Appendix 3: Key to the Identification of Natural Communities

Keys to the descriptions of the natural communities of Massachusetts are intended to assist users in identifying the natural communities that they encounter in the state. As with the classification, the keys are intended to be used by anyone with an interest in conservation and a familiarity with the plants of Massachusetts. The keys lead to named natural community types, and on the NHESP website are linked to illustrated fact sheets describing the natural community in more detail than available in the key.

The keys to the natural communities follow a typical pattern of taxonomic keys; that is, they are dichotomous, consisting of pairs of diverging options (couplets) requiring choices between the options given. Both choices should be considered with the best fit for the observed community being followed to the next couplet in the key (identified by a code on the far right of the page), or to a named community type that will be linked to the fact sheet for that community.

Because defined natural communities are parts of gradients in time and space and the definitions are based on both generalization of occurrences and idealization of the types, there are seldom exact fits between concrete examples (occurrences) and the definitions. Also, transitional areas - physical and biological - abound on the landscape and add great confusion to attempts to classify the natural communities formed by the vegetation. The named classified community types are defined from descriptions made at the 'best' or core areas: identification of communities located on the ground should then also use the core areas of those communities, not edges or areas of transition to adjoining community occurrences. Information on locations provided in the descriptions and as part of the key is for guidance. Reforestation after land clearance led to widespread vegetation homogenization and expansion of the broad transitional areas. In addition, patches of many community types naturally occur outside of the main areas of distribution when conditions (particularly moisture, temperatures, and soils) are appropriate and the plants that make up the communities are dispersed to them.

Very general numbers are used to divide community types in the keys. They are round numbers, for guidance not meant to be absolutely precise. For example, "about 25% cover by woody plants >5m tall" was used as the separators between forested and not forested. These are meant to be guides; they are approximate both in the field and the classification.

Cover by a vegetation layer refers to the estimated percentage of ground (looking down) or sky (looking up) visually blocked by the particular layer of focus. In the case of a community being described, the coverage of a layer is intended to be estimated over the entire occurrence. That is, if it is the cover of the tree canopy that is being estimated, the observer should move or look around to see if the canopy cover is consistently above or below the 25% threshold for determining whether the occurrence is a forest or not. The same is true for the other vegetation layers that are used to define the structure of a community.

Keys and descriptions for other states and the US National Vegetation Classification, and in forestry manuals may use different numbers as criteria for separating structural types. The purposes of the classifications may be different (for example, differentiating forests from woodlands or from parklike savannas), or it may be that what seems forested in different places is different. No one is wrong; these are the results of trying to impose order on a not all that cooperative nature.

Some community types are reached through multiple approaches in the key (that is, some woodlands and shrublands can be reached through either the forest or shrubland keys and some shrublands and open herbaceous communities are in both shrubland and open keys).

If the community reached at the end of keying does not seem to be the correct fit, it is worth keeping track of that result while going back through the key to see if a different choice or choices might have been reasonable and following that path to a different community that can be compared. Or, an unknown community that does not fit the described communities may be intermediate between two community types and may be described as such. There are several broadly defined communities (such as Northern Hardwood – Hemlock – White Pine Forest or Oak – Hemlock –White Pine Forest) that have recurrent variations that are named as natural community types. If a community occurrence does not match a named variant of a broadly defined type, it can be placed in the broadly defined types that capture their main characteristics. The broadly defined types are often the common types and most often encountered. This classification was designed to identify uncommon types of natural communities for conservation attention: the more common types are often of conservation interest if in excellent condition, large, not fragmented (especially for forests), and in very good landscape context (not impinged on by human disturbance factors).

Organization of the Classification

As in the previous versions of the *Classification of Natural Communities of Massachusetts*, natural community **types** are divided into three major categories or systems: **Terrestrial**, **Palustrine**, and **Estuarine**. Within these categories the structural dominance – growth form or physiognomy such as forest, shrubland, and open herbaceous or sparsely vegetated – is used to identify structural groups within each system. The forested categories in the terrestrial and palustrine sections are each further subdivided by whether there is dominance by conifers (evergreens), deciduous trees, or a mix of both. Vascular plants compose the vegetation of the natural communities that are described in this classification (however, communities comprised of submerged vascular plants are not included, except for Seagrass Communities).

Different parts of the keys may follow different patterns of what is best suited for differentiation; location in the state or substrate type divide some groups of communities from others. More detailed information on species dominance and composition are generally used in later divisions and as the final determinant of type.

A significant presence of non-tidal freshwater is used to define the Palustrine system; the Estuarine system is defined by the presence of water with some salinity or tidal influence. All tidally influenced

communities are in the Estuarine system whether the tidal water is saline or fresh. Salt spray communities not influenced by tides are treated as terrestrial.

This classification includes neither Aquatic (deep water systems with primarily submerged or floating plants) nor Marine (open ocean) communities. National classifications of both have been undertaken by other organizations.

Terrestrial Key

- Occur in upland on predominantly well-drained (dry to mesic) soils
- Not significantly influenced by standing or moving water.
- Vegetation is not adapted to growing in water or on very wet substrates even if the soil surface is occasionally flooded or saturated.

Note: Does not include High-terrace Floodplain Forest (see Palustrine).

Palustrine Key

- All freshwater, non-tidal wetlands dominated by trees, shrubs, or persistent emergents, including mosses and lichens.
- Submersed and floating-leaved aquatics are considered to be aquatic and are not included in this classification.
- All tidal wetlands are included in the estuarine system.
- Riverside communities that receive annual or semi-annual overbank flooding, e.g. floodplain forests.

Notes: High-terrace floodplain forests (although technically terrestrial communities) are included in the palustrine section in order to group them with other floodplain forest communities. The term “wetland” is not used in the sense of a “jurisdictional wetland”, which has a legal definition.

Estuarine Key

- Estuarine wetlands are affected by salt or brackish water, or tidal flooding by salt, brackish, or freshwater.
- Estuarine areas extend landward and up streams to where oceanic salts (defined as > 0.5 ppt salinity in an annual average low flow period) or tides (including freshwater tidal areas) have an influence on the vegetation.
- Hyper-salinity (compared to the ocean) may occur temporarily in some areas (such as in salt ponds).

How to use this Key:

It is important to refer to the community descriptions in the main body of this classification as the final step in confirming a natural community determination. Those have more complete descriptions and more information about typically dominant, characteristic, and indicator species than do the keys.

The Key is formatted as follows:

Couplet Code. Description to note key distinguishing features: **Natural Community Name or next step**
Longer description of Natural Community

Similar Communities: Related Natural Community #1 brief description and how it is different. Related Natural Community #2 brief description and how it is different. Related Natural Community #3 brief description and how it is different.

In the couplet code, T stands for terrestrial communities; P for Palustrine communities; and E for Estuarine communities. Within each community system, forests come first, subdivided into dominant leaf-type groups for convenience. Several named community types are variable in the dominance of conifers and listed in several leaf-type sections for convenience in keying. Shrub-dominated communities follow, with open communities that have few (<25% cover) trees and tall shrubs, are herbaceous or low-shrub-dominated, or are sparsely vegetated, at the end of each system. Each of these codes lead to a specific couplet with two choices that meet previous requirements of steps up to that point.

Terrestrial System

T: Upland natural communities; on predominantly well-drained soils that are dry to mesic; vegetation is never hydrophytic even if soil surface is seasonally flooded or saturated.

T1a. Forests, Woodlands, Tall Shrublands. Trees or tall shrubs as uppermost layer (>~6ft (~2 m)); total woody cover of that layer >25%: **T2**
T1b. Open Uplands, Grasslands, Low Shrublands. Tree and tall shrub cover in the uppermost stratum <25%; uppermost vegetation stratum is strongly shrubby <2m tall, or herbaceous or sparse; open uplands, may have small islands of trees: **T50**

T2a. Forests and Woodlands. Tree canopy cover >25% (single trunks, >~15 ft. (~5m) tall): **T3**
T2b. Shrublands**.** Shrub cover >25% (<~15 ft. (~5m) tall), trees <25%: **T36**

T3a. Deciduous Forest and Woodland (trees >25% cover); broad-leaved (generally deciduous) trees >75% of the cover (several types also in the mixed forest key): **T4**
T3b. Conifer or Mixed Forest/Woodland. Trees >25% cover; conifer trees>25% of the cover: **T22**

T4a. Upland forest with upland trees, such as oaks, beech, or sugar maple, over a small area of wetland soil and wetland herbaceous layer: **Forest Seep Community**

Forest Seep Communities are small wetland areas that retain the canopy of the surrounding upland forest; although they are wet, they may not show up as wetlands on wetlands maps.

Similar Communities: Swamps have wetland tree species rooted in the wetland or seep; wetland trees contribute >25% of the canopy cover. Swamps are in the Palustrine system key. Riverside Seep Communities occur at the base of steep riverbanks where groundwater emerges from the upland slope; they are generally not forested. Many calcareous wetland communities receive seepage waters, but are defined as separate communities with distinct floras, in the Palustrine System. Rich, Mesic Forests on slopes can have seasonally seepy patches that are part of the forest variation and are not separated as distinct communities.

T4b. Deciduous upland forests without wetland soils and wetland herbaceous layer: **T5**

T5a. Deciduous forest directly along the coast in the regular salt spray zone or on dunes or barrier beaches: **Maritime Forest/Woodland**

Maritime Forests/Woodlands usually occur in a mosaic with other barrier beach, maritime, and/or coastal communities. Communities grade into other types in the mosaic, maturing and being reset to earlier successional stages by disturbance from storms, movement of sand, flooding, and drought. Determining actual boundaries among the communities in a maritime mosaic is difficult and may require arbitrary assignments. Patches that are <5000 ft^2 should be noted in descriptions, but considered to be part of the variation of the surrounding community. Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and have stunted canopies (often <~30 ft. (~10m) tall, or the height of surrounding dunes) of mixed tree species.

Similar Communities: Maritime Pitch Pine Woodlands on Dunes are dominated by pitch pine, have sparser canopies, and are usually quite exposed and close to the ocean. Maritime Juniper Forest/Woodlands are dominated by red cedar and are usually close to the ocean. Maritime Shrublands are dominated by shrubs and have <25% tree canopy. Coastal Forest/Woodlands are further from the coast and are not affected by salt spray on a daily basis. They have taller trees and a shrub layer consisting primarily of low bush blueberry and black huckleberry.

T5b. Deciduous forest not receiving regular salt spray from the ocean, and not on dunes or barrier beaches: **T6**

T6a. Deciduous forest at low (<60 ft.) elevation near the coast, receiving salt and wind from storms, but not daily: **Coastal Forest/Woodland**

Coastal Forest/Woodlands grade into Maritime Forests/Woodlands along the coast, in the areas of daily salt spray, and they grade into forests of the oak and oak-pine continuum on the inland side. Edges of communities on the ground may be difficult to differentiate requiring arbitrary determinations of boundaries. Small patches (<5000 ft^2) of different types should be noted in descriptions, but considered as part of the variation of the prevailing community. Coastal Forest/Woodlands are within a few miles of the coast at <~60 ft. elevation and are not affected by salt spray on a daily basis, but receive storm winds with salt spray. They are predominantly deciduous forests with canopies usually at about 30-60 ft. (~10-20m) and an often dense shrub layer consisting primarily of low bush blueberry and black huckleberry.

Similar Communities: Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and often have stunted (often <~30 ft. (10m) canopies of mixed tree species. Oak - Hemlock - White Pine Forests and its named variants (including but not limited to) Pitch Pine - Oak Forests, White Pine - Oak Forests, and Mixed Oak Forests abut and grade into Coastal Forests. They receive much less storm spray and mature examples are taller than ~60 ft. (~20m).

T6b. Deciduous forest at >60 ft. elevation, occurring inland from the ocean and not regularly affected by storm winds off the ocean: **T7**

T7a. Forests with multiple species of oaks, mixed with sugar maple in the canopy: **T8**
T7b. Forests dominated by either central hardwoods (oaks, not including red oak, with hickories) or northern hardwoods (including sugar maple and white ash; red oak may be present as an associate), not mixed deciduous and coniferous species. (Red maple and beech are not useful indicators.)**: T10**

T8a. Deciduous forest dominated by sugar maple and white ash with scattered basswoods, a mix of black, white, and other oaks, and shagbark, pignut and/or mockernut hickories: **Sugar Maple - Oak - Hickory Forest**

Similar Communities: Sugar Maple - Oak - Hickory Forests are diverse forests in central and eastern Massachusetts where conditions, including nutrient richness, support northern hardwood species mixed with species of Oak - Hickory Forests. Broad-leaved woodland-sedge is close to being an indicator of Sugar Maple - Oak - Hickory Forest. Rich, Mesic Forests in Massachusetts are mostly west of the Connecticut River Valley, while Sugar Maple - Oak - Hickory Forest is to the east. The presence of multiple species of hickories and oaks in Sugar Maple - Oak - Hickory Forests is a main difference between these two types. Oak - Hickory Forests and Dry, Rich Oak Forests lack abundant sugar maple, white ash, and scattered basswood, and lack spring ephemerals and herbaceous species indicative of rich conditions, such as herb Robert and bloodroot.

T8b. Red oak is the dominant oak growing mixed with sugar maple, scattered white ash, and occasional white and black oaks: **T9**

T9a. Tall deciduous forest dominated by a mix of red oak and sugar maple with other oaks, beech, and birches: **Red Oak - Sugar Maple Transition Forest**

Red Oak - Sugar Maple Transition Forest has a closed (>75% cover) canopy dominated by (>~25% cover) of northern red oak, with sugar maple, and variable proportions of beech, black birch, red maple, and other associates.

Similar Communities: Oak – Tulip Tree Forests are similar but have tulip trees emergent above the canopy, and often present in all the vegetation layers. They often have a mix of northern and more southern or coastal species (called central hardwoods) in all layers. Northern Hardwood - Hemlock - White Pine Forest has fewer oaks and fewer species of oak. Hemlock and white pine are generally present. Oak - Hemlock - White Pine and other oak forests have much less red oak, sugar maple, and other northern hardwoods, and usually have abundant blueberry family shrubs. Sugar Maple - Oak - Hickory Forest includes multiple species of hickories and oaks in more abundance than occur in Red Oak - Sugar Maple Transition Forest. They tend to occur to the south and east in the state, but overlap with the distribution of Red Oak - Sugar Maple Transition Forest. Red Oak - Sugar Maple Transition Forests are more dominated by red oak and appear to be more acidic, less nutrient-rich, and less diverse than Sugar Maple - Oak - Hickory Forests, with undecomposed oak leaves covering the forest floor.

T9b. Tall red oak forest with tulip trees emerging above the canopy; canopy has a mix of oaks and northern hardwoods: **Oak - Tulip Tree Forest**

Oak - Tulip Tree Forests are distinguished by multiple mature tulip trees (not just occasional individuals) with a strong dominance of red oak (>25%), in association with both northern and central hardwoods.

Similar Communities: Red Oak - Sugar Maple Transition Forest is very similar but lacks tulip trees, and tends to have a less strong mix of species of northern areas (such as mountain and striped maples, and bluebead lily) combined with more southern or coastal species (such as tulip tree and sassafras). Other types of oak forest lack large populations of tulip trees and sugar maples, and tend to have more ericaceous shrub species.

T10a. Deciduous forest dominated by oak trees (but red oak is not a dominant) or with an abundance of oaks of multiple species, including red oak, in the canopy. Typically in eastern, central, or southern Massachusetts, or on south-facing slopes in the west, north, or at elevation: **T11**

T10b. Deciduous forest dominated by northern hardwoods such as sugar maple and white ash, typically in the western or northern parts of the state or at elevation or on north facing slopes: **T19**

T11a. Yellow oak is in the forest canopy, on marble or limestone hills in the Western New England Marble Valley of the Hudson Highlands Ecoregion (southern Berkshire County): **Yellow Oak Dry Calcareous Forest**

In Massachusetts, Yellow Oak Dry Calcareous Forests occur only in southern Berkshire County on calcium-rich bedrock, usually on upper slopes and ridgetops. Yellow oak is the indicator and characteristic canopy and subcanopy species of Yellow Oak Dry Calcareous Forest and is seldom found growing in other communities. Other oak forests and woodlands are generally less diverse and lack species typical of calcium-rich environments, such as prickly ash, bladdernut, and pagoda dogwood, as well as yellow oak.

Similar Communities: In appearance, Yellow Oak Dry Calcareous Forest is similar to a Hickory - Hop Hornbeam Forest/Woodland in having a somewhat open canopy that includes hickories, a subcanopy with hop hornbeam, and an often sedge-dominated herbaceous layer. However, the yellow oak forest has a richer flora due to its calcareous substrate and, of course, yellow oak.

T11b. Deciduous oak forest without yellow oak or tulip trees in the canopy: **T12**

T12a. Oak forest/woodland of dry ridgetops and upper slopes, dominated by chestnut oak**: Chestnut Oak Forest/Woodland**

Although distinctive because of the dominance of chestnut oak and its usual upper slope and ridgetop position, Chestnut Oak Forest/Woodland is part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species.

Similar Communities: Mixed Oak Forests/Woodlands have more oak species (black, scarlet, white, red, and chestnut oak) and birches than most other types of oak forests and lack abundant pines or hemlock. Chestnut Oak is not dominant. Oak - Hemlock - White Pine Forests are dominated by a mix of tree oaks with scattered white pine and hemlock, either of which may be locally dense. Black Oak - Scarlet Oak Woodlands are distinguished by abundant scarlet oak with black oak, usually in woodlands (woodlands have shorter trees more widely spaced than in a forest). Open Oak Woodlands occur on upper hill slopes with short red (and black or hybrid) and white oak trees scattered over a low shrub or graminoid (grass and sedge) understory around small rock outcrops. Coastal Forests/Woodlands are within a few miles of the coast at <~60 ft. elevation and receive storm winds and spray. The diverse canopy includes oaks and often has American holly, sassafras, and black gum. White Pine - Oak Forests and Pitch Pine- Oak Forests have >25% cover of pines overall (not just local patches) and a mix of oak species where black oak is particularly important.

