Terrestrial Communities Descriptions

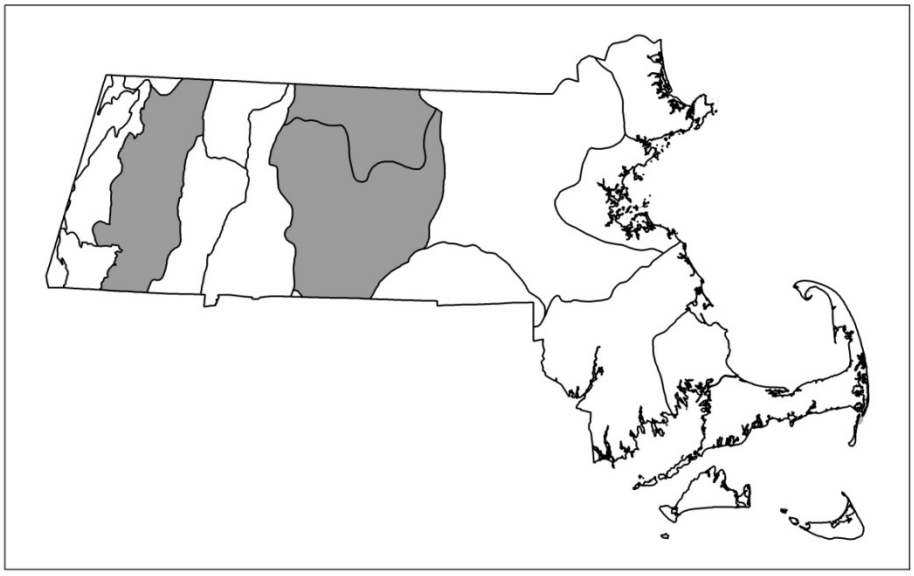
These are upland natural communities on predominantly well-drained soils that are dry to mesic. The vegetation is never hydrophytic even if the soil surface is seasonally flooded or saturated.

Sandplain Grassland, Frances Crane, WMA, Falmouth, MA, photo by Patricia Swain, NHESP

Acidic Rock Cliff Community

Community Code: CT2A2A2000

State Rank: S4



Concept: An open community of extremely sparse scattered vascular plants on ledges and in crevices, within a sparsely vegetated vertical substrate of acidic rocks and open talus at the base of the cliff. Lichens are occasionally dense on the cliff face.

Environmental Setting: 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 large talus at the base. Although often cooler and moister than Acidic Rocky Summit/Rock Outcrop Communities because of aspect or shading from surrounding forests, there is a continuum of conditions and Acidic Rock Cliff Communities may be physically below Acidic Rocky Summit/Rock Outcrop Communities. Cliffs less than about 5000 sq. ft. should be considered to be inclusions in the surrounding communities.

Vegetation Description: Rock cliff communities are sparsely vegetated. Acidic Rock Cliff Communities are the least diverse of the cliff communities: the vascular vegetation is sparse, the plant association is not distinctive, and there are few specialized plant species. Acidic Rock Cliffs support species of dry, low-nutrient openings from the surrounding forests, such as Virginia creeper (*Parthenocissus quinquefolia*), common polypody (*Polypodium virginianum*), and rusty cliff-fern (*Woodsia ilvensis*). Harebell (*Campanula rotundifolia*) and fringed bindweed (*Fallopia cilinodis*) are often in crevices on acidic cliffs, as well as in other sterile acidic conditions. Bearberry (*Arctostaphylos uva-ursi*), bristly sarsaparilla (*Aralia hispida*), and stout goldenrod (*Solidago squarrosa*) may occur on ledges in the cliff face. Purple-flowering raspberry (*Rubus odoratus*) occurs on acidic cliffs in the northern and western parts of the state. Lichens, including rock tripe (*Umbilicaria* spp.), may be abundant on the rock face. Trees from the surrounding forest may shade the cliff

face; shaded cliffs have less vegetation than sunny occurrences. Cliffs are small areas within surrounding forest and reflect the vegetation of the surroundings.

Differentiating Occurrences: Three types of very sparsely vegetated plant communities have been identified on rock cliff faces, depending on the chemistry of the rock: Acidic, Circumneutral, and Calcareous (alkaline, named for calcium availability). Circumneutral and Calcareous Rock Cliff Communities have species that don't occur on Acidic Rock Cliffs, which are less distinctive vegetationally. Presence of columbine (*Aquilegia canadensis*), pink corydalis (*Capnoides sempervirens*), marginal wood-fern (*Dryopteris marginalis*), ebony spleenwort (*Asplenium platyneuron*), maidenhair spleenwort (*Asplenium trichomanes*), or purple cliff brake (*Pellaea atropurpurea*) usually indicates less acidic conditions. Red cedar (*Juniperus virginiana*) is also less likely to be present in the vicinity of Acidic Rock Cliffs than on less acidic cliffs and rock outcrops. Rocky summit/rock outcrop and Open Talus/Coarse Boulder Communities also have bare rock and could be confused with Acidic Rock Cliff Communities. The differentiation between cliffs and rock outcrops and summits is arbitrary: cliffs are defined as vertical to near vertical (~60% slope). Open Talus communities have broken rock rather than continuous, near-vertical rock faces.

