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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.

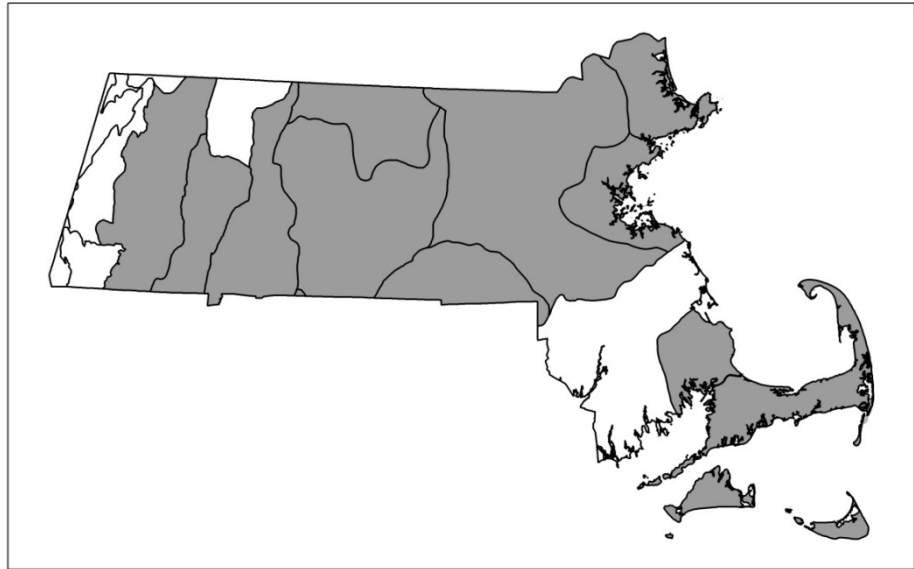
**USNVC/NatureServe:** A.1386 - *Scirpus cyperinus* Seasonally Flooded Herbaceous Alliance, *Scirpus cyperinus* Seasonally Flooded Herbaceous Vegetation [CEGL006349]; (part of) A4107 *Carex* spp. - *Calamagrostis canadensis* Eastern Wet Meadow Herbaceous Alliance, *Carex stricta* - *Carex vesicaria*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











**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: CEGLO06502 *Acer rubrum* - *Fraxinus nigra* - (*Tsuga canadensis*)/*Tiarella cordifolia* Forest. Related to *Acer rubrum* - *Fraxinus pennsylvanica* Seasonally Flooded Forest Alliance CEGLO06630: *Acer (rubrum, saccharinum)* - *Fraxinus pennsylvanica*/*Ilex verticillata*/*Osmunda regalis*/Forest and Midwestern CEGLO02098- *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*).



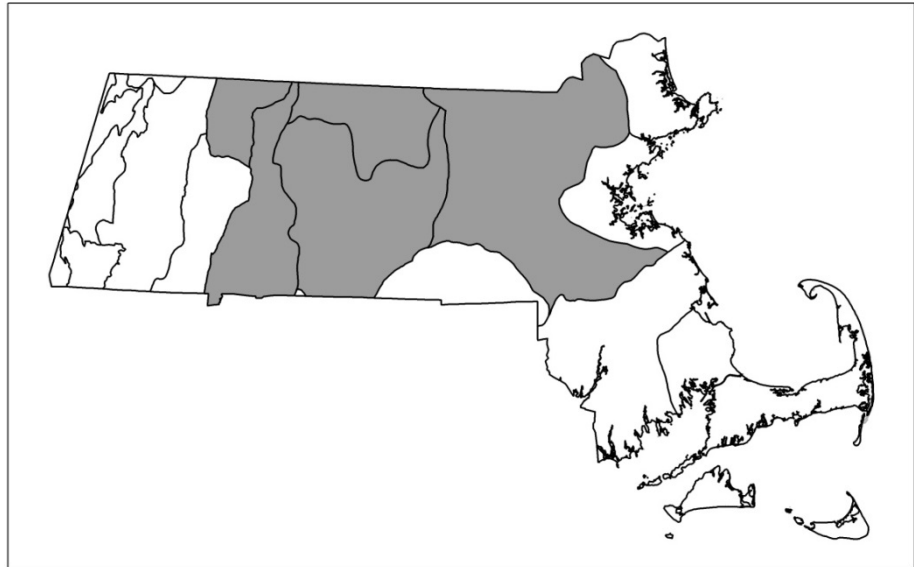
- Associated Fauna:** Calcareous seepage swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
- Public Access:** Due to the sensitivity of calcareous wetlands to damage from visitation, most land 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 (*Lythrum salicaria*), Tatarian honeysuckle (*Lonicera tatarica*), and Morrow's honeysuckle (*Lonicera morrowii*). Phragmites (*Phragmites australis*) is also an aggressive exotic in disturbed forested fens.
- Management Needs:** Removal/control of non-native plant species, especially phragmites.
- USNVC/NatureServe:** *Fraxinus nigra* - *Acer rubrum* Saturated Forest Alliance -- *Fraxinus nigra*-*Acer rubrum*-(*Larix laricina*)/*Rhamnus alnifolia* 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; however, 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.