T12b. Oak forest/woodland not dominated by chestnut oak (or yellow oak or tulip tree)**: T13**

T13a. Oak woodland with a black and scarlet oak canopy over a blueberry shrub layer maintained by regular light fires**: Black Oak - Scarlet Oak Forest/Woodland**

Many types of oak communities grade into one another in time and space and are difficult to differentiate both in a classification and on the ground. They all have tree oaks and most have a low shrub layer dominated

by plants of the blueberry family. Black Oak - Scarlet Oak Woodland often occurs on dry slopes. Most canopy trees are relatively short (<~60 ft. (<20m)) and the cover is generally interrupted rather than continuous (~60 % cover). The subcanopy is sparse, and the low shrub layer dense.

Similar Communities: Open Oak Woodlands occur on upper hill slopes with short red (and black or hybrid) and white oak trees scattered over a low shrub or graminoid (grass and sedge) understory around small rock outcrops. Mixed Oak Forests/Woodlands have more oak species than Black Oak - Scarlet Oak Woodlands (black, scarlet, and white plus red oak and chestnut oak), and black birch. The type is broadly defined and Black Oak - Scarlet Oak Woodland could be considered as a defined subtype. Coastal Forests/Woodlands are within a few miles of the coast at <~60 ft. elevation and receive storm winds and spray. The diverse canopy includes oaks and often has American holly, sassafras, and black gum. Oak - Hemlock - White - Pine Forests are the most broadly defined in the continuum of oak-dominated forests; specific types are split out from this matrix type. Oak - Hemlock - White - Pine Forests is dominated by a mix of tree oaks with scattered white pine and hemlock, either of which may be in local dense patches. White Pine - Oak Forests have >25% cover of white pine overall (not just local patches). Pitch Pine - Oak Forests have>25% cover of pitch pine overall (not just local patches).

T13b. Deciduous oak forest or woodland not dominated by yellow oak, chestnut oak, red oak, or a mix of black and scarlet oak: **T14**

T14a. Oak woodland on gradual upper hill slopes below the summit, with short red, black, red-black hybrid, and white oak trees scattered over a huckleberry or other ericaceous low shrub layer or graminoid understory around small rock outcrops: **Open Oak Forest/Woodland**

Open Oak Forests/Woodlands are part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species. Many types of oak communities grade into one another in time and space and are difficult to differentiate both in a classification and on the ground. They all have tree oaks and a low shrub layer dominated by blueberry family plants. They often occur between a rocky summit and the surrounding taller forest.

Similar Communities: Black Oak - Scarlet Oak Woodlands are also predominantly woodlands, but not usually associated with rocky outcrops. Abundant scarlet oak with black oak is the key indicator of the type. Mixed Oak Forests/Woodlands have more oak species than Open Oak Woodlands (black, scarlet, and white plus red oak and chestnut oak), and black birch. They are not generally near the summits of hills with rock outcrops. Coastal Forests/Woodlands are within a few miles of the coast at <~60 ft. elevation and receive storm winds and spray. The diverse canopy includes oaks and often has American holly, sassafras, and black gum. Oak – Hemlock – White - Pine Forests are the most broadly defined in the continuum of oak-dominated forests; specific types are split out from this matrix type. Oak – Hemlock – White - Pine Forest is dominated by a mix of tree oaks with scattered white pine and hemlock, either of which may be in local dense patches. White Pine - Oak Forests have >25% cover of white pine overall (not just local patches). Pitch Pine - Oak Forests have>25% cover of pitch pine overall (not just local patches).

T14b. Deciduous oak forest or woodland not as described in the couplets above; not dominated by yellow oak, chestnut oak, red oak, a mix of black and scarlet oak, or a mix of short red and white oaks around rocky summits: **T15**

T15a. Deciduous oak forest/woodland with a closed to interrupted canopy formed by a variable mix of black, white, red, scarlet, and chestnut oak trees with black and white birches and red maple: **Mixed Oak Forest/Woodland**

Mixed Oak Forests/Woodland is a broadly defined tree oak-dominated community that grades into other more narrowly defined communities. They often occur in areas that burn regularly, with dry soils and exposed slopes. It is part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species. Mixed Oak Forests/Woodlands have more oak species than most other oak forests (black, scarlet, white, red, and chestnut oak), as well as birches. They lack abundant pines or hemlock, and lack hop-hornbeam and indicators of rich sites.

Similar Communities: Oak - Hemlock - White Pine Forest is the most broadly defined in the continuum of oak-dominated forests; specific types are split out from this matrix type. Oak - Hemlock - White Pine

Forest is dominated by a mix of tree oaks with scattered white pine and hemlock, either of which may be in local dense patches. Black Oak - Scarlet Oak Woodland is characterized by abundant scarlet oak with black oak dominating the open canopy. Open Oak Woodland occurs on upper hill slopes with short red, black, red-black hybrid, and white oak trees scattered over a low shrub or graminoid understory around small rock outcrops. Occurrences are often between a rocky summit and the surrounding taller forest. Coastal Forests/Woodlands are within a few miles of the coast at <~60 ft. elevation and receive storm winds and spray. The diverse canopy includes oaks and often has American holly, sassafras, and black gum. White Pine - Oak Forests have >25% cover of white pine overall (not just local patches). Pitch Pine - Oak Forests have>25% cover of pitch pine overall (not just local patches).

T15b. Deciduous oak forest or woodland not as described in couplets above; not dominated by yellow oak, chestnut oak, red oak, a mix of black and scarlet oak, a mix of short red and white oaks around rocky summits, or a mix of black, scarlet, white, red, and chestnut oaks and birches: **T16**

T16a. Highly variable mixed oak, red maple, and conifer forest with a generally closed canopy: **Oak - Hemlock - White Pine Forest**

Oak - Hemlock - White Pine Forest is the most broadly defined in the continuum of oak-dominated forests; specific types are split out from this matrix type. Oak - Hemlock - White Pine Forest is dominated by a mix of tree oaks with white pine and hemlock, either of which may be in local dense patches or locally absent. Oaks (white, scarlet, chestnut, black, and red), black birch, American beech, black cherry, and red maple form the canopy in association with scattered eastern hemlock and white pine. Relative proportions of the species vary greatly among sites.

Similar Communities: White Pine - Oak Forest has >25% cover of white pine overall (not just local patches). The rest of the related forest types in the oak continuum lack significant conifer presence. Oak - Hickory Forest is on the less acidic and moister end of the continuum of oak communities; it has hickories in at least low percentages in the canopy. Flowering dogwood and hop hornbeam are often present in the subcanopy. It generally has diverse shrub and herbaceous layers. Dry, Rich Oak Forest/Woodland is also on the less acidic end of the continuum of oak-dominated communities; it includes low percentages of sugar maple and white ash, and has a diverse herbaceous layer that includes false foxgloves and multiple legumes. Mixed Oak Forest/Woodlands tend to be on dry acidic soils and exposed slopes with an open canopy (<75% cover) and an understory dominated by heath species. Coastal Forest/Woodland is within a few miles of the coast at <~60 ft. elevation and receives storm winds and salt spray. The diverse canopy includes oaks, but also often has American holly, sassafras, and black gum. In the northern part of its range, the Oak - Hemlock - White Pine Forest tends to be on south-facing slopes and is surrounded by Northern Hardwood - Hemlock- White Pine Forest that is dominated by sugar maple and white ash. In Northern Hardwood - Hemlock- White Pine Forests, the only oak is red oak and the only hickory is bitternut hickory, which is not common in Oak - Hemlock - White Pine Forests.

T16b. Deciduous forest generally dominated by oaks or surrounded by oak forests, with a sparse shrub layer with few members of the blueberry family: **T17**

T17a. A somewhat open oak-dominated canopy with occasional sugar and red maples, American beech, hickories, and scattered eastern hemlock on southwest-facing mid-slopes with well-drained often rocky soils that appear to be slightly acidic and of intermediate fertility: **Dry, Rich Oak Forest/Woodland**

Dry, Rich Oak Forest is a deciduous, predominantly oak, forest with a rich understory of herbaceous plants, including legumes and graminoids. Dry, Rich Oak Forests are on the richer, less acidic end of a continuum of oak-dominated forests. The addition of occasional maples in the canopy, flowering dogwoods and hop-hornbeams in the subcanopy, and a shrub layer lacking abundant heaths distinguishes this from more acidic oak forests and woodlands.

Similar Communities: Sugar Maple - Oak - Hickory Forests are moister and have a greater abundance of northern hardwoods (primarily sugar maple, basswood, and white ash). The herbaceous layer of Sugar Maple - Oak - Hickory Forest has fewer legumes and more spring ephemerals and herbaceous species indicative of rich conditions (such as herb Robert, wild geranium, and baneberry) than Dry, Rich Oak Forests. Red Oak – Sugar Maple Transition Forests have a greater dominance of red oak and sugar maple

than Dry, Rich Oak Forests. They have a less dense and less rich herbaceous layer, particularly lacking the legumes and false fox-gloves. Dry, Rich Oak Forests may be an open, early successional variant of Oak - Hickory Forests that is maintained by regular or severe disturbance, particularly fire. They both lack abundant sugar maple, basswood, and white ash, and lack spring ephemerals and herbaceous species indicative of rich conditions. Both include a mix of tree oak species and prominent but not dominant hickories. Oak - Hickory Forests tend to have more closed canopies and less of an herbaceous layer. Flowering dogwood is more common in the subcanopy of Oak - Hickory Forests than in Dry, Rich Oak Forests where it also occurs.

T17b. Deciduous forest with prominent hickories in the area of oak forests, with abundant oaks in or surrounding the community: **T18**

T18a. Forests on slopes with shallow soils, with hickory species prominent in the mixed hardwood canopy, with a very sparse shrub layer that lacks blueberry family shrubs and a nearly continuous cover of graminoids: **Hickory - Hop Hornbeam Forest/Woodland**

Hickory - Hop Hornbeam Forests/Woodlands have a park-like appearance with sparse shrub layer and a distinctive sedge understory. Hickories dominate the canopy with hop hornbeam forming a subcanopy. Oaks (particularly red oak) may or may not be part of the canopy but occur in surrounding forests.

Similar Communities: Oak - Hickory Forest canopies are generally closed or almost closed, with white and black oaks, rather than primarily red oak. Hickories are consistently present but not dominant. Flowering dogwood is characteristic. Shrubs are sparse but more abundant and more diverse than in HHH. Dry, Rich Oak Forests are dominated by oaks rather than hickories, the subcanopy is not dominated by hop hornbeam, and they lack the extensive sedge lawn of Hickory - Hop Hornbeam Forests/Woodlands. Mixed Oak Forests/Woodlands and other oak-dominated woodlands have a continuous low shrub layer formed by members of the blueberry family which are not characteristic of the Hickory – Hop Hornbeam Forest/Woodland.

T18b. Oak forests dominated by one or several species of tree oaks, with hickories prominent. The subcanopy includes hop hornbeam, flowering dogwood, and shadbush: **Oak - Hickory Forest**

Oak - Hickory Forests are in the middle to moist end of a continuum of forests that are dominated by tree oaks. They are more diverse in all the vegetation layers than many oak forests/woodlands in the continuum. The canopies of Oak - Hickory Forests are generally closed or almost closed (typically > 67% cover). White and black oaks usually dominate the canopy, with red or chestnut oaks producing additional canopy cover. Hickories and scarlet oaks are consistently present but not dominant.

Similar Communities: Hickory - Hop Hornbeam Forests/Woodlands have a park-like appearance with sparse shrub layer and a distinctive sedge understory. Hickories dominate the canopy with hop hornbeam forming a subcanopy. Dry, Rich Oak Forests might be an open, early successional variant of Oak - Hickory Forests that is maintained by regular or severe disturbance, particularly fire. Sugar Maple - Oak - Hickory Forests have abundant sugar maple, basswood, and white ash and fewer legumes and more spring ephemerals and herbaceous species indicative of rich conditions (such as herb Robert, wild geranium, and baneberry) than Oak - Hickory Forests. Red Oak - Sugar Maple Transition Forests have a greater dominance of red oak and sugar maple than Oak - Hickory Forests, and they have few hickories. Mixed Oak Forests/Woodlands lack abundant hickories and flowering dogwood and have a continuous low shrub layer formed by members of the blueberry family not found in Oak - Hickory Forests. Oak - Hemlock - White Pine Forests are the most broadly defined in the continuum of oak-dominated forests; Oak - Hickory Forests with abundant hickories are split out from this broad type. White Pine - Oak Forests have >25% cover of white pine overall (not just local patches). Pitch Pine - Oak Forests have >25% cover of pitch pine overall (not just local patches).

T19a. Deciduous forests dominated by northern hardwoods such as sugar maple and white ash in the canopy or subcanopy: **T20**

T19b. Deciduous forests with abundant (>~25%) red oak mixed with northern hardwoods, such as sugar maple and white ash**: T8 (above)**

T20a. The forest canopy is dominated by white birch, aspens, and red maple, with northern hardwood tree species (including sugar maple, white ash, and yellow birch) predominantly in the subcanopy: **Successional Northern Hardwood Forest**

Successional Northern Hardwood Forests include young to more mature forests in the northern and western parts of Massachusetts, and on northern slopes and at elevation, that have had past major disturbances that continue to affect the diversity and structure of the forest. They are highly variable forests, usually in a successional sequence leading to Northern Hardwood – Hemlock - White Pine Forests. In the Successional Northern Hardwood Forest, the northern hardwoods generally occur predominantly in the subcanopy or shrub layer, not the canopy.

Similar Communities: Northern Hardwood - Hemlock- White Pine Forests are dominated by sugar maple, white, ash, and other northern hardwoods in the canopy. The successional forest is best distinguished by the abundance of white birch and / or aspens in the canopy.

T20b. Deciduous forest with a canopy dominated by northern hardwood tree species, including sugar maple, white ash, and yellow birch: **T21**

T21a. Northern hardwoods forest with a canopy dominated by sugar maple over a sparse shrub layer and a dense, diverse herbaceous layer with many spring ephemeral wild flowers, on moist, nutrient-rich slopes: **Rich, Mesic Forest Community**

Rich, Mesic Forest is usually within the Northern Hardwood - Hemlock - White Pine Forest or in the transition between it and the oak-dominated forests to the south. Rich, Mesic Forest lacks conifers, beech, and oaks. The understory has dense spring ephemerals and lacks the abundant evergreen wood fern and wild sarsaparilla found in Northern Hardwood - Hemlock - White Pine Forest. Dense populations of late blue cohosh, Virginia waterleaf, or wild leek usually indicate Rich, Mesic Forest.

Similar Communities: The Northern Hardwood - Hemlock - White Pine Forest canopy is dominated by sugar maple and white ash, with American beech, red oak, eastern hemlock, and white pine, any of which may be locally abundant or locally absent. Rich examples of Northern Hardwood - Hemlock - White Pine Forest may have scattered spring ephemerals, but also early yellow violet and broad-leaved spring beauty that usually indicate lower nutrient availability. Red Oak - Sugar Maple Transition Forest has red oak as a dominant, with sugar maple, American beech, and black birch. Spring ephemerals are not abundant. Geography is basic to differentiating Sugar Maple - Oak - Hickory Forest from Rich, Mesic Forest: most occurrences of Sugar Maple - Oak - Hickory Forest are east of the Connecticut River Valley, and Rich, Mesic Forest is generally to the west. The presence of multiple species of hickories and oaks in Sugar Maple - Oak - Hickory Forest is a main difference between these two types. Broad-leaved woodland-sedge is close to being an indicator of Sugar Maple - Oak - Hickory Forest. Rich, Mesic Forest has plantain-leaf sedge instead. Rich, Mesic Forest is characterized by very dense herbaceous growth of spring ephemerals. Sugar Maple - Oak - Hickory Forest shares some of the species but with fewer individuals of fewer species. Sugar Maple - Oak - Hickory Forest has evergreen wood ferns that are lacking in Rich, Mesic Forest.

T21b. Tall forests with generally closed canopies of northern hardwoods mixed with hemlock and white pine: **Northern Hardwoods - Hemlock - White Pine Forest**

Northern Hardwoods - Hemlock - White Pine Forest is a widespread forest type in northern areas or on north-facing slopes. The forest generally has sparse shrub and herbaceous layers. Although conifers are part of the forest, they may be scattered and local, in sufficiently low percentages for the forest to appear to be a deciduous forest type.

Similar Communities: Within the matrix of Northern Hardwoods - Hemlock - White Pine Forest, subtypes with distinct species assemblages that occur in specialized conditions are named separately. All types of northern hardwood forests, including Northern Hardwoods - Hemlock - White Pine Forest, are dominated by sugar maple with white ash, yellow birch, American beech, and red oak, with low cover of white pine and hemlock. Northern Hardwoods - Hemlock - White Pine Forest lacks abundant spruce or fir. To the north and upslope, Northern Hardwoods - Hemlock - White Pine Forests grade into Spruce - Fir - Northern Hardwoods Forests. Red spruce or balsam fir are abundant in Spruce - Fir - Northern Hardwoods Forests, and white pine is uncommon. Successional Northern Hardwood Forest is best distinguished by the abundance of white birch or aspens in the canopy, while northern hardwood species generally occur in

the subcanopy or shrub layer, not in the canopy. Rich, Mesic Forest is a nutrient- and species-rich large-patch community usually within the Northern Hardwoods - Hemlock - White Pine Forest area. Rich, Mesic Forest lacks conifers, beech, and red oak. The understory has dense spring ephemerals and very little evergreen wood fern, Christmas fern, or wild sarsaparilla. Red Oak - Sugar Maple Transition Forest has red oak as a dominant, with sugar maple, American beech, and black birch. Other northern hardwoods are occasional associates. Spring ephemerals are not abundant. Oak - Hemlock - White Pine Forests occur to the south and in warmer areas; sugar maple is lacking and they are dominated by a mix of oak species that except for red oak do not occur in Northern Hardwoods - Hemlock - White Pine Forest. Blueberry and huckleberry usually are significant in the understory of Oak - Hemlock - White Pine Forests, but absent or nearly so in Northern Hardwoods - Hemlock - White Pine Forest.