Associated Fauna: All types of cliffs provide nesting habitat for Ravens (*Corvus corax*) and, increasingly, Peregrine Falcons (*Falco peregrinus*), as the offspring of Peregrine Falcons released in urban areas since 1984 have begun to return to the natural habitat to breed. Cliffs were probably the native habitat of the Eastern Phoebe (*Sayornis phoebe*). No mammals, reptiles, or amphibians would be expected on the steep cliff faces.

Public Access: Mt. Tekoa WMA, Russell; Mt. Everett State Reservation, Mt. Washington; Wendell State Forest, Wendell.

Threats: Rock climbing can break plants off of the cliff face, remove small pockets of soil, and wear lichens off of the rocks. Distinct trails appear on heavily used cliffs. A threat to Acidic Rock Cliff communities throughout the state is granite quarrying that removes existing vegetation along with underlying rocks. This causes changes in future vegetation, habitat characteristics, and hydrology. When quarries are abandoned, they are often left bare of all but planted grass and invasive weeds, land that is ripe for residential or commercial development.

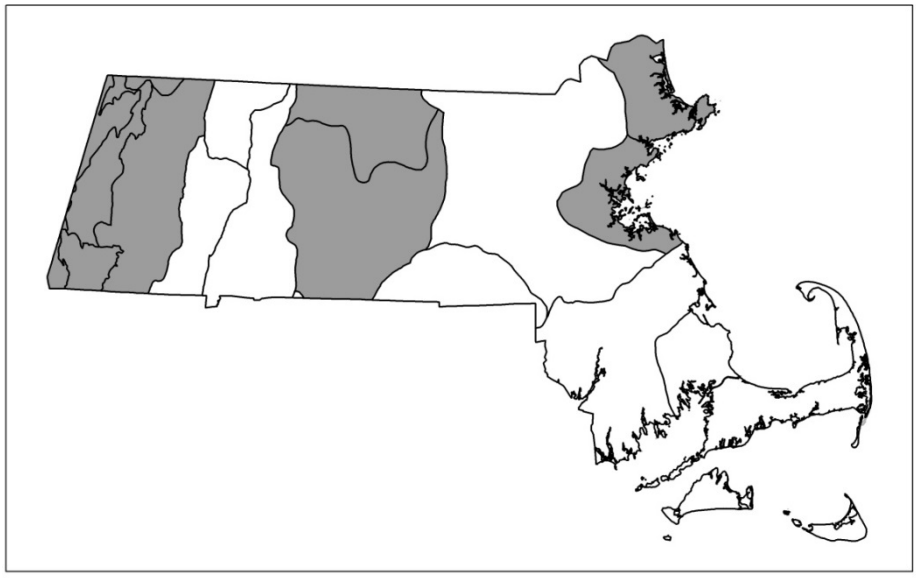
Management Needs:

USNVC/NatureServe: Includes: *Asplenium montanum* sparsely vegetated alliance - *Asplenium montanum* sparse vegetation [CEGL004391] includes: Lichen vegetation - *Umbilicaria mammulata* nonvascular alliance - *Umbilicaria mammulata* nonvascular vegetation [CEGL004387].

Acidic Rocky Summit/Rock Outcrop Community

Community Code: CT2A1A0000

State Rank: S4



Concept: A widespread open community of low shrubs, scattered grasses, mosses, lichens, and occasional trees, found on rocky summits with exposed acidic bedrock or on rock outcrops where bedrock is acidic.

Environmental Setting: This community is found on rocky summits (balds) or ridge tops with exposed acidic bedrock or on rock outcrops derived from acidic bedrock. These areas are characteristically dry, with little or no soil, and can often be found as open patches within ridgetop pitch pine or dry, mixed oak communities. Although it can be found on flat surfaces, it is more typically found on steep slopes with aspects varying from southeast through southwest. Vegetation is concentrated around the edges or is found in pockets of soil within the outcrop. Ridgetop Pitch Pine - Scrub Oak Communities and other ridgetop communities are often around the open patches of the Acidic Rocky Summit/Rock Outcrop Community. Examples of the Acidic Rock Cliff Community may occur below rocky summits, sometimes with intervening ridgetops or other forest/woodlands.