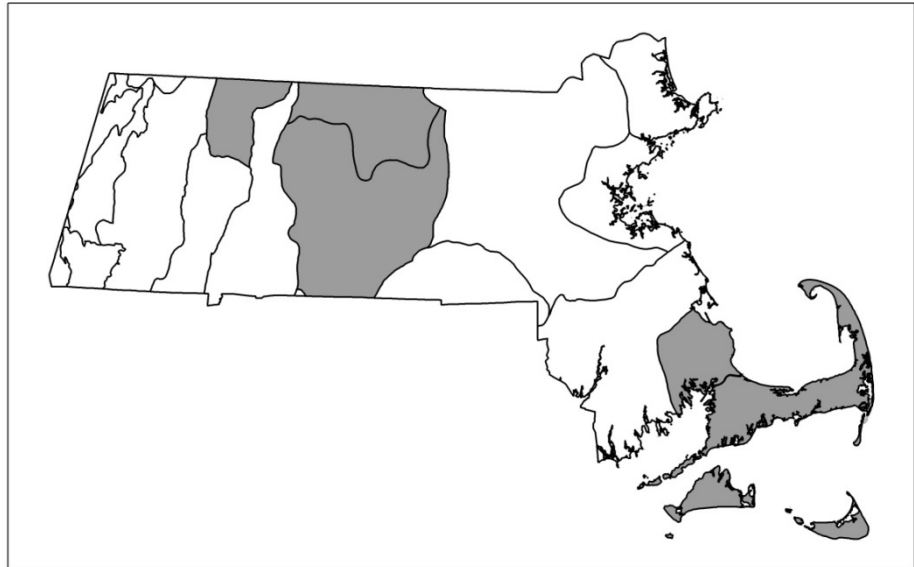
<b>Associated Fauna:</b>	Red Maple - Black Ash Swamps can function as vernal pool habitat if water remains standing for 2-3 months and they lack fish; these areas provide important amphibian breeding habitat.
<b>Public Access:</b>	Oxbow National Wildlife Refuge, Harvard; Tully Lake Reservation (US Army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

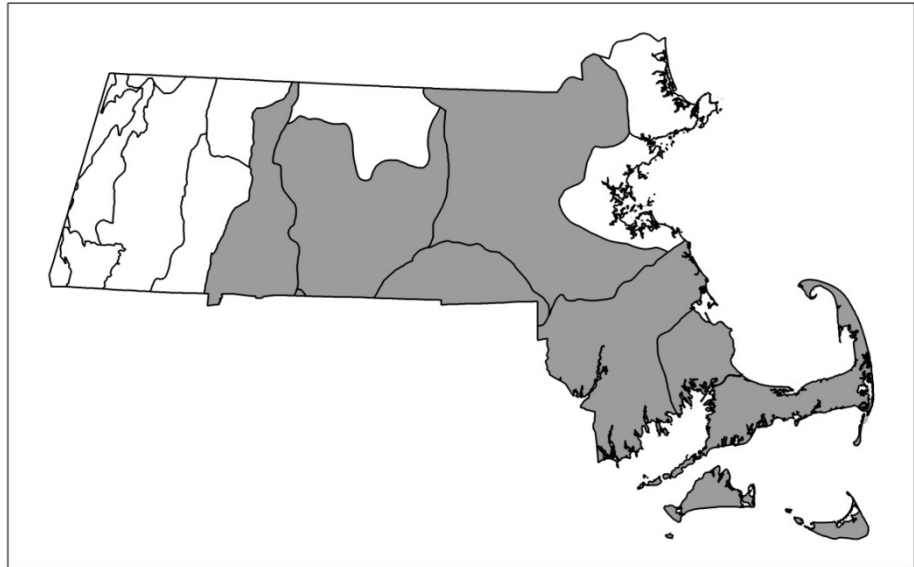
*Acer rubrum* - *Nyssa sylvatica* Saturated Forest Alliance -- *Acer rubrum*-*Nyssa sylvatica*-*Betula alleghaniensis*/*Sphagnum* spp. Forest [CEGL006014] and *Acer rubrum* - *Nyssa sylvatica*/*Rhododendron viscosum* - *Clethra alnifolia* Forest [CEGL006156].