T22a. Conifer forest/woodland. Forest (trees >25% cover); conifer trees >75% of the cover and broad-leaved trees <25% of the cover: **T23**
T22b. Mixed conifer/deciduous forest/woodland. Canopy trees >25% cover, with mixed tree species: conifer trees 25-75% of the cover and deciduous trees 75-25% of the cover: **T29**

T23a. Canopy dominated by upland conifer trees over a small area of wetland soil and wetland herbaceous layer**:** **T4a, Forest Seep Community (above)**
T23b. Canopy dominated by upland conifer trees without wetland soils and wetland herbaceous layer: **T24**

T24a. Conifer forest/woodland/ near the coast, in the daily or storm salt spray zone or on dunes or barrier beaches: **T25**
T24b. Conifer forest/woodland inland from the coast, and not in the daily or regular storm spray zone: **T26**

T25a. Woodland conifer or tall shrubland dominated by red cedar very near the coast, in the daily salt spray zone, or on dunes or barrier beaches: **Maritime Juniper Woodland/Shrubland**

Maritime Juniper Woodlands/Shrublands are predominantly evergreen woodlands/shrublands within the coastal salt spray zone, often on dunes or bluffs over the ocean. The trees tend to be short (< 5 m (~15 feet) and scattered. The tops of trees and shrubs are sculpted by winds and salt spray. The community grades from sparse shrubland to woodland, in areas of constant changes of levels of salt spray and substrate stability; even in stable situations, community edges may not be clear. Maritime Juniper Woodland/Shrubland intergrades and interdigitates with Maritime Pitch Pine Woodland on Dunes and Maritime Forest/Woodland. Very small patches (<5000 ft^2) of any type within another community should be considered to be part of the variation of the other community.

Similar Communities: Maritime Pitch Pine Woodlands on Dunes are dominated by pitch pine, but share species with the juniper community. Maritime Shrubland Communities are dominated by a dense mixture of primarily deciduous shrubs, but may include red cedar. Outside of the maritime salt spray zone, some rocky outcrops with non-acidic bedrock support a shrub community that may include red cedar; in the Massachusetts classification of natural communities, these are included in Circumneutral Rocky Summit/Rock Outcrop and Calcareous Rocky Summit/Rock Outcrop communities. Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and have stunted canopies of mixed tree species; they are not dominated by Red cedar.

T25b. Conifer woodlands dominated by pitch pine, directly along the coast in the daily salt spray zone on dunes**:** **Maritime Pitch Pine Woodlands on Dunes**

Maritime Pitch Pine Woodlands on Dunes have scattered pitch pines, many with partially buried trunks. Between the pines, there is bare sand with sparse, low-growing, drought-tolerant plants, fungi, and lichens.

Similar Communities: Pitch Pine - Oak Forests/Woodlands have nearly closed canopies that include abundant tree oaks, and have little bare ground, more soil development, and more species diversity than the dune community. The pines having skirts is typical of the dune community; in more established woodlands, even if the pine trunks are partially buried, shaded lower branches are unlikely to remain alive.

T26a. Forests/woodlands with canopies dominated by white pine. Found state-wide, although most typically in eastern, central, or southern Massachusetts, or on south-facing slopes in the west, north, or at elevation: **Successional White Pine Forest**

Successional White Pine Forests are best distinguished by the >75% canopy cover of white pine. Successional White Pine Forests grade into Northern Hardwood - Hemlock - White Pine Forest to the north and the general matrix of Oak -Hemlock - White Pine Forest to the south.

Similar Communities: White Pine - Oak Forests have 25-75% cover of white pine and the inverse, 75-25%, of oaks, making the oaks clearly sharing dominance with the pine. Successional White Pine Forests often become White Pine - Oak Forests over time. Pitch Pine - Oak Forests are often near white pine forests in southern areas and grade into them. Determining types along the gradients may require careful, or even arbitrary, application of the definitions, or a decision to map at a more general scale while noting the existence of variation within map units. Pine plantations usually have rows of trees that produce a dense canopy over a generally low-diversity understory that often includes native species. Plantations, being culturally created and managed, are not defined as natural community types.

T26b. Forests with other conifer canopies, including hemlock and spruce: **T27**

T27a. Forests dominated by eastern hemlock: **Hemlock Forest**

In Hemlock Forests, eastern hemlock is the dominant canopy species (>50% canopy cover) throughout the community. They typically occur on north-facing slopes or along north-facing ravines.

Similar Communities: Both Oak - Hemlock - White Pine Forest and Northern Hardwoods - Hemlock - White Pine Forest have relatively small, scattered patches of hemlock that are part of the variation in the overall forest. These mixed forest types tend to have much greater diversity in all layers than do Hemlock Forests. Hemlock Swamps are also dominated by eastern hemlock, but are wetlands; Hemlock Forests are upland communities.

T27b. Forests/woodlands dominated by red spruce, often with balsam fir: **T28**

T28a. Forest canopy is dominated by red spruce and fir with >25% northern hardwood trees: **Spruce - Fir - Northern Hardwoods Forest**

In Spruce - Fir - Northern Hardwoods Forests, red spruce is dominant, or at least present with other conifers, including balsam fir and eastern hemlock. White pine is uncommon. Deciduous species contribute >25% of the canopy cover, overall. Occurrences are highly variable and may be locally dominated by conifers or may have mixed canopies. Spruce - Fir - Northern Hardwoods Forest can have abundant eastern hemlock, but differ from other upland hemlock forests by the presence of red spruce, balsam fir, or heart-leaf paper birch, and other species of cool areas, including mountain and striped maples, mountain ash, and skunk currant, and by the absence of species of warmer areas such as oaks, black birch, and mountain laurel.

Similar Communities: In Massachusetts, High Elevation Spruce - Fir Forest/Woodland occurs only in the Greylock range at the very highest elevations in the state where trees are very exposed, resulting in shorter, sparser trees in more open woodland conditions than Spruce - Fir - Northern Hardwoods Forest. Deciduous northern hardwoods constitute <25% of the cover of High Elevation Spruce - Fir Forest/Woodland. Northern Hardwoods - Hemlock - White Pine Forests lack abundant spruce, fir, and heart-leaf paper birch.

T28b. Forest canopy is dominated by often stunted spruce and fir with <25% deciduous trees overall: **High Elevation Spruce - Fir Forest/Woodland**

In Massachusetts, High Elevation Spruce - Fir Forest/Woodland occurs only on the Greylock massif at the very highest elevations in the state, and has short, sculpted trees with >75% spruce and fir combined, with the rest of the canopy dominated by birches with other northern hardwoods.

Similar Communities: Spruce - Fir - Northern Hardwoods Forests occur at slightly lower elevations in the Berkshires and also in the higher elevation areas of the northern Worcester Plateau. Spruce - Fir - Northern Hardwoods Forest has taller, less windswept trees; red spruce is dominant, or at least present with other conifers, including balsam fir and eastern hemlock. Northern Hardwoods generally comprise >25% of the canopy. If spruce or fir are present in Northern Hardwoods - Hemlock - White Pine Forests or Successional Northern Hardwood Forests, it is as scattered individuals with <25% cover.

T29a. Canopy a mix of coniferous and deciduous upland trees over a small area of wetland soil and wetland herbaceous layer: **T4a, Forest Seep Community (above)**
T29b. Canopy a mix of coniferous and deciduous upland trees without wetland soils or a wetland herbaceous layer: **T30**

T30a. Mixed forest/woodland near the coast, below 60 ft. elevation, in the daily or storm salt spray zone or on dunes or barrier beaches: **T31**
T30b. Mixed forest/woodland inland from the coast, above 60 ft. elevation and not in the daily or regular storm spray zone)**: T32**

T31a. Mixed forest directly along the coast in the daily salt spray zone or on dunes or barrier beaches: **T5a, Maritime Forest/Woodland (above)**
T31b. Deciduous forest at low (<60 ft.) elevation near the coast, receiving salt and wind from storms, but not on a daily basis: **T6a, Coastal Forest/Woodland (above)**

T32a. Forests with canopies of mixed central hardwoods (oaks often with hickories) and conifers. Red maple and American beech are not useful indicators. Typically in eastern, central, or southern Massachusetts, or on south-facing slopes in the west, north, or at elevation: **T33**
T32b. Forests with canopies of mixed northern hardwoods (including sugar maple, white ash, and birches, with red oak present as an associate) and conifers in the canopy. (Red maple and American beech are not useful indicators.) Typically north or west, or at elevation, or on north-facing slopes: **T35**

T33a. Mixed forest with >25% oak and >25% pine in the canopy, generally away from the coast at >60 ft. elevation: **T34**
T33b. Highly variable mixed oak, red maple, and conifer forest, with a generally closed canopy: **T16a, Oak - Hemlock - White Pine Forest (above)**

T34a. Pitch pine and tree oaks dominate the canopy generally on dry, low-nutrient, acidic soils. Occurs statewide, but forms a matrix forest in southeastern Massachusetts: **Pitch Pine - Oak Forest Woodland**

Pitch Pine - Oak Forest/Woodland is part of a continuum of dry, acidic communities dominated by a variety of tree oak and pine species. Similar communities often mix on the ground, with successional stages present that are strongly influenced by historic and recent disturbances. Topography, soils, and local climate control the broader vegetation types. In Pitch Pine - Oak Forest/Woodlands, pitch pine and tree oaks are each at least 25% of the canopy.

Similar Communities: Pitch Pine - Scrub Oak Communities have <25% cover of trees and lack tree oaks. Neither White Pine - Oak Forest nor Successional White Pine Forest have >25% cover of pitch pine; in both, white pine is a dominant. Maritime Pitch Pine Woodlands on Dunes are on dunes. They are dominated by pitch pine and usually lack abundant tree oaks. Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and have stunted canopies of mixed tree species. Coastal Forest/Woodlands generally have a more diverse tree layer than Pitch Pine - Oak Forests, although they may include some pitch pine and many oaks with other trees. Oak - Hemlock - White Pine Forests have <25% pitch pine, and >25% hemlock, plus white pine.

T34b. White pine and tree oaks dominate the canopy or white pines may form a super-canopy. A widespread successional community type: **White Pine - Oak Forest**

White Pine - Oak Forests have >25% cover of white pine overall (not just local patches) and >25% oaks.

Similar Communities: Successional White Pine Forests have <25% oaks in the canopy. Pitch Pine - Oak Forests have >25% cover of pitch pine and <25% canopy of white pine. Oak forests dominated by various species of oak have <25% white pine. Coastal Forests/Woodlands are within a few miles of the coast at <~60 ft. elevation and receive storm winds and spray. The diverse canopies include oaks and often American holly, sassafras, and black gum; white pine may be present. Oak - Hemlock - White Pine Forests have >25% hemlock plus white pine. In general, OHWP are more diverse than White Pine - Oak Forests**.**

Northern Hardwood - Hemlock- White Pine Forests are dominated by sugar maple and white ash with <25% canopy cover of white pine and the only oak is red oak.

T35a. Canopy consists of mixed northern hardwood trees including sugar maple, white ash, and yellow birch with >25% combined cover of eastern hemlock and white pine: **T21b, Northern Hardwoods - Hemlock - White Pine Forest (above)**
T35b. Forest canopy consists of a mix of red spruce and northern hardwood trees: **T28a, Spruce - Fir - Northern Hardwoods Forest (above)**

T36a. Shrublands regularly exposed to salt spray in coastal and maritime areas; maritime and coastal shrublands in the regular salt spray zone**: T37**
T36b. Shrublands inland from regular salt spray: **T45**

T37a. Maritime and coastal shrublands dominated by conifers/evergreen species**: T38**
T37b. Maritime and coastal shrublands dominated by deciduous species**: T41**

T38a. Shrubland or woodland dominated by red cedar on barrier beach systems, dunes, or ocean bluffs: **T25a, Maritime Juniper Woodland/Shrubland (above)**
T38b. Shrubland or woodland with a low canopy of pitch pine, near the coast at <60 ft. elevation, receiving daily or storm winds with salt spray: **T39**

T39a. Shrubland or woodland on dunes, dominated by pitch pine, in the zone of regular salt spray**: T25b, Maritime Pitch Pine Woodlands on Dunes (above)**
T39b. Shrubland or woodland (<25% coverage of trees) with pitch pine over dense scrub oak: **T40**

T40a. Shrubland or woodland on sand, with pitch pine (<25% coverage) over dense scrub oak: **Pitch Pine - Scrub Oak Community**

Pitch Pine - Scrub Oak Communities are shrub-dominated, with scattered to dense trees and scattered openings. Shrubs are usually dense.

Similar Communities: Pitch Pine - Oak Forest/Woodlands have >40% canopy and tree oaks that do not occur in the Pitch Pine - Scrub Oak communities. Scrub oak is much less abundant and less dense in the forest/woodland type, which usually occurs in less dry environments and has more soil development. Maritime Pitch Pine on Dunes has little scrub oak and generally has much sparser pines. Ridgetop Pitch Pine - Scrub Oak Communities are on bedrock outcrops, often ridges. Scrub Oak Shrublands are dominated by dense shrub oaks and lack pitch pine. Sandplain Grasslands and Sandplain Heathlands may occur as open patches within Pitch Pine - Scrub Oak occurrences. In order to name and map included Scrub Oak Shrublands, Sandplain Heathlands, and/or Sandplain Grasslands, the small patches would need to occupy significant area or topographic differences where they are distinct (large frost pockets, for example).

T40b. Shrubland or woodland on rock, with pitch pine (<25% coverage) over scrub oak: **Ridgetop Pitch Pine - Scrub Oak Community**

Ridgetop Pitch Pine - Scrub Oak Communities on bedrock ridges have scattered stunted pitch pine and dense scrub oak, with little bare rock, usually. Identifying community types on rock outcrops is complicated by interdigitating of types and overlap of constituent species.

Similar Communities: Pitch Pine - Scrub Oak Communities are on sand or gravel, tend to be larger, and have most of the same species. Scrub Oak Shrublands lack pitch pine. Ridgetop Heathlands, also on bedrock ridges, lack abundant scrub oak and pitch pine, have large areas dominated by continuous cover (>50%) of low shrubs, usually lowbush blueberry, and have little exposed bedrock. Rocky Summit/Rock Outcrop communities are dominated by bare or lichen-covered rock.

T41a. Coastal shrublands on erosional cliff faces next to the ocean, dominated by deciduous species: **Maritime Erosional Cliff Community**

The Maritime Erosional Cliff Community usually has extremely sparse vegetation on cliffs being actively eroded by the sea. Occasionally shrubs (including wild rose, bayberry, and beach plum) or woody vines (such as green briar or poison ivy) dominate the vegetation. Maritime Erosional Cliffs are made of mixed unconsolidated material.

Similar Communities: The Maritime Rock Cliff Community is on bedrock.

T41b. Coastal deciduous shrubland not on cliff faces: **T42**

T42a. Deciduous shrubland dominated by members of the blueberry family, usually <~6 ft. (~2m) tall, often not dense: **Sandplain Heathland**

Sandplain Heathlands are open, shrub-dominated coastal communities. They have many plants from the Heath or blueberry family and share many species with Sandplain Grasslands. Sparse patches of shrubs may have bare soil or lichens between them. When bearberry and black huckleberry are dominant, they are considered to be indicators of Sandplain Heathlands. Small patches may occur as openings in Pitch Pine - Scrub Oak Communities, Scrub Oak Shrublands, Maritime Shrublands, Coastal Forests, and Maritime Forests/Woodlands. In mapping, as in defining, the edges are not always clear.

Similar Communities: The structure and species composition of Sandplain Heathlands overlap with Sandplain Grasslands and Maritime Dune Communities. Sandplain Heathlands and Sandplain Grasslands share about 70% of their dominant species: it is the proportion of the species and the resultant structure that separates the types. Sandplain Heathlands look shrubby, appear taller, and have fewer vascular plant species and more bare ground than do grasslands. The communities are not distinct at some sites; in that case, the dominant community is the one designated. Maritime Dune Communities are structurally similar to Sandplain Heathlands in that each has low shrub, herbaceous, and grassy growth with patches of bare soil. Dune communities are on dunes and are often dominated by beach grass and beach heather. These species occur less abundantly with more other species in Sandplain Heathlands. These communities may overlap along dune edges, necessitating arbitrary assignment of community types based on land form or the prevailing community type. Maritime Shrublands are generally much denser, taller, and more diverse than Sandplain Heathlands and are less dominated by members of the blueberry family. Maritime Juniper Woodland/Shrubland and Maritime Pitch Pine Woodland on Dunes are on dunes, and are dominated by trees, although the trees may be scattered. Very small patches of any type within another community should be considered to be part of the variation of the main community. Sandplain Heathlands - Inland Variant are located inland at distances away from maritime influences. Ridgetop Heathlands are on bedrock.

T42b. Shrubland dominated by mixed shrubs or scrub oak: **T43**

T43a. Coastal deciduous shrubland dominated by mixed shrubs, often dense and of mixed heights: **Maritime Shrubland**

Maritime Shrublands are intended to be large, relatively continuous areas of shrublands in the salt spray zone. Large patches of Scrub Oak are separated out as their own community type. When shrub cover is <~40%, the community is considered to be something else, often Sandplain Heathland. Tree cover of Maritime Shrublands is <~ 25% overall. The differences among the communities and associations are often gradual, making differentiation on the ground difficult at times.

Similar Communities: Scrub Oak Shrublands are dominated by dense shrub oaks and lack pitch pine. They are less diverse than Maritime Shrublands and generally further from the ocean, usually out of the daily or regular storm salt spray zone. Maritime Dunes include patches of shrubs in areas protected from winds and salt spray. When large and continuous, such patches might be considered to be Maritime Shrublands.

T43b. Shrubland dominated by scrub oak, with or without a sparse pitch pine overstory: **T44**

T44a. Scrub oak-dominated shrubland, with pitch pine forming a sparse canopy of up to ~25% cover**: T40a, Pitch Pine - Scrub Oak Community (above)**

T44b. Scrub oak-dominated shrubland without pitch pine canopy: **Scrub Oak Shrubland**

Scrub Oak Shrublands are on sand and bedrock, are dominated by dense shrub oaks, and lack pitch pine. They generally occur within Pitch Pine - Scrub Oak Communities, particularly in frost bottoms and frost pockets, and

on ridge tops near Ridgetop Pitch Pine - Scrub Oak Communities. They may occur in a matrix with Sandplain Heathlands.

