herbaceous Alliance, *Carex stricta* - *Carex vesicaria* Herbaceous Vegetation [CEGL006412]. A1399 *Leersia oryzoides* - *Glyceria striata* Herbaceous Alliance, *Leersia oryzoides* - *Sagittaria latifolia* Herbaceous Vegetation [CEGL006461].