## 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:**

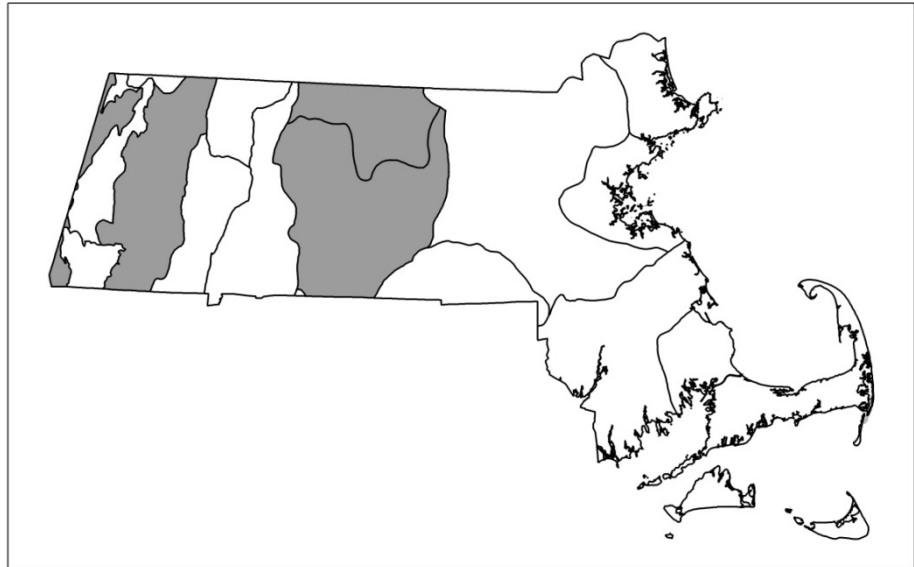
*Acer rubrum/Nemopanthus mucronatus - Vaccinium corymbosum* Forest (CEGL006220); *Acer rubrum/Carex stricta - Onoclea sensibilis* Woodland (CEGL006119); *Acer rubrum/Carex lacustris* Woodland (CEGL006105).



## 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 hispida*), 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.

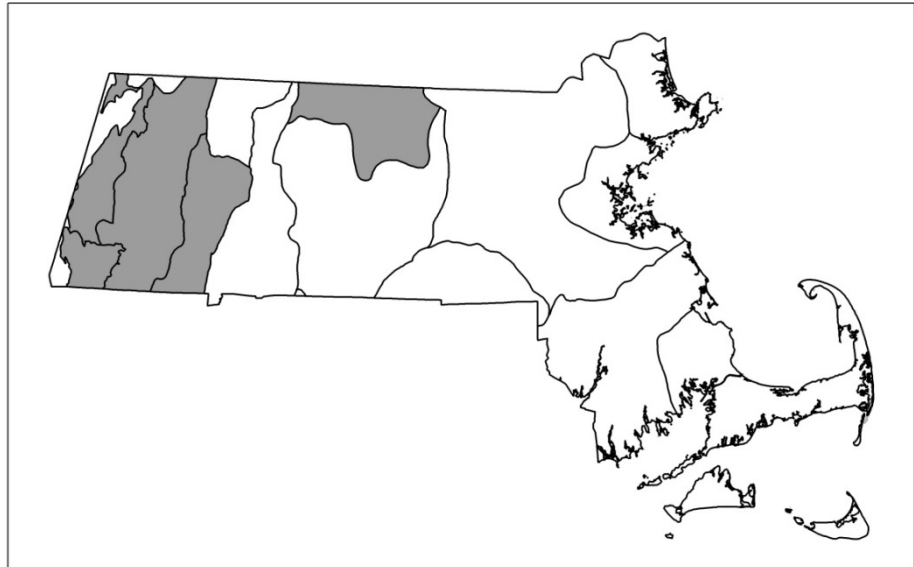
**USNVC/NatureServe:** *Picea rubens* - *Abies balsamea* Saturated Forest Alliance -- *Picea rubens*-*Abies balsamea*/*Gaultheria hispidula*/*Sphagnum* spp. [CEGL006312]; *Picea rubens* - *Acer rubrum*/*Nemopanthus mucronatus* Forest [CEGL006198].