Similar Communities: Pitch Pine - Scrub Oak Communities have <25% cover by pitch pine trees, are on sand or gravel, tend to be large, and have most of the same species. Sandplain Heathlands and Sandplain Heathlands – Inland Variant may include some scrub oak with other shrubs, generally of the blueberry family. Scrub oak is not dominant in either community. Both types of Sandplain Heathlands tend to be sparser and more diverse than scrub oak shrublands. Ridgetop Pitch Pine - Scrub Oak Communities occur on bedrock ridgetops, have scattered stunted pitch pine and dense scrub oak, and usually have little bare rock showing. Ridgetop Heathlands lack abundant scrub oak and pitch pine, have large areas dominated by fairly continuous cover (>50%) of low shrubs, usually lowbush blueberry, and have little exposed bedrock. Acidic Rocky Summit/Rock Outcrop communities are dominated by bare or lichen-covered rock. Identifying community types on rock outcrops is complicated by the mixing of community types in mosaics and overlap of constituent species. Very small occurrences of any community types should be considered to be parts of the prevailing community.

T45a. Inland deciduous shrubland away from the coast, dominated by scrub oak, with or without a sparse pitch pine overstory**: T44 (above)**
T45b. Inland deciduous shrubland, dominated by mixed shrub species or blueberry family shrubs, not dominated by scrub oak: **T46**

T46a. Inland deciduous shrubland, dominated by members of the blueberry family, usually <~6 ft. (~2m) tall: **T47**
T46b. Mixed species shrublands on rocky outcrops or summits, often sparsely vegetated around bare rock**: T48**

Rocky Summit/Rock Outcrop Communities are dominated by bare rock with vegetation that often includes shrubs. Three rocky summit/rock outcrop community types are named depending on whether the exposed bedrock is acidic (pH < 6.0), circumneutral (pH 6.0 - 7.5), or calcareous (pH > 7.5). The pH is identified from geological or soils maps, or often inferred from the vegetation or location. These communities would not be expected to co-occur since the type of bedrock determines the type of natural community. However, depending on size, one site could have multiple other types of ridgetop/outcrop communities. If one community type is predominant and the others are in small areas within it, the dominant community type would be named with notes on the variation.

T47a. Shrubland on rocky ridges, dominated by generally dense, low-growing blueberries, along with other members of the blueberry family: **Ridgetop Heathland**

Ridgetop Heathlands occur on bedrock, at the edges of Acidic (or sometimes Circumneutral) Rocky Summit/Rock Outcrop communities. Identifying community types on rock outcrops is complicated by interdigitating of types and overlap of constituent species. If a community occupies a cumulative area of >5000 ft^2 on a ridge, it may function as a separate community and be designated as such. Otherwise, small patches would be considered to be part of the variation in the prevailing community.

Similar Communities: Acidic Rocky Summit/Rock Outcrop communities are dominated by low shrubs and significant scattered clumps of grass. Vegetation is discontinuous with large areas of bare or moss- or lichen-covered rock. Ridgetop Heathlands have large areas dominated by a fairly continuous cover (>50%) of low shrubs (often lowbush blueberry), and have only scattered grasses and little exposed bedrock. Ridgetop Pitch Pine - Scrub Oak Communities have scattered stunted pitch pine and dense scrub oak, and usually have little bare rock. Shrub oaks and pitch pines need to be abundant, with tree oaks lacking for the community to be a Pitch Pine - Scrub Oak Community. Sandplain Heathlands - Inland Variant occur on sand or gravel soils, not on bedrock.

T47b. Shrubland on sand or gravel away from the coast, with abundant blueberry family plants: **Sandplain Heathland – Inland Variant**

Sandplain Heathland - Inland Variant is a low shrub community, usually successional, on sandplains or gravel in interior parts of the state. It needs management to remain open (with <25% tree cover) in the absence of fire. Occurrences include those on erosional gravel/sandy cliff faces next to rivers or river floodplains. Sandplain Heathlands - Inland Variant grade into Sandplain Grasslands - Inland Variant. Both are often small patch

communities within the prevailing forest matrix. Domination by blueberries or other low shrubs is a key difference from grasslands.

Similar Communities: Sandplain Heathlands are near the coast within the storm salt spray zone. Sandplain Heathlands - Inland Variant are located inland at distances away from maritime influences. Ridgetop Heathlands occur on bedrock, often at the edges of rocky summits or on old blueberry farms. Pitch Pine - Scrub Oak Communities are dominated by scrub oak with pitch pine, neither of which is dominant in Sandplain Heathlands. Very small patches of Sandplain Heathland - Inland Variant inside a Pitch Pine - Scrub Oak Community may be considered to be variation in the Pitch Pine - Scrub Oak Community occurrence. Sandplain Grasslands - Inland Variant are dominated by grasses; Sandplain Heathlands - Inland Variant are and look shrubbier.

T48a. Acidic bedrock outcrops or summits, often sparsely vegetated with discontinuous low shrubs and scattered clumps of grasses. The shrubs usually include scattered (not dominant) blueberries, huckleberry, chokeberry, scrub oak, and/or bearberry: **Acidic Rocky Summit/Rock Outcrop Community**

The vegetation of Acidic Rocky Summit/Rock Outcrop Communities is often predominantly low shrubs, with grasses, sedges, and a few herbaceous species forming a secondary component. Acidic Rock Outcrops tend to lack columbine, climbing fumitory, red cedar, and/or pink corydalis, all of which are more likely on circumneutral or calcareous outcrops. In the eastern part of the state, the Acidic Rocky Summit/Rock Outcrop Community is often associated with dry oak and pine forests.

Similar Communities: The vegetation of Circumneutral Rocky Summit/Rock Outcrop Communities is predominantly grasses, sedges, and a variety of herbaceous species. The circumneutral rocky summit community is often associated with hickory-hop hornbeam, oak-hickory, or forests with sugar maple. The vegetation of Calcareous Rocky Summit/Rock Outcrop Communities is predominantly shrubs mixed with herbaceous plants, with steeper, moister ledges supporting a rich community of ferns. Calcareous outcrops may be near or above patches of Rich, Mesic Forests or enriched northern hardwood forests. Acidic Rocky Summits/Rock Outcrop Communities can be difficult to separate from other ridgetop communities that may be present at the same site in a mosaic of communities. Rock cliffs are vertical to near vertical (more than about 60% slope); rock outcrops are not that steep. The difference is arbitrary. If Acidic, Circumneutral, or Calcareous Rock Cliffs are small (less than about 5000 ft^2), patches would be considered to be variations of the surrounding type and would be included in that type. Scrub Oak Shrublands have dominant, dense shrub oaks, no pines, few other trees, and little bare rock. Ridgetop Pitch Pine - Scrub Oak Communities have multiple but scattered stunted pitch pine trees and dense scrub oak, and usually have little bare rock. There need to be abundant shrub oaks and pitch pines for the community to be Pitchy Pine – Scrub Oak Communities or Scrub Oak Shrublands. Ridgetop Heathland has large areas dominated by lowbush blueberry, and little exposed bedrock. They may occur at the edges of Acidic Rocky Summits.

T48b. Circumneutral or calcareous bedrock outcrops or summits, often sparsely vegetated with discontinuous shrubs and herbaceous plants. Plants include columbine, climbing fumitory, red cedar, and/or pink corydalis: **T49**

T49a. Outcrops of circumneutral bedrock, often sparsely vegetated, with grasses, sedges and forbs dominating. Except for the Carolina rose and bearberry, shrubs are usually restricted to the edge of the openings. Red cedar may be present: **Circumneutral Rocky Summit/Rock Outcrop Community**

Sparsely vegetated, Circumneutral Rocky Summit/Rock Outcrop Communities occur on exposed circumneutral bedrock. The circumneutral rocky summit community is often associated with hickory-hop hornbeam, oak-hickory, or forests with sugar maple.

Similar Communities: Acidic Rocky Summit/Rock Outcrop communities generally lack columbine, climbing fumitory, red cedar, pink corydalis, broad-leaved woodland-sedge, ebony spleenwort, bulblet fern, or fragile fern, which typically occur in Circumneutral Rocky Summit/Rock Outcrops. Acidic Rocky Summit/Rock Outcrop communities are often associated with dry oak and pine forests. Calcareous Rocky Summit/Rock Outcrop Communities may include plantain-leaf sedge, maidenhair spleenwort, or walking fern, indicating calcareous conditions. The vegetation is predominantly shrubs mixed with herbaceous plants, with steeper, moister ledges supporting a rich community of ferns. Calcareous outcrops may be

near or above patches of Rich, Mesic Forest or enriched northern hardwood forests. Rock cliffs are vertical to near vertical (more than about 60% slope); rock outcrops are not that steep. The difference is arbitrary. If Acidic, Circumneutral, or Calcareous Rock Cliffs are small (less than about 5000 ft^2), patches would be considered to be variations of the surrounding type and would be included in that type. Ridgetop Pitch Pine - Scrub Oak Community occur on rocky acidic ridges, have pitch pine and abundant, often dense scrub oak, and usually have less bare rock (this may not be true where abundant visitation has caused loss of plant and soil cover). In Scrub Oak Shrublands, scrub oak is dominant and dense, with few trees, and little bare rock, usually on acidic bedrock. Ridgetop Heathland Community is dominated by heaths, usually low bush blueberry, usually on acidic bedrock.

T49b. Marble or limestone (calcareous rock) outcrops or summit, with sparse vegetation: **Calcareous Rocky Summit/Rock Outcrop Community**

Calcareous Rocky Summit/Rock Outcrop Communities are sparsely vegetated (but the least sparse of the named communities of rocky summits/rock outcrops), dry, open communities, usually on steep, mid-slope, calcareous ledges in the marble regions of Berkshire County or the Connecticut River Valley. Calcareous Rocky Summit/Rock Outcrop Communities may include plantain-leaf sedge, maidenhair spleenwort, walking fern, or other herbaceous species typical of Rich, Mesic Forests.

Similar Communities: Rock cliffs are vertical to near vertical (more than about 60% slope); rock outcrops are not that steep. The difference is arbitrary. If Acidic, Circumneutral, or Calcareous Rock Cliffs are small (less than about 5000 ft^2), patches would be considered to be variations of the surrounding type and would be included in that type. Cliffs are generally very sparsely vegetated and seldom include shrubs. Ridgetop Pitch Pine - Scrub Oak Communities occur on rocky acidic ridges, have pitch pine and abundant, often dense scrub oak, and usually have less bare rock (this may not be true where abundant visitation has caused loss of plant and soil cover). In Scrub Oak Shrublands, scrub oak is dominant and dense, with few trees, and little bare rock, usually on acidic bedrock. Ridgetop Heathland Community is dominated by heaths, usually low bush blueberry, usually on acidic bedrock.

T50a. Open vegetation regularly exposed to salt spray from the ocean in coastal and maritime areas, on sand or rock substrate**: T51**

T50b. Open vegetation inland from regular salt spray; vegetation of rocky summits, ridges, rock outcrops, rocky slopes, or inland sandplains**: T58**

T51a. Open vegetation on any substrate, abutting ocean, within daily salt spray zone: **T52**

T51b. Maritime and coastal vegetation near the ocean, not directly next to open water, not affected daily by salt spray from tides**: T55**

T52a. Sparse vegetation on rock cliffs next to the ocean, above normal high tide: **Maritime Rock Cliff Community**

Sparsely vegetated Maritime Rock Cliff Communities are in cracks and ledges of seawards cliffs on rocky headlands above the tidal and salt spray zones. The low, scattered plants are salt and wind hardy, and are often somewhat weedy species of the surroundings. Rock cliffs are arbitrarily defined as near vertical (>60% slope). A variety of different bedrocks form Maritime Rock Cliffs.

Similar Communities: Maritime Erosional Cliff Communities are also in the salt spray zone above the intertidal shores. The substrate of mixed unconsolidated material of erosional cliffs is highly unstable. The Maritime Beach Strand Community is not on bedrock and is not close to vertical. Maritime Shrublands occur outside of the daily salt spray zone and are generally on flatter surfaces; they share species with Maritime Rock Cliff Communities, but are much more densely vegetated. The Marine Intertidal Rocky Shore Community is on rocky shores below the normal high tide, sometimes below a rock cliff. Any vegetation is non-vascular. This community is discussed in the Estuarine system.

T52b. Sparse vegetation next to the ocean, not on rock cliffs: **T53**

T53a. Sparse vegetation on cliffs being actively eroded by the sea: **T41a, Maritime Erosional Cliff Community (above)**

T53b. Sparse vegetation next to the ocean, not on cliffs: **T54**

T54a. Sparsely vegetated, long, narrow community between wrack line of high tide and foredunes: **Maritime Beach Strand Community**

Maritime Beach Strand Communities have scattered vascular plants. They may be part of a barrier beach system. They occur above the daily high tides, between the wrack line and for dune, or on top of a berm, cliff, or other structure. Maritime Beach Strand Communities may be inundated or structurally altered by storm tides.

Similar Communities: Marine Intertidal Gravel/Sand Beach communities are below the wrack line and submerged twice daily by tides. Any vegetation in the Marine Intertidal Gravel/Sand Beach is non-vascular. This community is discussed in the Estuarine system.

T54b. Community on dynamic sand dunes: **Maritime Dune Community**

Maritime Dune Communities are on dynamic sand dunes, with patches of herbaceous plants and shrubs interspersed with areas of bare sand. They are often part of a barrier beach system. Barrier beach and dune communities occur in mosaics that shift location over time as the dunes move; even in stable situations, the community edges may not be clear. Maritime Dune Communities are the most sparsely vegetated communities on the dune systems, dominated by beach grass and beach heather, with scattered patches of low shrubs, including red cedar, pitch pines, bayberry, herbaceous species, and grasses, with bare sand.

Similar Communities: Sandplain Heathlands have more diverse vegetation and much less beach grass and beach heather than Maritime Dune Communities and are not on dunes. Along the edges of dunes, Sandplain Heathlands and Maritime Dune Communities may overlap. Maritime Juniper Woodland/Shrubland, Maritime Pitch Pine Woodland on Dunes, and Maritime Shrubland Communities all have woody plants dominating and can be on dunes. When large enough (>~5000 ft^2), they are mapped as separate communities from the dune community. Very small patches of any type within another community should be considered to be part of the variation of the larger community.

T55a. Community on dynamic sand dunes**: T54b, Maritime Dune Community (above)**

T55b. Community not on sand dunes or barrier beaches, dominated by low shrubs or grasses: **T56**

T56a. Deciduous, usually sparse shrubland, dominated by members of the blueberry family, usually <~6 ft. (~2m) tall: **T42a, Sandplain Heathland (above)**

T56b. Grass-dominated community, often mixed with forbs and occasional shrubs, within the coastal zone influenced by salt-laden storm winds: **T57**

T57a. An open, near-coastal community dominated by native grasses, with significant presence of forbs and shrubs: **Sandplain Grassland**

Sandplain Grasslands are essentially treeless coastal communities dominated by native grasses and herbaceous species with sparse shrubs on sand or other dry, low-nutrient soils. Sandplain Grasslands are part of a structural and successional continuum with other coastal communities. When communities are not distinct the best fitting community type should be chosen to designate the site.

Similar Communities: Sandplain Heathlands have a shrubby appearance with a taller shrub layer than Sandplain Grasslands. The structure and greater proportions of shrubs in Sandplain Heathlands separates them from Sandplain Grasslands. Maritime Dune Communities are on dunes and are often dominated by beach grass and beach heather that occur less abundantly in grasslands. Sandplain Grasslands - Inland Variant are located inland away from maritime influences and lack coastal species, such as sandplain flax, golden heather, and sandplain blue-eyed grass. Although dominated by little bluestem grass, Sandplain Grasslands - Inland Variant often have an abundance of non-native and weedy species. Cultural Grasslands are dominated by non-native grasses maintained for pasture or hayfields. Salt Marshes are coastal and dominated by grasses, but are inundated by salt water in twice-daily tides. They are in the Estuarine system.

T57b. Grassland dominated by non-native grasses requiring sowing and maintenance, occurring state-wide, including coastally: **Cultural Grassland**

Cultural Grasslands are grasslands that are cultivated or are the results of cultivation. They are dominated by non-native agricultural grasses. Examples are pastures and hayfields.

Similar Communities: Sandplain Grasslands and Sandplain Grasslands - Inland Variant are dominated by native grasses, often by the distinctive little bluestem. Sandplain Heathlands and Sandplain Heathlands - Inland Variant are dominated by native shrubs and look shrubbier than grasslands, with a shrub layer comprised of scrub oak, black huckleberry, and/or lowbush blueberry.

T58a. Open to shrubby vegetation of rocky summits, ridges, rocky slopes, and other rock outcrops: **T59**
T58b. Open to grassy or shrubby vegetation not on bedrock; dry, open vegetation of inland sandplains and non-forested sites**: T66**

T59a. Terrestrial (non-wetland) vegetation on rock outcrops, influenced by river processes: **Riverside Rock Outcrop Community**

Sparsely vegetated, Riverside Rock Outcrop Communities occur in crevices where soil accumulates on flood-scoured bedrock outcrops along rivers. These open terrestrial communities may be associated with wetland communities around the bedrock outcrops.

Similar Communities: High-energy Riverbank Communities are wetland communities that occur on cobble and sand substrates. They also usually have sparse, open low vegetation, but with some bare cobble and sand. High-energy Rivershore Meadow and Riverside Seep Communities are wetland communities that have fairly dense vegetation, with some organic as well as mineral soil development. They occur along the shores of fast-flowing, high-energy rivers.

T59b. Open vegetation of rocky summits, ridges, and rocky slopes: **T60**

T60a. Sparse vegetation among large boulders or talus: **Open Talus/Coarse Boulder Community**

Open Talus/Coarse Boulder Communities are sparsely vegetated communities of vines and scattered herbaceous plants on moss- or lichen-covered boulders or broken rocks on slopes with deciduous litter in crevices and little to no tree canopy. Small (<5000 ft^2) occurrences of Open Talus at the base of cliffs would be included with the cliff or surrounding forest as appropriate to the size and site. If the Open Talus is larger than the cliff or outcrop, it might be named as the community type with the other small part as a variation within it. Talus, boulder fields, rocky summits, rock outcrops, and rock cliffs all support natural communities adjacent to and grading into each other, all within and reflecting the surrounding matrix forest. Forested areas lower in the talus slope/ boulder field are considered to be a different community, usually part of the prevailing forest.