## 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:**

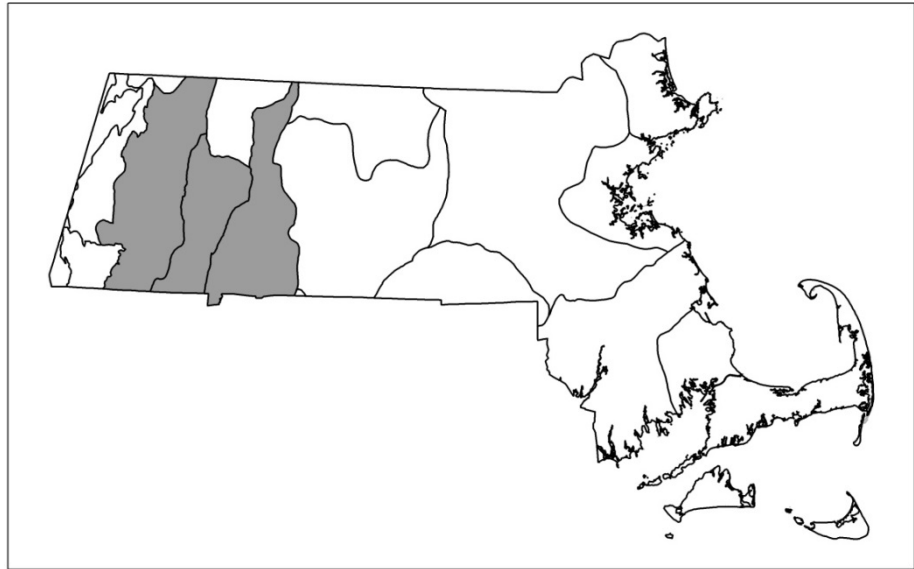
**USNVC/NatureServe:** Related to: River Mudflats Sparse Vegetation [CEGL002314]; Lake Mudflats Sparse Vegetation [CEGL002313]; Inland Freshwater Strand Beach Sparse Vegetation [CEGL002310]. Included in the broadly described: *Lysimachia ciliata* - *Apocynum cannabinum* Sparse Vegetation [CEGL006554];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

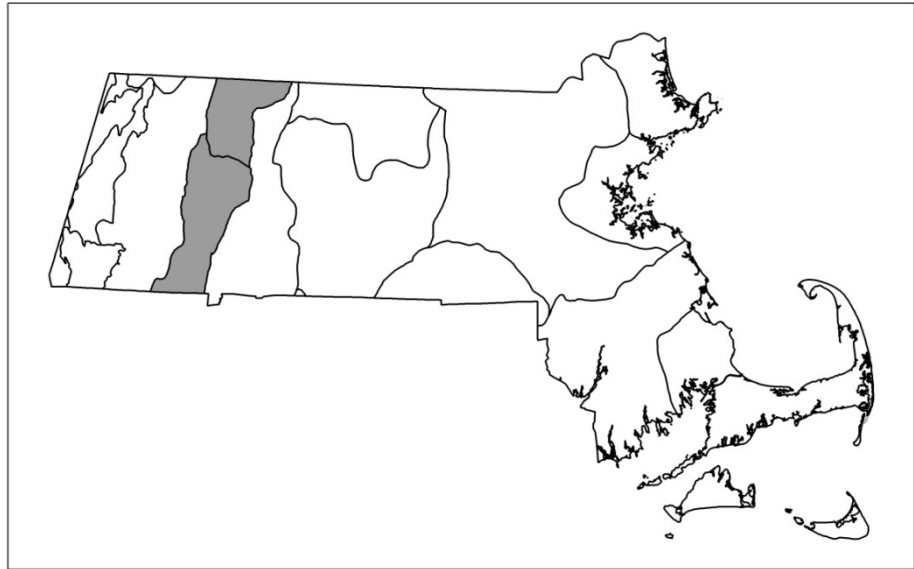
**USNVC/NatureServe:** Inland Freshwater Strand Beach Sparse Vegetation (CEGL002310). Included in the broadly described: *Lysimachia ciliata* - *Apocynum cannabinum* sparse vegetation (CEGL006554); Related concept to: Riverine Sand Flats - Bars Sparse Vegetation (CEGL002049).



## 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 pennsylvanica*), 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:** CP2BOB3000

**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 (*Symphotrichum 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:**

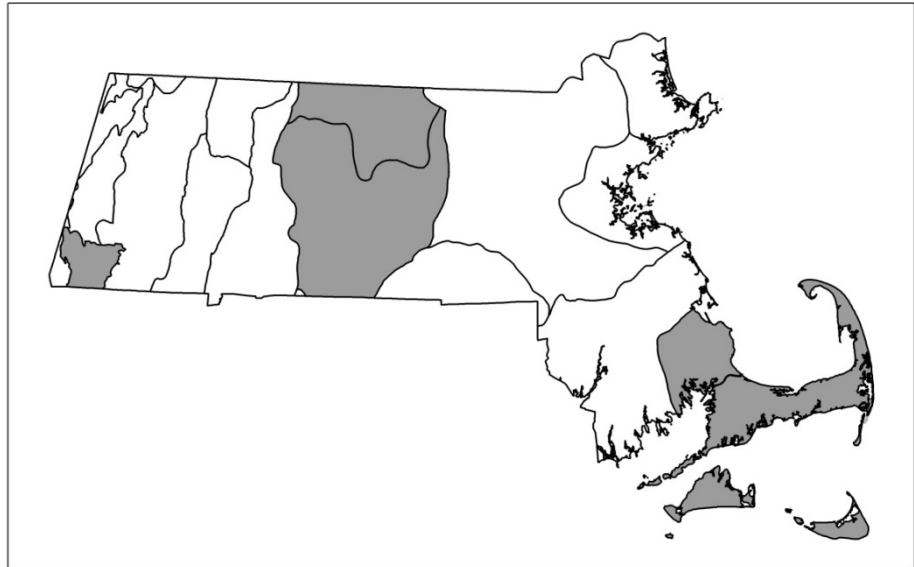
*Cladium mariscoides*-*Drosera intermedia*-*Eleocharis rostellata* herbaceous  
vegetation [CEGL006310]. G1 (2014).



## 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.



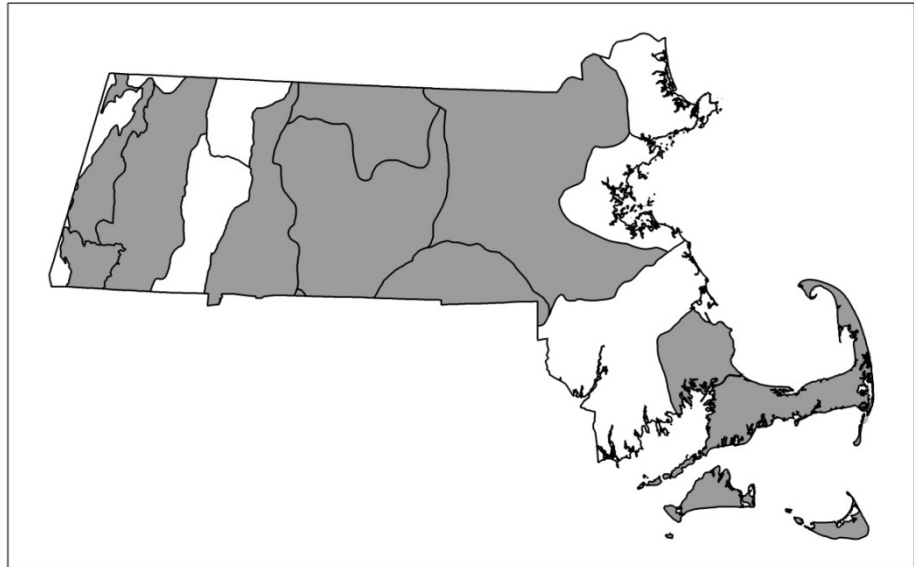
- Threats:** Shallow Emergent Marshes are threatened by filling and dredging, impoundments that alter natural water-level fluctuations, and nutrient inputs from adjacent roads, fields, or septic systems. The invasion and spread of purple loosestrife (*Lythrum salicaria*) alters natural community structure 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 (*Phalaris arundinacea*), common buckthorn (*Rhamnus alnifolia*), glossy buckthorn (*Frangula alnus*), and purple loosestrife (*Lythrum salicaria*).