Similar Communities: Acidic, Circumneutral, and Calcareous Rock Cliff Communities are on vertical to near vertical slopes (>60%) with sparse vegetation. Open Talus/Coarse Boulder communities are on broken rocks on a slope rather than on near-vertical cliffs with continuous rock. Rocky Summit/Rock Outcrop Communities have patches of bare rock that are part of the continuous underlying bedrock. Open Talus/Coarse Boulder Communities are on broken or sometimes loose rocks, often with deep crevices where vegetation is rooted.

T60b. Vegetation on bedrock summits or outcrops: **T61**

T61a. Sparse (to patchily dense) vegetation of rocky summits or rock outcrops on hills: **T62**
T61b. Sparse vegetation on cliff faces (>60% slope)**: T64**

Rock Cliff Communities are dominated by bare rock with open and very scattered vegetation that may include grasses, forbs, and shrubs. Cliffs are defined as vertical to near vertical (>~60% slope). Cliff communities are often between rocky outcrops and talus slopes. Three rock cliff community types are named depending on whether the exposed bedrock is acidic (pH < 6.0), circumneutral (pH 6.0 - 7.5), or basic (alkaline, named calcareous for calcium availability) (pH > 7.5). The pH is identified from geological or soils maps, or often inferred from the vegetation or location. These communities would not be expected to co-occur since the type of bedrock determines the type of natural community. However, depending on size, one site could have multiple other types of summit, ridgetop, or rock outcrop communities. If one community type is predominant and the others are in small areas within it, the dominant community type would be named with notes on the variation.

T62a. Acidic bedrock outcrops or summits, often sparsely vegetated with discontinuous low shrubs and scattered clumps of grasses. The shrubs usually include scattered, not dominant, blueberries, huckleberry, chokeberry, scrub oak, and/or bearberry: **T48a, Acidic Rocky Summit/Rock Outcrop Community (above)**
T62b. Circumneutral or calcareous bedrock outcrops or summits, often sparsely vegetated with discontinuous shrubs and herbaceous plants around. Plants include columbine, climbing fumitory, red cedar, and/or pink corydalis: **T63**

T63a. Outcrops of circumneutral bedrock, often sparsely vegetated, with grasses, sedges and forbs dominating. Except for the Carolina rose and bearberry, shrubs are usually restricted to the edge of the openings. Red cedar may be present: **T49a, Circumneutral Rocky Summit/Rock Outcrop Community (above)**
T63b. Marble or limestone (calcareous rock) outcrops or summits, with sparsely vegetation: **T49b, Calcareous Rocky Summit/Rock Outcrop Community (above)**

T64a. Extremely sparsely vegetated cliff (>~60% slope) on acidic bedrock; vegetation includes species of dry, low-nutrient openings in surrounding forests: **Acidic Rock Cliff Community**

Vascular plants in the extremely sparsely vegetated Acidic Rock Cliff Communities grow on small ledges and in crevices of acidic cliff faces. There may be dense patches of lichen. Acidic rock cliffs form on resistant bedrock, such as granite. Little soil and few nutrients are available to support plants on the acidic cliff faces or the large talus at the base of the cliff. Presence of columbine, pink corydalis, marginal wood-fern, ebony spleenwort, maidenhair spleenwort, purple cliff brake, or red cedar usually indicates less acidic conditions. These species are unlikely to be on Acidic Rock Cliffs.

Similar Communities: Calcareous Rock Cliff Communities include species requiring high nutrient levels (nutrient richness) or high pH such as smooth rock-cress, lyre-leaved rock-cress, fragile rock-brake, purple cliff brake, and bulblet-fern. These are not usually found in Circumneutral Rock Cliff Communities. Rocky summits and rock outcrops also have bare rock, but are not near vertical (>~60% slope). Open Talus/Coarse Boulder Communities have broken rock rather than continuous, near-vertical rock faces.

T64b. Extremely sparsely vegetated cliff (>~60% slope) on non-acidic bedrock: **T65**

T65a. Sparse vegetation on cliffs on sandstone, traprock, conglomerate, or other non-acidic, non-calcareous rock: **Circumneutral Rock Cliff Community**

Plants in the extremely sparsely vegetated Circumneutral Rock Cliff Communities grow on small ledges and in crevices on a circumneutral cliff face. In distribution, Circumneutral Rock Cliffs overlap with and are more widespread than Calcareous Rock Cliff Communities, which are restricted to the Marble Valley and Connecticut Valley ecoregions. Circumneutral Rock Cliff Communities would be expected to have some of the following characteristic species: columbine, pink corydalis, marginal wood-fern, ebony spleenwort, herb Robert, green rock-cress, or red cedar.

Similar Communities: Acidic Rock Cliff Communities have a lower diversity of species, and lack columbine, pink corydalis, marginal wood-fern, ebony spleenwort, maidenhair spleenwort, purple cliff brake, or red cedar. Calcareous Rock Cliff Communities include species requiring high nutrient levels (nutrient richness) or high pH, such as smooth rock-cress, lyre-leaved rock-cress, fragile rock-brake, purple cliff brake, and bulblet-fern. Rocky summits and rock outcrops also have bare rock, but are not near vertical (>~60% slope). Open Talus/Coarse Boulder Communities have broken rock rather than continuous, near-vertical rock faces.

T65b. Sparse vegetation on cliffs of limestone, dolomite, or other calcareous bedrock: **Calcareous Rock Cliff Community**

In Massachusetts, Calcareous Rock Cliff Communities are restricted to the Marble Valleys and Connecticut Valley ecoregions. They include species requiring high nutrient levels (nutrient richness) or high pH, such as smooth rock-cress, lyre-leaved rock-cress, fragile rock-brake, purple cliff brake, and bulblet-fern, that are not usually found in Circumneutral Rock Cliff Communities or Acidic Rock Cliff Communities.

Similar Communities: Circumneutral Rock Cliff communities would be expected to have some of the following characteristic species: columbine, pink corydalis, marginal wood-fern, ebony spleenwort, herb

Robert, green rock-cress, or red cedar. Acidic Rock Cliff Communities have a lower diversity of species, and lack columbine, pink corydalis, marginal wood-fern, ebony spleenwort, maidenhair spleenwort, purple cliff brake, or red cedar. Rocky summits and rock outcrops also have bare rock, but are not near vertical (>~60% slope). Open Talus/Coarse Boulder Communities have broken rock rather than continuous, near-vertical rock faces.

T66a. Shrubland, often with sparse vegetation, but with abundant blueberry family plants, on sand or gravel away from the coast: **T47b, Sandplain Heathland – Inland Variant (above)**
T66b. Open (essentially treeless) vegetation dominated by grasses, in areas inland from maritime influences, on sand, gravel, or tilled soils: **T67**

T67a. Grassland dominated by native grasses, usually on sand or gravel substrates: **Sandplain Grassland - Inland Variant**

Sandplain Grassland - Inland Variant is an open community dominated by native grasses on sandplains or gravel in interior parts of the state. They usually need management to remain treeless in the absence of fire. The largest examples of the community in Massachusetts occur at inland airports, military lands, and wildlife management areas on sandplains. The Inland Variant often has an abundance of non-native and weedy species. Small patches of Sandplain Grasslands - Inland Variant in a mosaic with other communities may be considered to be part of the variation of the prevailing community. When communities are not distinct, the best-fitting community should be the type designated for the site.

Similar Communities: Sandplain Grasslands have more coastal species than the Inland Variant, which lacks sandplain flax, golden heather, and sandplain blue-eyed grass. Sandplain Heathlands - Inland Variant grade into Sandplain Grasslands - Inland Variant. Sandplain Heathlands - Inland Variant are shrubbier than grasslands. The dominance of lowbush blueberry, scrub oak, or black huckleberry is a key difference from grasslands. Cultural Grasslands as a classification unit are intended to be grasslands that are cultivated or the results of cultivation with non-native, agricultural grasses, such as pastures and hayfields.

T67b. Grassland dominated by non-native grasses requiring sowing and maintenance, occurring statewide, including in coastal areas: **T57b, Cultural Grassland (above)**

Palustrine System

P: Wetland communities where the species composition is affected by flooding or saturated soil conditions. The soil is usually saturated with the water table at or near the surface most of the year. Note: The term "wetland" is not used in the sense of a "jurisdictional wetland," which has a legal definition.

P1a. Trees or tall shrubs (>~6ft (~2 m)) are the uppermost layer, with total woody cover >25%. The canopy is closed to partially open, and includes woodlands: **P2**
P1b. Tree and tall shrub cover in the uppermost stratum <25%. The uppermost vegetation stratum is strongly sparse, herbaceous, or shrubs <~6 ft. (~2m) tall. There may be small islands of trees or tall shrubs. Low (<~6 ft. (~2m)) shrubs may be dense: **P33**

P2a. Trees (single trunks, >~15 ft. (~5m) tall); total woody cover >25%; trees >25%: **P3**
P2b. Shrubs (<~15 ft. (~5m) tall); total woody cover >25%; trees <25%: **P23**

P3a. Forest (trees >25% cover); broad-leaved (generally deciduous) trees >75% of the cover (several types have mixed coniferous/deciduous canopies): **P4**
P3b. Forest (trees >25% cover); conifer trees >25% of the cover (several types have mixed coniferous/deciduous canopies)**: P16**

P4a. Deciduous swamps along rivers in floodplains: **P5**
P4b. Deciduous swamps not in floodplains along rivers; may be in basins, seepage slopes, small valleys, lake shores, or other wet areas**: P11**

P5a. Deciduous to mixed canopy forests along moderate-gradient reaches of small rivers and large streams in small watersheds where multiple short-duration flooding events occur throughout the year: **Alluvial Hardwood Flat Community**

Alluvial Hardwood Flat Communities are fairly open hardwood forests along small rivers and streams on river-deposited material. They flood briefly after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple.

Similar Communities: Alluvial Red Maple Swamps, along low-gradient rivers, flood annually and are slow to drain. Silver maple may be codominant with red maple. High-terrace Floodplain Forests do not flood annually. They have a mix of floodplain trees, including silver maple, and mesic, deciduous hardwoods. The diverse herbaceous layer includes floodplain species and others more typical of rich forests. Red Maple Swamps are in basins or hillside seeps along small drainage ways. They are dominated by red maple.

P5b. Deciduous forests along rivers with active annual flooding, with cobble or silt deposition: **P6**

P6a. Narrow bands of forests on coarse substrates along the shorelines of high-energy rivers: **Cobble Bar Forest**

Cobble Bar Forests are limited to cobble and other coarse substrates along high-energy rivers where little deposition of finer materials occurs and flooding and ice flows scour the surface. These narrow bands of forest are close to the river edge where flood waters recede quickly after the flood events, not behind berms that retain flood waters. In Cobble Bar Forests, sycamore and cottonwood may be more abundant than silver maple in the canopy.

Similar Communities: High-terrace, Major-river, Transitional, and Small-river Floodplain Forests generally occur on silt and mixed mineral and organic soil substrates. Major-river, Transitional and Small-river Floodplain Forests are behind low berms that slow and detain flood waters, causing alluvial silt deposition. High-energy Riverbank Communities also occur within the zone of active erosion on cobble and sand substrates along steep-gradient, fast-flowing rivers, but have sparse, open low vegetation and no trees.

P6b. Deciduous forests of river floodplains in the silt deposition zones with an active, generally annual, flood regime: **P7**

P7a. Swamps dominated by red and silver maples, in low areas along low-gradient rivers with overbank flooding: **Alluvial Red Maple Swamp**

Flood waters in Alluvial Red Maple Swamps drain more slowly than from other floodplain communities. Unlike true floodplain forests, alluvial swamp forests have well-developed shrub layers composed of northern arrow-wood, silky dogwood, and the non-native glossy buckthorn. Soils are typically silt loams with pronounced soil mottling and a surface organic layer.

Similar Communities: Alluvial Hardwood Flats are along small streams that have multiple short flooding events throughout the year after storms. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple. High-terrace Floodplain Forests do not flood annually. They have a mix of floodplain trees and mesic, deciduous hardwoods. The diverse herbaceous layer includes floodplain species and others more typical of rich forests. Red Maple Swamps are in basins or hillside seeps along small drainage ways. They are less diverse than Alluvial Red Maple Swamps in all layers. Major-river, Transitional, and Small-river Floodplain Forests are dominated by silver maple, while red maple is uncommon, and they lack the well-developed shrub layer found in Alluvial Red Maple Swamps. None of them has a surface organic layer, due to annual scouring by active flood waters. Alluvial Atlantic White Cedar Swamps occur along low-gradient rivers with Atlantic white cedar and red maple co-dominant in the canopy.

P7b. Floodplain forests with abundant silver maple in the canopy: **P8**

P8a. Mesic, deciduous hardwood forests of high alluvial terraces above the zone of annual flooding: **High-terrace Floodplain Forest**

High-terrace Floodplain Forests flood less regularly and for shorter periods than other floodplain forests. They have more structural and species diversity and more litter accumulation than other floodplain forests. Vegetation in all layers is a mix of floodplain and upland taxa, with silver maple growing with sugar maple and shagbark hickory. Ironwood typically forms an open subcanopy.

Similar Communities: Alluvial Red Maple Swamps along low-gradient rivers flood annually and are slow to drain. Silver maple is often a codominant with red maple, without the mix of upland species. Alluvial Hardwood Flats are along small streams that have multiple short flooding events after storms throughout the year. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple. Major-river, Transitional, and Small River Floodplain Forests flood annually, are dominated by silver maple, and lack the upland forest species. Rich, Mesic Forests are upland forests that lack silver maple and other species of floodplain forests. They are not associated with river flooding.

P8b. Floodplain forests dominated by silver maple that are flooded annually: **P9**

True floodplain forest communities occur within the zone of active flooding of rivers and streams on mineral soils that receive annual silt deposition. They differ in the size of river on which they occur and in the severity of flooding. Major-river, Transitional, and Small-river Floodplain Forests can be viewed as points on a continuum from most severely scoured and well-drained (major-river type) to least severely scoured and poorly drained (small-river type). Mixes of floodplain forest communities can occur as a riparian community complex at a single site. Distinctive large patches should be designated; small patches would be noted as part of the site variation with the main community type.

P9a. Floodplain forests along mainstems of large rivers with a dense herbaceous layer of wood nettle or ostrich fern: **Major-river Floodplain Forest**

Major-river Floodplain Forests have severe flooding with rapidly flowing flood waters that scour the surface. They seldom have a shrub layer. Soils are predominantly sandy loams without soil mottles and without a surface organic layer.

Similar Communities: Transitional Floodplain Forests occur on 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. Small-river Floodplain Forests occur on smaller tributaries of major

rivers, on small rivers where banks are low and overbank flooding occurs, and on edges of riverine islands. Annual flooding occurs, but the water volume and degree of scour are much less than in Major-river Floodplain Forests. 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 include a mix of upland and floodplain species and 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 after storms throughout the year. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple.

P9b. Floodplain forests on alluvial soils, usually dominated by silver maple, with green ash and American elm in the canopy: **P10**

P10a. Floodplain forest of middle-sized rivers, without a shrub layer. Soils are generally not hydric and lack a surface organic layer: **Transitional Floodplain Forest**

Transitional Floodplain Forest soils are intermediate in severity of flooding, soil texture, and drainage, and do not usually have 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.

Similar Communities: Major-river Floodplain Forests occur along large rivers with severe flooding. Soils are predominantly not hydric and lack a surface organic layer. Cottonwood and silver maple can be common in the canopy, 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. 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. 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 include a mix of upland and floodplain species and 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 after storms throughout the year. Black cherry and white pine are usually abundant in the canopy with red maple, but not silver maple.

P10b. Floodplain forest with a shrub layer, occurring along small, low-gradient rivers. Soils are hydric, often with an organic layer: **Small-river Floodplain Forest**

Small-river Floodplain Forests occur on smaller tributaries of major rivers and on small rivers of eastern Massachusetts where banks are low and annual overbank flooding occurs. Silver maple is mixed with more other species than in other types of floodplain forest. However, cottonwood 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 in 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.

Similar Communities: Major-river Floodplain Forests have severe flooding with rapidly flowing flood waters that scour the surface. They seldom have a shrub layer. Soils are predominantly sandy loams without soil mottles and without a surface organic layer. Transitional Floodplain Forests occur on 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. 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 include a mix of upland and floodplain species and 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.

P11a. Basin swamp with black gum dominant or codominant with red maple in the canopy: **P12**
P11b. Swamps with species other than black gum codominant with red maple: **P13**

P12a. Red maple-dominated basin swamp, in which black gum, pin oak, and swamp white oak are important components of the overstory. Deciduous swamp on glacial lakebed sediments in the Connecticut River Valley: **Black Gum - Pin Oak - Swamp White Oak Perched Swamp**

Black Gum - Pin Oak - Swamp White Oak Perched Swamps are known only from the Connecticut River Valley in areas underlain by clays in the lakebed sediments of glacial Lake Hitchcock. The presence of fairly high proportions of black gum, pin oak, and swamp white oak in the canopy, in addition to the topographic setting, distinguish the type.

Similar Communities: Red Maple - Black Gum Swamps are generally in small topographically constrained basins surrounded by upland forests. Black gum needs to be dominant or codominant in large areas of the swamp for the occurrence to be a black gum swamp, but they don't have high proportions of pin oak or swamp white oak. Red Maple Swamps may have black gum or occasional pin oak or swamp white oak in low proportions in the canopy, but not as dominants or codominants.

P12b. Swamps typically in small basins characterized by abundant (>~25% cover) black gum in the canopy, along with red maple: **Red Maple - Black Gum Swamp**

Red Maple - Black Gum Swamps are generally in small topographically constrained basins, surrounded by upland forests, as opposed to being parts of larger wetlands. 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.

Similar Communities: Red Maple Swamps do not have black gum as a dominant or codominant in large areas of the swamp, although it may be present as scattered individuals. Most Red Maple Swamps have a more diverse herbaceous layer; however, the species overlap is great between these types. Many Red Maple Swamps are in large basins. The key difference is the abundance of black gum in Red Maple – Black Gum Swamps. Black Gum - Pin Oak - Swamp White Oak Perched Swamps are known only from the Connecticut River Valley in areas underlain by clays in the 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. Red Maple - Black Ash Swamps and Rich Conifer Swamps share many species with Red Maple – Black Gum Swamps, but black gum is only a minor component of these communities.