**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:**

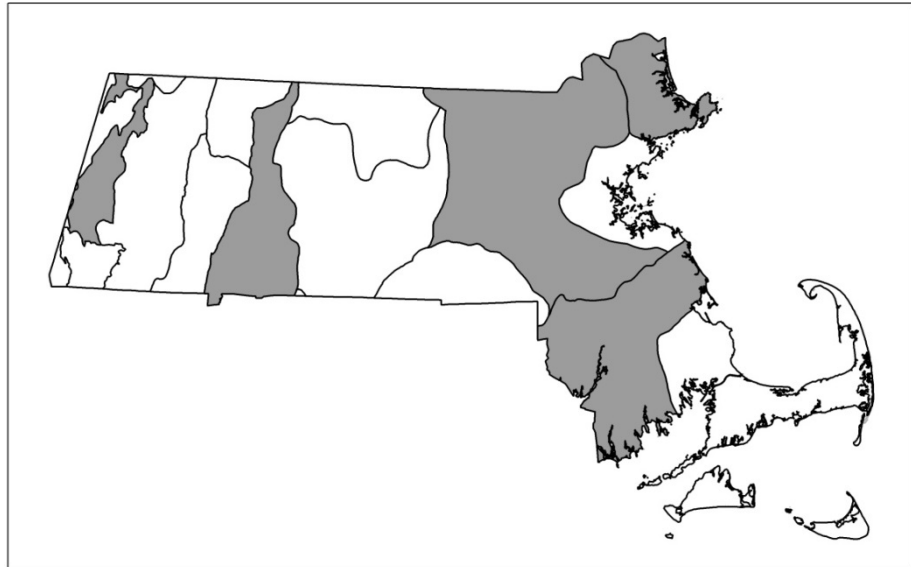
G167: Northern and Central Shrub Swamp - *Alnus incana* Swamp Shrubland [CEGL002381]; *Alnus serrulata* Eastern Shrubland [CEGL005082]; *Cephalanthus occidentalis* Semipermanently Flooded Shrubland [CEGL003908]; *Decodon verticillatus* Semipermanently Flooded Shrubland [CEGL005089]; *Cornus (amomum, sericea) - Viburnum dentatum - Rosa multiflora* Ruderal Shrubland [CEGL006576]; *Cephalanthus occidentalis - Decodon verticillatus* Shrubland Northeastern Buttonbush Shrub Swamp [CEGL006069]; *Alnus incana - Cornus (amomum, sericea)/Clematis virginiana* Shrubland [CEGL006062]; *Alnus incana - Viburnum recognitum/Calamagrostis canadensis* 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:**

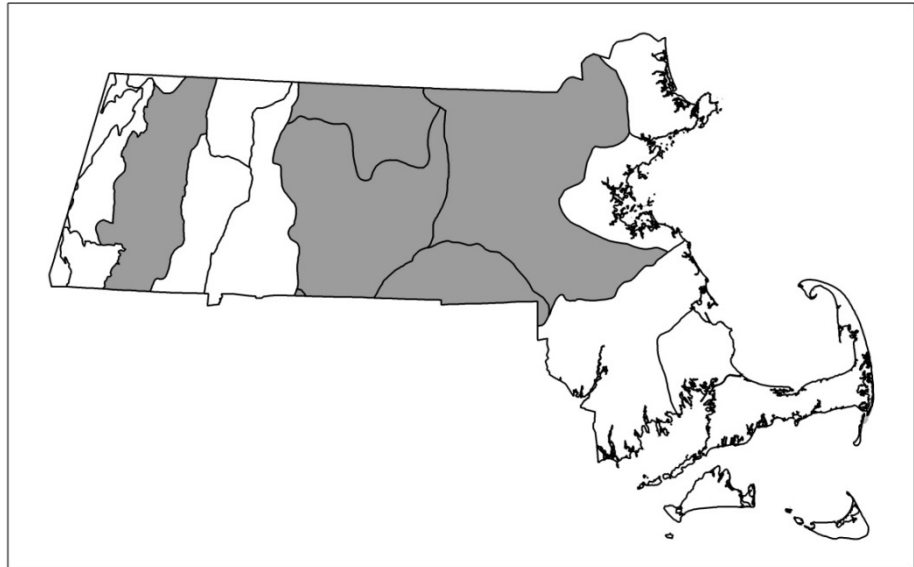
Similar to *Quercus palustris* - *Acer rubrum* Temporarily Flooded Forest Alliance -- *Quercus palustris*-*Acer rubrum*/*Carex grayi*-*Geum canadense* Forest [CEGL006185] and to *Acer saccharinum* Temporarily Flooded Forest Alliance -- *Acer saccharinum*/*Onoclea sensibilis* - *Boehmeria cylindrica* 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 (*Nemopanthus 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.



<b>Threats:</b>	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> ).
<b>Management Needs:</b>	All efforts should be made to mechanically remove non-native plant species and to prevent further clearing.
<b>USNVC/NatureServe:</b>	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].