P13a. Basin swamps with black ash as a regular subcanopy associate of red maple**: P14**
P13b. Red maple strongly dominant in the canopy with a variable mix of other species: **Red Maple Swamp**

Red Maple Swamp is a common, broadly defined, red maple-dominated community type. It is highly variable in its species composition, with canopy associates including yellow birch, black gum, white ash, white pine, American elm, hemlock, pin oak, and swamp white oak. Soils have shallow to thick organic layers overlying mineral sands/silts. Distinctive types are defined separately.

Similar Communities: 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, with black cherry and white pine abundant in the canopy, and ironwood and alternate-leaved dogwood mixed with other shrub species in the subcanopy layer. 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 hybrid bur oak/swamp white oak trees. Red Maple - Black Gum Swamps are generally in small, topographically constrained basins surrounded by upland forests. Black gum is 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.

All types of Atlantic White Cedar Swamp are dominated by Atlantic white cedar in the overstory, often with red maple.

P14a. Areas near marble/limestone bedrock, primarily in the Marble Valleys in Berkshire County; also parts of the Connecticut River Valley: **P15**

P14b. Red maple-dominated swamps, with black ash abundant in the subcanopy, east of Marble Valleys in Berkshire County: **Red Maple - Black Ash Swamp**

Red Maple - Black Ash Swamps are an enriched variant of Red Maple Swamps, with black ash abundant (>~25%) in the canopy/subcanopy in at least parts of the swamp. Red Maple - Black Ash Swamps generally include spicebush and indicators of enriched seepage such as swamp saxifrage, golden ragwort, foamflower, and golden saxifrage.

Similar Communities: Red Maple - Black Ash - Bur Oak Swamps (bur oak swamps) are similar in structure and species composition to Red Maple - Black Ash Swamps (black ash swamps), but bur oak swamps occur in Berkshire County near marble/limestone bedrock and black ash swamps occur east of Berkshire County. Both are forested wetlands with fairly closed canopies; but only the bur oak swamps have bur oak or bur oak/swamp white oak hybrids and also have more ironwood 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. Rich Conifer Swamps include black ash as an occasional species rather than a co-dominant. Rich Conifer Swamps have high proportions of eastern hemlock, red spruce, or balsam fir as important canopy species, along with variable amounts of hardwoods and white pine. Red Maple Swamps may include scattered black ash trees but they are not co-dominant. They seldom include seepage indicators.

P15a. Swamp with closed to continuous canopy cover in areas with somewhat enriched circumneutral groundwater: **Red Maple - Black Ash - Bur Oak Swamp**

Red Maple - Black Ash - Bur Oak Swamps are mostly deciduous forests of circumneutral, somewhat nutrient-enriched, often large wetlands. Red maple, black ash, and bur oak, and other species of trees growing on hummocks form an almost continuous tall canopy over variable shrub and diverse dense herbaceous layers. Bur oak swamps occur in Berkshire County near marble/limestone bedrock. They do not have calciphiles in openings.

Similar Communities: Red Maple - Black Ash Swamps (black ash swamps) occur east of Berkshire County and do not include bur oak. Red Maple - Black Ash Swamps are enriched swamps with black ash close to codominant with red maple in the canopy/subcanopy in at least parts of the swamp. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps (calcareous seepage swamps) have sparse, low canopies. Openings generally include strong calciphiles such as shrubby cinquefoil and grass-of-Parnassus.

P15b. 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: **Red Maple - Black Ash - Tamarack Calcareous Seepage Swamp**

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. All calcareous wetlands include shrubby cinquefoil and most have other calciphiles such as grass-of-Parnassus and Kalm's lobelia.

Similar Communities: 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 taller, 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 hybrid bur oak/swamp white oak

are more likely in Red Maple - Black Ash - Bur Oak Swamps than in 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 and/or balsam fir.

P16a. Conifer swamp dominated by Atlantic white cedar (often mixed with red maple): **P17**

Red Maple Swamps in basins in southeastern Massachusetts are often former Atlantic white cedar swamps that were cut in the past. Many have small patches of Atlantic white cedar; however, Atlantic white cedar needs to be dominant in the overstory for the community to be classified as an Atlantic white cedar swamp. Mapping of relatively large dense patches of Atlantic white cedar as Atlantic white cedar swamps communities may be useful within a Red Maple Swamp to indicate a mosaic of wetland communities.

P16b. Conifer swamp dominated by trees other than Atlantic white cedar**: P20**

P17a. Atlantic white cedar swamp along low-gradient rivers; canopy codominated by red maple: **Alluvial Atlantic White Cedar Swamp**

Alluvial Atlantic White Cedar Swamps occur along smaller rivers and ponds where Atlantic white cedar is co-dominant with red maple. Annual floods make them more mineral-rich than other Atlantic White Cedar wetlands. Silky dogwood, sensitive and royal ferns, bugleweed, and marsh St. John's-wort are more common than in other Atlantic white cedar swamps, and sphagnum carpets are less dense in regularly flooded areas. As with all natural communities, transitions and mixes occur.

Similar Communities: Coastal Atlantic White Cedar Swamps are not along river floodplains, although geographic distribution and resultant coastal species may overlap with Alluvial Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps may also overlap geographically, but are also not in floodplains. Yellow birch is more common than in Alluvial Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps have lower abundance of coastal indicators such as greenbrier, inkberry, dangleberry, swamp sweetbells, Virginia chain-fern, and netted chain-fern than Alluvial or Coastal Atlantic White Cedar Swamps. Northern Atlantic White Cedar Swamps have Atlantic white cedar in the tree canopy, along with northern conifers such as black and red spruce. This nutrient-poor community type is restricted to basins at high elevations with the single documented example at >1100 ft. In Alluvial Red Maple Swamps, silver maple is often codominant with red maple; there is very little Atlantic white cedar (<25% cover), if it is present at all.

P17b. Atlantic white cedar swamps not along rivers: **P18**

P18a. Atlantic white cedar swamps at low elevations (< 60 ft. above sea level) in southeastern Massachusetts: **Coastal Atlantic White Cedar Swamp**

Coastal Atlantic White Cedar Swamps occur on saturated peat of variable depth over the mineral sediments. In Coastal Atlantic White Cedar Swamps, pitch pine is an occasional canopy associate seldom found in other Atlantic white cedar swamp types. Other species that are found in greater abundance in Coastal Atlantic White Cedar Swamps than other Atlantic white cedar swamps include greenbrier, the shrubs inkberry and dangleberry, and the ferns Virginia chain-fern and netted chain-fern.

Similar Communities: Inland Atlantic White Cedar Swamps typically occur at elevations > 60 ft. above sea level and not in southeastern Massachusetts. Yellow birch is more common than in Coastal Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps have lower abundance of coastal indicators than Coastal Atlantic White Cedar Swamps. Northern Atlantic White Cedar Swamps have Atlantic white cedar in the tree canopy, along with northern conifers such as black and red spruce. This nutrient-poor community type is restricted to basins at high elevations with the known example at >1100 ft. Alluvial Atlantic White Cedar Swamps are along rivers and streams. The vegetation is highly variable. Atlantic white cedar and red maple dominate the tree layer. Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat.

P18b. Atlantic white cedar-dominated swamps inland at >60 ft. elevation, not in southeastern Massachusetts; coastal species lacking: **P19**

P19a. Atlantic white cedar-dominated swamps inland at between 60 and 1100 ft. elevation: **Inland Atlantic White Cedar Swamp**

Inland Atlantic White Cedar Swamps occur away from the coast in basins or seepage areas, with Atlantic white cedar dominant in the overstory with associated eastern hemlock, spruce, red maple, and yellow birch. Coastal indicator species such as greenbrier, inkberry, and the ferns Virginia chain-fern and netted chain-fern are lacking. Inland Atlantic White Cedar Swamps typically do not occur not in southeastern Massachusetts.

Similar Communities: Alluvial Atlantic White Cedar Swamps are along rivers and streams. The vegetation is highly variable. Atlantic white cedar and red maple dominate the tree layer. Coastal Atlantic White Cedar Swamps are not along river floodplains, Coastal Atlantic White Cedar Swamps generally occur at < 60 ft. elevation and in southeastern Massachusetts. Northern Atlantic White Cedar Swamps have Atlantic white cedar in the tree canopy, along with northern conifers such as black and red spruce. This nutrient-poor community type is restricted to basins at high elevations >1100 ft., with the single documented example at >1100 ft. Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat.

P19b. Atlantic white cedar swamp restricted to basins at high elevation (>1100 ft.), codominated by spruce and fir: **Northern Atlantic White Cedar Swamp**

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 and balsam fir. Shrubs and herbs include typically northern species such as Labrador tea and rhodora, as well as creeping snowberry and bunchberry that also are found in high-elevation variant Inland Atlantic White Cedar Swamps.

Similar Communities: Alluvial Atlantic White Cedar Swamps are along rivers and streams. The vegetation is highly variable. Atlantic white cedar and red maple dominate the tree layer. Coastal Atlantic White Cedar Swamps are not along river floodplains, Coastal Atlantic White Cedar Swamps generally occur at < 60 ft. elevation and in southeastern Massachusetts. Inland Atlantic White Cedar Swamps typically occur at elevations > 60 ft. above sea level and not in southeastern Massachusetts. Yellow birch is more common than in Coastal Atlantic White Cedar Swamps. Inland Atlantic White Cedar Swamps typically occur at elevations <1000 ft. and lack the full set of northern species. Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat. They may have scattered black spruce, but lack red spruce. Red Spruce Swamps may occur near Northern Atlantic White Cedar Swamps, but red spruce is dominant in the overstory and Atlantic white cedar is seldom present, and then as <25% canopy cover.

P20a. Conifer Swamp dominated by eastern hemlock: **Hemlock Swamp**

Hemlock Swamps are acidic forested wetlands characterized by a dense tree canopy dominated by mature eastern hemlock, allowing little light to reach the forest floor. They occur in poorly drained basins throughout the state where the organic soils are saturated throughout the year. Many swamps have eastern hemlock as a component of the canopy but Hemlock Swamps are differentiated by having eastern hemlock as the dominant canopy species throughout the community.

Similar Communities: Red Maple Swamps and named variants such as Red Maple - Black Gum Swamps often have pockets of hemlock or scattered hemlocks, but overall those community types are dominated by deciduous trees, particularly red maple, and hemlocks are present in low overall percentages as part of the normal variation within the community. Red Maple Swamps have more species diversity in all the layers, as well as denser shrubs and herbaceous layers, than do Hemlock Swamps. Red Spruce Swamps are dominated by red spruce and have species typical of colder or northern areas not found in Hemlock Swamps. Rich Conifer Swamps in the western portion of the state occur in areas with calcium-enriched seepage waters and are characterized by red spruce, less abundance of hemlock, and a much more diverse species assemblage, including elm, spicebush, marsh marigold, and hemlock. In the southeast part of the state, hemlock mixes with Atlantic white cedar and other species typical of the coastal plain or more southern areas, grading into Atlantic white cedar swamps, with the type determined by the overall dominant tree species.

P20b. Conifer swamp dominated by or with a significant component of a spruce species: **P21**

P21a. Forested peatlands with a usually dense, short canopy of black spruce and tamarack over heath shrubs on sphagnum moss: **Spruce – Tamarack Bog**

Spruce - Tamarack Bogs are acidic forested peatlands that often occur in the older, more stable areas of larger wetland complexes that include other forested, shrub, and open community types. 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. They occur in kettlehole depressions, at watershed divides, and along pond margins.

Similar Communities: Level Bogs, Kettlehole Level Bogs, and Acidic Graminoid Fens (open (non-forested) acidic peatlands) may have clumps of trees, but with <25% canopy overall. Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar over sphagnum on peat. They may have scattered black spruce, but lack red spruce. 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, 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. Red Spruce Swamp occurrences are often larger than Spruce - Tamarack Bogs. Hemlock Swamps are dominated by eastern hemlock, which are usually much taller and less dense than trees in Spruce - Tamarack Bogs. Red Maple - Black Ash - Tamarack Calcareous Seepage Swamps also include tamarack, and may have red spruce. However, these generally have much greater species diversity, including abundant deciduous trees, and occur in calcareous or circumneutral groundwater, with calciphiles in openings.

P21b. Red spruce-dominated swamps with balsam fir or deciduous species: **P22**

P22a. Forested wetlands, primarily of high elevations in western and north-central Massachusetts, dominated by red spruce: **Red Spruce Swamp**

Red Spruce Swamps have tall, large-diameter trees, dominated by red spruce, generally with an open understory. Creeping snowberry and twinflower are good indicators of Red Spruce Swamps but they do not occur in all examples.

Similar Communities: Rich Conifer Swamps are high elevation (>1000 ft.) forested wetlands that are characterized by a canopy of mixed red spruce, hemlock, balsam fir, and deciduous trees including black ash They may have species such as spicebush that indicate less acidic conditions, and pockets of moss rather than sphagnum lawns. Hemlock Swamps are dominated by eastern hemlock. Lower strata are sparse. Sphagnum may form a continuous ground cover. Spruce-Tamarack Bogs have a dense tree canopy dominated by generally short (<40' tall) black spruce and tamarack, and an often dense shrub layer.

P22b. Species-rich conifer swamps with eastern hemlock, balsam fir, or red spruce important in the canopy, with variable but high proportions of deciduous trees and white pine: **Rich Conifer Swamp**

Rich Conifer Swamps are characterized by a canopy of mixed red spruce, hemlock, balsam fir, and deciduous trees, including black ash and red maple. Shrubs may be dense and include species indicative of mineral-enriched conditions, including spicebush. The surface has pockets of moss rather than sphagnum lawns.

Similar Communities: Red Spruce Swamps are dominated by red spruce; lower strata are sparse. Sphagnum often forms a continuous ground cover. Hemlock Swamps are dominated by eastern hemlock throughout the community. Other types of forested wetlands often have scattered patches of eastern hemlock. Lower strata are sparse. Sphagnum may form a continuous ground cover. Red Maple Swamps and its named variants such are dominated by deciduous trees, particularly red maple. Atlantic white cedar swamps are dominated by Atlantic white cedar trees.

P23a. Shrublands, dominated by dense shrubs: **P24**
P23b. Open, sparsely vegetated, herbaceous, or low shrub wetland communities**: P26**

P24a. Tall (>~6 ft. (~2m)) shrub-dominated wetlands occurring on mineral or mucky mineral soils that are seasonally or temporarily flooded: **Shrub Swamp**

Shrub Swamps have >25% cover of tall shrubs on mixed mineral and well-decomposed organic soils. Shrub Swamp Communities are a common and variable type of wetlands occurring on seasonally or temporarily flooded soils. They are often found in the transition zone between emergent marshes and swamp forests.

Similar Communities: Highbush Blueberry Thickets are tall shrub communities occurring on peat, dominated by usually very dense highbush blueberries. Acidic Shrub Fens are peatlands, dominated by low growing shrubs, along with patchy 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 Pondshore/ Lakeshore Communities 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. They are part of the Estuarine system. Red Maple Swamp and its variants (forested swamp communities) often contain a significant shrub component, and may include patches of shrub swamp where the tree canopy cover is <25%.

P24b. Acidic peatlands dominated by shrubs: **P25**

P25a. Acidic peatlands dominated by dense highbush blueberry bushes on hummocky sphagnum moss: **Highbush Blueberry Thicket**

The physical and biological characteristics of Highbush Blueberry Thickets, Acidic Shrub Fen, Shrub Swamp, and Fresh/ Brackish Tidal Shrubland overlap and intergrade. They all lack tree cover (<25% canopy cover); they are all dominated by dense shrubs on wet substrates. Highbush Blueberry Thickets are tall shrub fens, dominated by highbush blueberries or other members of the blueberry family, on peat or at least have sphagnum at the base of the shrubs. Other peatlands include highbush blueberries as patches in more open communities or under canopies.

Similar Communities: Acidic Shrub Fens are dominated by low growing shrubs, with sphagnum moss and herbaceous species of varying abundance on wet, often weak peat. Shrub Swamps lack peat, are often quite diverse, and are not dominated by blueberries or other ericaceous plants. Fresh/ Brackish Tidal Shrubland are dense to open shrublands along tidal sections of coastal rivers, part of the Estuarine system.

P25b. Shrub-dominated acidic peatlands characterized by a mixture of low-growing, primarily deciduous shrubs. The peat is usually wetter and looser than in other peatlands: **Acidic Shrub Fen**

Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs with patches of sphagnum moss growing at the shrub bases. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter, with a less well-developed sphagnum mat than other acidic peatlands.

Similar Communities: Acidic Graminoid Fens are differentiated by the abundance of graminoid and herbaceous species and the lack of extensive shrubs. Level Bog communities receive little or no stream flow and are isolated from the water table, making them the most acidic (pH is in the range of 3 to 4) and nutrient-poor of peatland communities. The sphagnum peat tends to be deep and well developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Kettlehole Level Bogs are a subset of Level Bogs that occur in iceblock depressions (commonly called kettleholes) in sandy glacial outwash. They are typically small (<3 acres) and round, and they lack inlets and outlets. Highbush Blueberry Thickets are dominated by tall (>~6 ft. (~2m)) dense shrubs of the blueberry family with other deciduous species. Shrub Swamps lack peat, are often more diverse than Acidic Shrub Fens and are not dominated by blueberries or other ericaceous plants. They are often dense and tall.

P26a. Acidic peatlands on sphagnum mats that are at least fairly well developed: **P27**

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.

P26b. Other open wetland communities, generally without well-developed sphagnum mats and deep peat: **P33**

Other open, sparsely vegetated, herbaceous, or low shrub wetland communities, generally without well-developed sphagnum mats and deep peat; may be in areas with calcium-rich groundwater and occur on peat.

P27a. Acidic peatlands that receive little or no stream flow and are (mostly) isolated from the water table by the peat: **P28**
P27b. Acidic peatlands where growing plants receive nutrients from stream flow or ground water; fens**: P30**

P28a. Acidic dwarf ericaceous shrub peatlands, generally with pronounced hummock-hollow topography: **Level Bog**

Level Bogs are dwarf-shrub peatlands, generally with pronounced hummocks and hollows in sphagnum moss. These wetland communities are very acidic and nutrient-poor because the peat isolates them from nutrients in groundwater and streams. The sphagnum peat tends to be deep and well-developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf.

Similar Communities: 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 sparse canopies (averaging <25%, but there may be locally denser 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 dominated by graminoid and herbaceous species and by the lack of extensive shrubs. Three-way sedge and buckbean 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 include both estuarine and palustrine species. Regionally, three species are considered to be diagnostic of Sea-level Fens: saltmarsh straw-sedge, saltmarsh spike-sedge, and saltmarsh threesquare. Twig-sedge at the edges of salt marshes is also used as an indicator of Sea-level Fens. Interdunal Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands. Spruce - Tamarack Bogs are acidic forested peatlands with an overstory of black spruce and tamarack and an understory of heath shrubs on sphagnum moss.

P28b. Other acidic dwarf ericaceous shrub peatlands that are (mostly) isolated from the water table by the peat: **P29**

P29a. Level Bogs that develop in isolated valley bottoms without inlet or outlet streams, often in kettle depressions in sandy glacial outwash: **Kettlehole Level Bog**

Kettlehole Level Bogs are acidic dwarf-shrub peatlands with little water input or outflow, that form in circular depressions left by melting iceblocks in sandy glacial outwash. They are typically small (<3 acres) and round, and they lack inlets and outlets. The vegetation in Kettlehole Level Bogs usually grows in rings.

Similar Communities: In Level Bogs, the sphagnum peat tends to be deep and well developed, graminoids may be present but not dominant, and low shrubs are dominated by leatherleaf. Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be locally denser 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 dominated by graminoid and herbaceous species and lack extensive shrubs. Spruce-Tamarack Bogs are acidic forested peatlands with an overstory of black spruce and tamarack.

P29b. Bogs with Atlantic white cedar (generally <25% cover): **Atlantic White Cedar Bog**

Atlantic White Cedar Bogs have sparse canopy (averaging <25%, but there may be local clumps of trees) cover of Atlantic white cedar with sphagnum on peat. The coverage vale is for the full extent of the community (which may have areas of no canopy cover at all), with Atlantic white cedar dominating the canopy that does occur. Atlantic White Cedar Bogs share many species and characteristics with other acidic peatlands, including Level Bogs, Kettlehole Level Bogs, and Acidic Graminoid Fens.

Similar Communities: Level Bogs, Kettlehole Level Bogs, and Acidic Graminoid Fens do not have Atlantic white cedar on the sphagnum mat. Coastal, Inland, and Northern Atlantic White Cedar Swamps are forested wetland communities with closed canopies (>25% tree cover overall, generally more), with >25%

cover of Atlantic white cedar. Atlantic White Cedar Bogs have, overall, <25% cover of canopy species (there may be small clumps of trees with greater cover), with Atlantic white cedar dominating the canopy that does occur. Whether Atlantic White Cedar Bogs are considered to be separate entities or openings in the prevailing Atlantic white cedar swamp depends on the patch size and abundance of local patches.

P30a. Acidic peatlands where growing plants receive nutrients from stream flow or groundwater, on natural substrates: **Acidic Graminoid Fen**

Acidic Graminoid Fens are sedge- and sphagnum-dominated acidic peatlands that experience some groundwater and/or surface water flow, but no calcareous seepage. Standing water is often present throughout much of the growing season. Abundant herbaceous species are mixed with the dominant sedges; they generally lack of extensive tall shrubs. Three-way sedge and buckbean are characteristic of wet, nutrient-enriched edges of Acidic Graminoid Fens.

Similar Communities: Sea-level Fens occupy the interface between estuarine marshes and upland seepage slopes, and have a mix of estuarine and palustrine species. Regionally, three species are considered diagnostic of Sea-level Fens: saltmarsh straw-sedge, saltmarsh spike-sedge, and saltmarsh threesquare. Twig-sedge at the edges of salt marshes is also a good indicator of Sea-level Fens. Interdunal Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. They are wetter with a less well-developed sphagnum mat than other acidic peatlands. Level Bog communities receive little or no stream flow and are isolated from the water table, making them the most acidic (pH ~ 3 to 4) and nutrient-poor of peatland communities. The sphagnum peat tends to be deep and well developed, graminoids may be present but not dominant, and shrubs are dominated by leatherleaf. Acidic Graminoid Fen - Spillway Fens are shallow acidic peatlands with mixed graminoid/herbaceous vegetation that develops on spillway bedrock channels associated with large dams.

P30b. Other acidic fens: **P31**

P31a. Acidic peatlands where growing plants receive nutrients from stream flow or groundwater, on spillways of large dams: **Acidic Graminoid Fen - Spillway Fen**

Acidic Graminoid Fen - Spillway Fen is a cultural variant of Acidic Graminoid Fen. They are shallow acidic peatlands with mixed graminoid/herbaceous vegetation, that develops on and are restricted to spillway bedrock channels associated with large dams.

P31b. Acidic peatlands along coast or on barrier beaches: **P32**

P32a. Herbaceous/graminoid peatlands that occur at the upland edges of ocean tidal marshes. The combination of upland freshwater seepage and infrequent salt or brackish overwash produces a mixed plant community of freshwater and estuarine species on peat: **Sea-level Fen**

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. Regionally, three species are considered diagnostic of Sea-level Fens: saltmarsh straw-sedge, saltmarsh spike-sedge, and saltmarsh threesquare. Twig-sedge at the edges of salt marshes is also used as an indicator of Sea-level Fens.

Similar Communities: Acidic Graminoid Fens are differentiated by the dominance of graminoid and herbaceous species and lack of extensive shrubs. They are also not very near the coast. Three-way sedge and buckbean are characteristic of wet, nutrient-enriched edges of Acidic Graminoid Fens. Interdunal Swales occur as part of a coastal dune system. They are graminoid- or shrub-dominated communities occurring in shallow basins (swales) between dunes. Some are fen-like with cranberries and sedges growing on shallow peat, but occurrence in dune systems is the defining characteristic. Acidic Shrub Fens are composed primarily of low-growing, interwoven shrubs. Dense water-willow and sweet gale are indicative and characteristic. Acidic Shrub Fens are wetter with a less well-developed sphagnum mat than other acidic peatlands.

P32b. Small patch wetland communities in shallow basins (swales) between dunes in coastal dune systems: **Interdunal Marsh/Swale**

Interdunal Marshes/Swales are not always peatlands, but many occurrences include sphagnum, cranberry, and other peatland plants. 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.

Similar Communities: Interdunal Marshes/Swales are the only open or shrub-dominated freshwater wetlands in dune systems.

P33a. Sparse, herbaceous, or low shrub calcareous wetland communities in areas with marble or limestone bedrock; may have peat: **P34**

All calcareous wetlands include shrubby cinquefoil. Most also have other calciphiles (calcium-loving plants) such as grass-of-Parnassus, Kalm's lobelia, alder-leaf buckthorn, hemlock parsley, autumn and hoary willows, and slender cotton-grass. Within a given site, calcareous fen communities may grade from one type to another.

P33b. Other sparse, herbaceous, or low shrub wetland communities**: P36**

Neither acidic sphagnum peatlands nor calcareous fens. 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.

P34a. Sedge-shrub peatlands occurring in well-defined basins that have calcareous water inputs: **Calcareous Basin Fen**

Calcareous Basin Fens are sedge-shrub peatlands occurring on deep (>2.0 m (6.5 ft.)) peat in well-defined basins that have calcareous water inputs. These uncommon communities are the least nutrient- and species-rich of the three types of calcareous fen communities described in Massachusetts. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. They share many species with acidic fens, but include species restricted to calcareous conditions, such as bog birch and other calciphiles.

Similar Communities: Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is mostly restricted to sedge hummocks. A diverse herbaceous layer dominates the vegetation. Tall shrubs and short trees may occur in scattered patches. Calcareous Seepage Marshes include some calciphiles as well as generalist species in a mixture of herbaceous, graminoid, and shrub species similar to an emergent marsh, with peat generally 0.5 to 2 meters deep. They are flat to slightly sloping. Black Ash-Red Maple-Tamarack Calcareous Seepage Swamps are dominated by tree species and tall shrubs. Small openings within them share many of the species and conditions of Calcareous Sloping Fens. Calcareous Pondshore/Lakeshore Communities consist of shrubby, herbaceous, or graminoid vegetation along shores of hard-water lakes. These communities are saturated for much of the year with some plants emerging only during low water.

P34b. Sedge-shrub peatlands occurring that have calcareous water inputs, not in well-defined basins: **P35**

P35a. Marshy wetlands enriched by calcareous groundwater seepage: **Calcareous Seepage Marsh**

Calcareous Seepage Marshes are marshy wetlands enriched by calcareous groundwater seepage. Of the three types of calcareous fen communities described in Massachusetts, they are intermediate in richness and botanical rarities. They share species with both Shallow and Deep Emergent Marshes, but contain more calciphiles.

Similar Communities: Calcareous Basin Fens have deep (>2.0 m (6.5 ft.)) peat in basins. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. They share many species with acidic fens, but include species restricted to calcareous conditions, such as bog birch, shrubby cinquefoil, grass-of-Parnassus, Kalm's lobelia, alder-leaf buckthorn, hemlock parsley, autumn and hoary willows, and slender cotton-grass. Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is

mostly restricted to sedge hummocks. A diverse herbaceous layer that includes many calciphiles dominates the vegetation. Tall shrubs and short trees may occur in scattered patches. Black Ash - Red Maple - 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. Shallow Emergent Marshes are graminoid/herbaceous wetlands in broad, flat areas bordering rivers or along pond margins. The mucky mineral substrate has shallow standing water throughout the growing season. Deep Emergent Marshes are tall graminoid wetlands in deep water (up to 3 ft.) in broad, flat areas along slow rivers or ponds. Broad-leaved cat-tail and phragmites often form extensive dense stands. Calcareous Pondshore/Lakeshore Communities consist of shrubby, herbaceous, or graminoid vegetation along shores of hard-water lakes. These communities are saturated for much of the year with some plants emerging only during low water.

P35b. Marshy wetlands on shallow to moderate slopes enriched by calcareous groundwater seepage: **Calcareous Sloping Fen**

Calcareous Sloping Fens are on shallow to moderate slopes and have more mineral soil than other calcareous fens; peat is mostly restricted to sedge hummocks. A diverse herbaceous layer dominates the vegetation. Tall shrubs and short trees may occur in scattered patches.

Similar Communities: Calcareous Seepage Marshes include some calciphiles as well as generalist species in a mixture of herbaceous, graminoid and shrub species similar to an emergent marsh, with peat generally 0.5 to 2 meters deep. They are flat to slightly sloping. Calcareous Basin Fens have deep (>2.0 meters (6.5 ft.)) peat in basins. They are dominated by sedges with a sparse shrub layer; they generally contain a more developed bryophyte layer than the other calcareous fens. They share many species with acidic fens, but include species restricted to calcareous conditions, such as bog birch, shrubby cinquefoil, grass-of-Parnassus, Kalm's lobelia, alder-leaf buckthorn, hemlock parsley, autumn and hoary willows, and slender cotton-grass. Black Ash-Red Maple-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.

P36a. Wetlands with permanently saturated soils that do not have standing water throughout the growing season: **P37**

P36b. Wetlands that have standing water through the growing season including along lake or river shores: **P38**

P37a. Graminoid wetland communities that occur in wet depressions, along streams, and in sloughs and backwaters in river basins. The mucky mineral soil is saturated during the growing season but not generally inundated: **Wet Meadow**

Wet Meadows are graminoid/emergent herbaceous communities that are similar to Deep and Shallow Emergent Marshes except that they are temporarily rather than seasonally flooded. They typically have a single sedge or grass species dominating. Repeated disturbance, usually from grazing or mowing, keeps these communities open. 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.

Similar Communities: Kettlehole Wet Meadows are dense graminoid marshes on mucky peat that occur in small basins. 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. Wet Meadows do not have standing water throughout the growing season. Deep Emergent Marshes are tall graminoid seasonally flooded wetlands with deep water (up to 3 ft.). They generally form in broad, flat areas along slow rivers or ponds. Coastal Plain Pondshore Communities and Coastal Plain Pondshores – Inland Variant are generally on sand around ponds in closed basins that intersect groundwater. By late summer, an exposed shoreline supports a suite of 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.

P37b. Treeless graminoid communities in small (<5 acres) depressions in stratified glacial deposits. For most of the year they look like shallow ponds, but by late summer dense graminoid vegetation covers the mixed organic sediments. The small basins often have no stream inlet or outlet: **Kettlehole Wet Meadow**

Kettlehole Wet Meadows are dense graminoid marshes on mucky peat that occur in small basins. They are temporarily inundated after storms as well as from high groundwater.

Similar Communities: Wet Meadows, also graminoid communities, are in larger lake basins, backwaters, and sloughs along rivers. Shallow Emergent Marshes are predominantly graminoid wetlands in broad, flat areas bordering rivers or along pond margins and are seasonally flooded. Deep Emergent Marshes are tall, graminoid, seasonally flooded wetlands with deep water (up to 3 ft.). They generally form in broad, flat areas along slow rivers or ponds. Coastal Plain Pondshore Communities and Coastal Plain Pondshores – Inland Variant are generally on sand around ponds in closed basins that intersect groundwater. 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.

P38a. Dense vegetation on mucky mineral soils that are seasonally inundated and permanently saturated with standing water throughout the growing season: **P39**

P38b. Sparse, herbaceous, or low shrub communities associated with lakes or rivers, generally on mineral soils**: P40**

P39a. Wetlands dominated by relatively short grasses, sedges, and rushes on mucky mineral soils that have shallow (averaging <6 in. deep) surface water all year, including during the growing season. They often occur in broad, flat areas bordering slow rivers or along pond margins: **Shallow Emergent Marsh**

Shallow Emergent Marshes are graminoid/herbaceous wetlands that usually have shallow (averaging <6 in. deep (15 cm)) surface water all year. Cattails, phragmites, and wool-grass (the dominants of Deep Emergent Marshes) can occur but never dominate. The substrate is typically a layer of well-decomposed organic muck overlying mineral material.

Similar Communities: Deep Emergent Marshes are tall graminoid wetlands that are usually flooded with water averaging 6 in. to 3 ft. (15 cm to 1m)). They are dominated by cattails, phragmites, and wool-grass. Shrub Swamps have >25% cover of shrubs. Wet Meadows are graminoid wetlands, 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 are dense graminoid marshes on mucky peat that occur in small basins. They are temporarily inundated after storms as well from high groundwater. 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. Calcareous Pondshore/Lakeshore Communities consist of shrubby, herbaceous, or graminoid vegetation along shores of hard-water lakes. These communities are saturated for much of the year with some plants emerging only during low water. The ponds themselves contain mats of the green alga stonewort. Bogs and fens are peatlands and have peat instead of mucky mineral soil; however, gradations do exist among types.

P39b. Wetlands dominated by tall graminoids on mucky mineral soils in deep water (<3 ft. (~1m) deep) surface water all year, including during the growing season. They occur along rivers and streams, lakes, artificial impoundments, and other water bodies: **Deep Emergent Marsh**

Deep Emergent Marshes are tall graminoid wetlands often dominated by cattails, phragmites, and wool-grass growing in water from a half foot to 3 ft. deep. Water depth may vary not only during the growing season, but from year to year.

Similar Communities: Shallow Emergent Marshes are short graminoid/herbaceous wetlands and usually have shallow (averaging <6" (~15 cm) deep) surface water all year. Vegetation composition is similar to Deep Emergent Marsh except that shorter grasses, sedges and rushes dominate. Shrub Swamps have >25% cover of shrubs. Wet Meadows are graminoid wetlands 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 are dense graminoid marshes on mucky peat that occur in small basins. They are temporarily inundated after storms as well from high groundwater. Calcareous Pondshore/Lakeshore Communities consist of shrubby, herbaceous, or graminoid vegetation along shores of hard-water lakes. These communities are saturated for much of the year with some plants emerging only during low water. The ponds themselves contain mats of the green alga stonewort. 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 emergent marsh or other wetlands. Bogs and Fens are peatlands, not dominated by cattails, phragmites, or wool-grass, without standing water.

P40a. Non-aquatic vegetation associated with lakes and ponds; mostly shores with mineral soils: **P41**
P40b. Wetland vegetation associated with river or stream shores**: P45**

P41a. Vegetation associated with calcareous lakeshores. Stoneworts may form mats on the lake bottoms: **Calcareous Pondshore/Lakeshore Community**

Calcareous Pondshore/Lakeshore Communities are submerged or saturated for a significant part of the year or continuously in wet years. They occur on gravelly, sandy or muddy shores of calcareous or circumneutral inland lakes and ponds. Documented only from the Marble Valleys of Berkshire County, they have calcium in the water derived from nearby limestone or dolostone bedrock. The ponds usually have inflow and outflow. The shore line is often not distinct, merging into marsh or other wetlands.

Similar Communities: Acidic Pondshore/Lakeshore Communities are on lakes with lower pH (<pH7) than calcareous ponds, and do not have stoneworts. Many have inflow or outflows. Acidic pondshore vegetation is broadly defined, variable, and includes shorelines not explicitly included in calcareous or coastal plain pondshores. Coastal Plain Pondshore Communities are generally on ponds in sand in the coastal plain, in closed basins that intersect groundwater. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports common and rare, generally coastal or southern, mostly herbaceous species. Coastal Plain Pondshores - Inland Variant also occur in closed basins in sandy outwash, but in the Connecticut River Valley. Coastal plain species grow in them, but include fewer specialists. Freshwater Mud Flat Communities are within ponds rather than shorelines. They have low, sparse annual herbaceous vegetation on recently exposed muddy sediments.

P41b. Vegetation associated with shores of ponds and lakes that are not calcareous; not in areas of marble or limestone bedrock: **P42**

P42a. Vegetation associated with shores of ponds and lakes that are closed basins in sandy outwash: **P43**
P42b. Vegetation associated with shores or exposed lake bottoms of lakes, ponds, or low-energy rivers, not in closed basins in sandy outwash**: P44**

P43a. Herbaceous communities of exposed pondshores in southeastern Massachusetts that are characterized by a distinct coastal plain flora: **Coastal Plain Pondshore Community**

Coastal Plain Pondshore Communities occur on exposed shores of ponds in glacial outwash in the coastal plain where water levels are controlled by seasonal groundwater changes. The herbaceous flora has a distinct southern component.

Similar Communities: Coastal Plain Pondshores - Inland Variant also occur in closed basins in sandy outwash, but are in the Connecticut River Valley. Some, but fewer, coastal plain species grow in them. Acidic Pondshore/Lakeshore Community is broadly defined, variable, and includes shorelines not explicitly included in coastal plain pondshores, the inland variant, or calcareous ponds. The shore line is often not distinct, merging into marsh or other wetlands. Many ponds have inflow or outflows. Calcareous Pondshores /Lakeshores occur in the Marble Valleys of Berkshire County, around ponds that have calcium

in the water. Freshwater Mud Flat Communities are within ponds rather than along shores. Mud flats in Coastal Plain Ponds are treated as part of the pondshore community.

P43b. Herbaceous communities of exposed pondshores in closed basins in sandy outwash in the Connecticut River Valley: **Coastal Plain Pondshores - Inland Variant**

Coastal Plain Pondshores - Inland Variant have vegetation zones of graminoids or herbaceous species on sloping, seasonally exposed, gravelly, sandy or muddy shores of acidic, inland lakes and ponds that have substantial natural fluctuation of water levels.

Similar Communities: Acidic Pondshore/Lakeshore Communities are broadly defined, variable, and include shorelines not explicitly included in coastal plain pondshores, the inland variant, or calcareous ponds. The shore line is often not distinct, merging into marsh or other wetlands. Many ponds have inflow or outflows. Coastal Plain Pondshore Communities are generally on ponds in sand in the coastal plain in closed basins that intersect groundwater. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports common and rare, generally coastal or southern, mostly herbaceous species. Calcareous Pondshores /Lakeshores occur in the Marble Valleys of Berkshire County, around ponds that have calcium in the water. Freshwater Mud Flat Communities are within ponds rather than along shores. Mud flats in Coastal Plain Ponds are treated as part of the pondshore community.

P44a. Vegetation associated with shores of acidic ponds and lakes that are not closed basins in sandy outwash: **Acidic Pondshore/Lakeshore Community**

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

Similar Communities: Coastal Plain Pondshore Communities are generally on ponds in sand in the coastal plain in closed basins that intersect groundwater that affects pond levels. The seasonally and annually fluctuating water table typically leaves an exposed shoreline by late summer that supports common and rare, generally coastal or southern, herbaceous dominated species. Coastal Plain Pondshores - Inland Variant also occur in closed basins in sandy outwash, but in the Connecticut River Valley. Coastal plain species grow in them, but include fewer specialists. Freshwater Mud Flat Communities are within ponds rather than shorelines. They have low, sparse annual herbaceous vegetation on recently exposed muddy sediments. Calcareous Pondshore/Lakeshore Communities consist of shrubby, herbaceous, or graminoid vegetation along shores of hard-water lakes. These communities are saturated for much of the year with some plants emerging only during low water. The ponds themselves contain mats of the green alga stonewort.

P44b. Sparsely vegetated herbaceous community dominated by herbs (usually annuals) on recently exposed fine sediments: **Freshwater Mud Flat Communities**

Freshwater Mud Flat Communities have low, sparse annual herbaceous vegetation on recently exposed muddy sediments in rivers and ponds, where they may include stranded aquatic vegetation.

Similar Communities: Low-energy Riverbank Communities are on slopes of river banks composed of a mix of relatively fine mineral materials (clay, silt, or sand). The stream bottoms of Low-energy Riverbanks can merge into Freshwater Mud Flat Communities; separation depends on patch size and connectedness. High-energy Riverbank Communities occur along the shores of fast-flowing, high-energy rivers, with sparse plants growing in the sediment caught between rock cobbles. Riverine Pointbar and Beach Communities are along higher energy rivers on sand or gravel. Deep and Shallow Emergent Marshes have dense graminoid emergent plants on mucky sediments, often with standing water at the base of the plants. Freshwater Tidal Marshes and Brackish Tidal Marshes occur in tidally influenced stretches of coastal rivers; the communities are defined to include mud flats adjacent to marshier, more densely vegetated areas in the tidal reach. Mud flats in coastal plain ponds are treated as parts of the Coastal

Plain Pondshore Community. Mud flats that emerge from human-mediated water lowering in lakes or rivers (including for dam repair or removal, or for nuisance plant control) are usually temporary and would develop River and Lake Drawdown Communities that might be extensions of naturally occurring mud flat communities.

P45a. Open vegetation associated with low-energy or low-gradient rivers and streams: **P46**
P45b. Open vegetation associated with high-energy or high-gradient rivers and streams**: P47**

P46a. Sparsely to moderately vegetated exposed drawdown areas of reservoirs and behind dams: **River and Lake Drawdown Community**

River and Lake Drawdown Communities occur on exposed sediments of reservoirs and behind dams when water levels are lowered. These areas are often large. The vegetation of the River and Lake Drawdown Community is usually low-growing with cover varying from very sparse to dense. Weedy, opportunistic, non-competitive, short-lived, quick-to-reproduce species quickly dominate recently exposed sediments.

Similar Communities: 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 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.

P46b. Open herbaceous vegetation occurring on sandy or silty soils of river banks that do not have severe flooding or ice scour: **Low-energy Riverbank Community**

Low-energy Riverbank Communities are on slopes of river banks composed of a mix of relatively fine mineral materials (clay, silt, or sand) that lack both the cobble substrate of high-energy areas and the organic materials of marshes. The communities may include scattered shrubs or trees along with herbaceous species.

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

P47a. Sparsely vegetated exposed sand/gravel beaches and pointbars of high energy-rivers and large streams: **Riverine Pointbar and Beach Community**

Riverine Pointbar and Beach Communities are on exposed sand or gravel river beaches in high-energy stream channels. 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.

Similar Communities: High-energy Riverbank Communities occur on the banks of fast-flowing, high-energy rivers with sparse plants growing in the 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 sediments in river backwaters and ponds, where they may include stranded aquatic vegetation. River and Lake Drawdown Communities are sparsely to moderately vegetated exposed drawdown areas of reservoirs and behind dams.

P47b. Communities of the shores of high-energy/high gradient rivers, between the water and the bank above sandbars and beaches: **P48**

P48a. Sparse, open herbaceous/graminoid communities occurring on cobble and sand substrates of steep-gradient, fast-flowing rivers that experience severe flooding and ice scour: **High-energy Riverbank Community**

High-energy Riverbank Communities include river shores and edges of islands. Along river islands, zones of switch grass, big bluestem, and Indian grass, along with sandbar willow and/or sandbar cherry, are indicative of High-energy Riverbanks. Along rivers, High-energy Riverbanks have, on average, sparser vegetation and more dry, bare ground than do High-energy Rivershore Meadows or Riverside Seeps.

Similar Communities: High-energy Rivershore Meadows occur on shores as the percentages of sand and silt, and moisture increase, supporting hemp dogbane, riverside-sedge, Canadian burnet, and water horsetail that as a group characterize the rivershore meadows. Riverside Seeps occur at the base of steep riverbanks where mineral-enriched groundwater seeps out of the bottom of the upland slope; they are wetter than associated High-energy Rivershore Meadows and High-energy Riverbank Communities. Low-energy Riverbank Communities are open herbaceous/graminoid communities occurring on sandy or silty mineral soils of river and stream banks that do not experience severe flooding or ice scour. The vegetation is often dominated by reed canary grass, Canada blue joint grass, or other dense grasses, with some of the same species typical of disturbed areas as High-energy Riverbanks. Cobble Bar Forests occur on cobble bars that have a tree canopy (cover >30%).

P48b. Communities between the open cobbles exposed in the summer and the steep bank to the surrounding uplands: **P49**

P49. Variably sized, occurring in about 30 ft. (~10m) wide bands along medium to high-energy river channels, kept open by flooding and ice scouring: **High-energy Rivershore Meadow**

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. On cobble shores along high-energy rivers, High-energy Rivershore Meadows intergrade with High-energy Riverbank and Riverside Seep Communities.

Similar Communities: Riverside Seep Communities occur at the base of steep riverbanks where groundwater seeps out of the bottom of the upland slope; they are wetter than associated High-energy Rivershore Meadows and High-energy Riverbank Communities. Muskflower, Canadian burnet, and golden alexanders as a group are good indicator species of Riverside Seeps. High-energy Riverbank Communities have, on average, sparser vegetation and more bare ground than do High-energy Rivershore Meadows or Riverside Seeps.

P49. Mixed herbaceous community along river shores where groundwater discharge provides mineral enrichment, often kept open by flood and ice scour: **Riverside Seep Community**

Riverside Seep Communities are small patch communities that often occur with and grade into High-energy Rivershore Meadows 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 indicator species of Riverside Seeps.

Similar 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 Seeps.

Estuarine System

E: Tidal wetlands with fresh to salt water. Vegetation is flooded twice daily by fresh, brackish or saltwater tides. Wetland communities with some direct hydrological connection to the open ocean. Substrate has regular, daily, water level fluctuations caused by ocean tides.

E1a. Trees or tall shrubs (>~6ft (~2 m)) as uppermost layer, with total woody cover of that layer >25%; along free-flowing coastal rivers in areas influenced by daily tides**: E2**
E1b. Tree and tall shrub cover in the uppermost layer <25%; uppermost vegetation layer sparse, herbaceous, or low shrubs <~6 ft. (~2m) tall**: E3**

E2a. Trees dominant (single trunks, >~15 ft. (~5m) tall), total woody cover >25%, trees >25%: **Fresh/Brackish Tidal Swamp**

Fresh/Brackish Tidal Swamps are low-stature forested wetlands located along coastal rivers, flooded by daily tides at the upper limit of tidal influence. They have a dense shrub understory and an unusually rich herbaceous layer.

Similar Communities: Freshwater Tidal Marshes occur downslope and downstream from tidal swamps. They are not dominated by trees. Other types of forested wetlands, particularly Red Maple Swamps, Alluvial Red Maple Swamps, and Alluvial Atlantic White Cedar Swamps, do not occur in the sections of coastal rivers that are influenced by daily tides. Fresh/Brackish Tidal Shrublands are dominated by shrubs (<5m, generally multi-stemmed), with <25% trees in the canopy.

E2b. Shrub-dominated (multiple trunks, <~15 ft. (~5m) tall); total woody cover >25%, trees <25%: **Fresh/Brackish Tidal Shrubland**

Fresh/Brackish Tidal Shrublands are dense to open shrublands flooded by daily tides, occurring along the freshwater to brackish reach of coastal rivers and along the upland edges of salt marshes. Shrubby areas within and at the upland edges of salt marshes could be designated as Fresh/Brackish Tidal Shrubland if large enough; otherwise, they would be considered to be part of the expected variation of Salt Marshes. Some Salt Marsh plants occur in tidal shrublands mixed with the more usual freshwater species.

Similar Communities: Fresh/Brackish Tidal Swamps are forested and dominated by trees. Tidal shrublands have less than 25% tree canopy. Shrub Swamps do not occur in areas with brackish water, not where there is freshwater/brackish water tidal action on coastal rivers or where there is freshwater seepage along the edges of salt marshes just above the zone of regular salt water incursion. They do not include typically salt marsh species. Maritime Shrublands are upland communities.

E3a. Open vegetation along tidal rivers and streams in areas where fresh and salt water mix: **E4**
E3b. Vegetation inundated by salt water in daily tides or submerged in salt water: **E5**

E4a. An estuarine intertidal, mixed herbaceous marsh flooded by daily tides, and occurring in the freshwater reach of coastal rivers: **Freshwater Tidal Marsh**

Freshwater Tidal Marshes represent the upstream end of a gradient, ranging from coastal Salt Marsh through Brackish Tidal Marsh to Freshwater Tidal Marsh. Freshwater Tidal Marshes are characterized by salt-intolerant plant species such as sweet flag and wild rice, and do not include Salt Marsh plants such as saltmarsh hay and saltmarsh cordgrass.

Similar Communities: Salt Marshes are submerged twice daily by salt water. Saltmarsh hay and saltmarsh cordgrass are dense and dominate. Brackish Tidal Marshes are limited to short stretches of tidal rivers where salinity is between fresh and salt water levels and along the upper edges of Salt Marshes where freshwater enters from uplands. Saltmarsh bulrush and salt reedgrass occur in brackish conditions. Wet Meadows are not affected by tides.

E4b. Mixed herbaceous marsh that is flooded by daily tides, in brackish reaches of coastal rivers. May also occur in small patches in upper zones of coastal salt marshes and salt ponds, usually near seepages or freshwater transition areas: **Brackish Tidal Marsh**

Brackish Tidal Marshes are limited to short stretches of free-flowing tidal sections of coastal rivers where salinity is between fresh and salt water levels. Smaller patches often occur along the edges of salt marsh habitat, near stream inputs, seepages, or other freshwater transition areas, such as the upper edges of Salt Marshes where freshwater enters from uplands. Saltmarsh bulrush and salt reedgrass occur in brackish conditions.

Similar Communities: Salt Marshes are submerged twice daily by salt water. Saltmarsh hay and saltmarsh cordgrass are dense and dominate. Salt Marshes have less diverse vascular plants than do Brackish Tidal Marshes. Freshwater Tidal Marshes are a mixed herbaceous marsh flooded by daily tides, in the freshwater reaches of coastal rivers; the presence of sweet flag and wild rice indicates fresh water, not brackish or salt. Freshwater Tidal Marshes lack salt-tolerant plants.

E5a. Community submerged on flats in salt water, intertidal or subtidal, estuarine or marine, or in coastal salt ponds irregularly open to the ocean: **E6**
E5b. Intertidal communities along shores covered twice daily in salt water by tides, on ocean shores, bays, and in salt water sections of coastal rivers: **E7**

E6a. Community on flats in salt water, either intertidal or subtidal, dominated by eelgrass or widgeon grass, not in coastal salt ponds: **Seagrass Community**

Seagrass Communities occur on estuarine or marine flats with sand or mud substrates that are completely submerged by, usually, less than 2m of water at high tide. They are sparsely to densely vegetated communities, completely submerged at high tide and dominated by eelgrass with a strong invertebrate component. All seagrass beds not in Coastal Salt Ponds are included in this community type.

Similar Communities: Coastal Salt Ponds may include eelgrass or widgeon grass beds, but those are included in the Coastal Salt Pond community type. Marine Intertidal Gravel/Sand Beaches are below the wrack line and submerged twice daily by tides. Any vegetation is non-vascular. Marine Intertidal Rocky Shore Communities are dominated by invertebrates and non-vascular macro-algae (seaweeds). They are covered in salt water twice daily, and are fully exposed to waves. A national classification of marine and estuarine communities is in the early stages of development. Inter- and sub-tidal flats occur all along the Atlantic coast, and have many variants. Subtidal submerged rocky habitats are often dominated by kelp and other algae; they are not included in this classification.

E6b. The vegetation in and surrounding coastal saline to brackish ponds separated from the ocean by sandspits: **Coastal Salt Pond Community**

Coastal Salt Ponds are separated from the ocean by sandspits that open and close irregularly causing great variability in salinity, water levels, and vegetation within the salt pond. The inland ends tend to be fresher water, with denser, taller vegetation developing where freshwater enters from uplands.

Similar Communities: This is the only community represented by a body of water with a narrow opening to the sea, generally formed between the mainland and a barrier beach. Seagrass Communities have some similar species but occur on inter- and subtidal flats in open saline or brackish waters, with no freshwater component.

E7a. A densely vegetated, graminoid-dominated, tidally flooded coastal community, with multiple recurring zones: **Salt Marsh**

Salt Marshes are graminoid-dominated, tidally flooded coastal communities developed on non-sphagnum peaty material in areas protected from wave energy in estuaries and behind barrier beaches. Salt Marshes are flooded by salt water twice daily. Most of the vegetation is dominated by saltwater cordgrass and salt hay.

Similar Communities: Brackish Tidal Marshes have salinity levels between fresh- and salt water (0.5-18 ppt,). The vegetation is mixed with saltmarsh bulrush, salt reedgrass, and narrow-leaved cattail, not with saltwater cordgrass and salt hay. Freshwater Tidal Marsh lacks saltwater cordgrass and salt hay, and has sweet flag, wild rice, climbing hempweed, and other broad-leaved herbaceous plants. It is flooded by freshwater (salinity <0.5 ppt). The various freshwater marshes and Wet Meadows are not flooded by daily tides and are not dominated by saltwater cordgrass and salt hay.

E7b. Intertidal rocky or gravel/sand shore, vegetated sparsely to densely by nonvascular macro-algae (seaweeds): **E8**

E8a. Rocky ocean shore covered by salt water in twice daily tides: **Marine Intertidal Rocky Shore Community**

Marine Intertidal Rocky Shores are dominated by invertebrates and non-vascular plants, in a high-stress environment alternately covered by tides and exposed to desiccation and thermal stress.

Similar Communities: This is the only marine rock community covered in salt water twice daily. It is fully exposed to waves. Marine Intertidal Gravel/Sand Beaches have smaller substrate materials, but may share some of the species and are also inundated by twice daily tides and receive the full force of waves. Maritime Rock Cliff Communities are sparsely vegetated terrestrial communities where plants grow in cracks and ledges where soil collects, within the salt spray zone, but above normal high tides. They are often physically above Marine Intertidal Rocky Shore communities.

E8b. Gravel or sand beaches submerged twice daily by salt water tides: **Marine Intertidal Gravel/Sand Beach Community**

Marine Intertidal Gravel/Sand Beaches are below the wrack line and submerged twice daily by tides. Invertebrates and nonvascular plants dominate Marine Intertidal Gravel/Sand Beaches, a highly stressed community in the intertidal (zone of beaches, below the Maritime Beach Strand community.

Similar Communities: Maritime Beach Strand Communities are above the daily high tides, between the wrack line and the dunes, and they support scattered vascular plants. Seagrass Communities are dominated by vascular eelgrass or widgeon grass, on subtidal or intertidal mud flats that are not in the zones of intense wave action.