Vegetation Description: Low shrubs and scattered clumps of grass dominate this community. Vegetation is discontinuous. The exposed rocks often have extensive patches of lichen and moss. Canopy cover is largely absent but trees commonly found near the margin of the bedrock areas include pitch pine (*Pinus rigida*), white pine (*Pinus strobus*), and red oak (*Quercus rubra*), and occasionally may include red pine (*Pinus resinosa*, native in this habitat). The dominant shrubs include scrub oak (*Quercus ilicifolia*), huckleberry (*Gaylussacia baccata*), early sweet blueberry (*Vaccinium pallidum*), low sweet blueberry (*V. angustifolium*), bearberry (*Arctostaphylos uva-ursi*), black chokecherry (*Aronia melanocarpa*), and running shadbush (*Amelanchier spicata*).

Dwarf chestnut oak (*Q. prinoides*) can also be found, but not as commonly. Herbaceous species include little bluestem (*Schizachyrium scoparium*), poverty grass (*Danthonia spicata*), common hair grass (*Deschampsia flexuosa*), Pennsylvania sedge (*Carex pensylvanica*), and cow wheat (*Melampyrum lineare*).

Differentiating Occurrences: Rocky Summit/Rock Outcrop communities are dominated by bare rock. 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 basic (alkaline, named calcareous for calcium availability) (pH > 7.5). These communities would not be expected to co-occur since the type of bedrock determines the type of natural community. Circumneutral and Calcareous Rocky Summit/Rock Outcrop Communities have species that do not occur on Acidic Rocky Summit/Rock Outcrops, which has a less distinctive flora. Columbine (*Aquilegia canadensis*), climbing fumitory (*Adlumia fungosa*), red cedar (*Juniperus virginiana*), and pink corydalis (*Capnoides sempervirens*) are more likely on circumneutral or calcareous outcrops than on acidic occurrences. In the eastern part of the state, Acidic Rocky Summit/Rock Outcrop Communities are often associated with a dry oak and pitch pine forest, while Circumneutral Rocky Summit/Rock Outcrop Communities are often associated with hickory-hop hornbeam, oak-hickory, or forests with sugar maple. Calcareous outcrops may be near or above patches of Rich, Mesic Forest or enriched northern hardwood forests. The Acidic Rocky Summit/Rock Outcrop Community is often dominated by low shrubs, with grasses, sedges, and a few herbaceous species forming a secondary component. In the Circumneutral Rocky Summit/Rock Outcrop Community, grasses, sedges, and a variety of herbaceous species dominate the vegetation. The Calcareous Rocky Summit/Rock Outcrop Community is dominated by both shrubs and herbaceous plants, with steeper, moister ledges supporting a rich community of ferns. Acidic Rocky Summits/Rock Outcrops can be difficult to separate from other ridgetop communities that may be present at the same site in a mosaic of communities. These include all types of rock cliff communities, Ridgetop Pitch Pine - Scrub Oak Community, Scrub Oak Shrublands, and Ridgetop Heathland Community. When mapping communities on a rock outcrop or summit, the size of the various patches should be considered. One site could have multiple types of these communities or, if one community type is predominant and the others are in small areas (patches of less than 5000 sq. ft.) within it, the dominant community type would be named with notes on the variation. Rock cliffs are vertical to near vertical (more than about 60% slope); rock outcrops are not. The difference is arbitrary. Scrub Oak Shrublands have dominant, dense shrub oaks, no pines and 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 little bare rock. There need to be abundant shrub oaks and pitch pines for the community to be Ridgetop Pitch Pine - Scrub Oak or Scrub Oak Shrubland. Ridgetop Heathland has large areas dominated by lowbush blueberry, and little exposed bedrock.

Associated Fauna: Most animals of rock outcrop communities are not sensitive to the chemistry of the rock, but rather are responding to the elevation and dryness of the habitat. Any

differences in resident fauna between outcrop types are most likely due to geographical differences in species distributions. Outcrops tend to be fairly small, and only a part of the habitat of most vertebrate animals. Small mammals of rock outcrop communities include those of dry habitats such as white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*) and, in grassy/sedgy areas with some soil accumulation, meadow voles (*Microtus pennsylvanicus*). Acid Rocky Summit/Rock Outcrop Communities with their open, south-facing slopes provide good habitat for snakes of dry areas, such as north American racer (*Coluber constrictor*), northern ring-necked snake (*Diadophis punctatus*), and northern red-bellied snake (*Storeria occipitomaculata*). No turtles, frogs or toads would be expected. Ravens (*Corvus corax*) are all around high elevations, especially near cliffs where they nest.

Public Access: Greylock State Reservation, Adams; Watatic Mtn., Ashburnham; Middlesex Fells Reservation, Winchester/Stoneham.

Threats: The major threat is probably the use of the areas as viewpoints. This can destroy the vegetation by trampling. The larger and steeper areas where the community occurs are probably stable and not likely to be overgrown by trees. Smaller areas may be overgrown during succession.

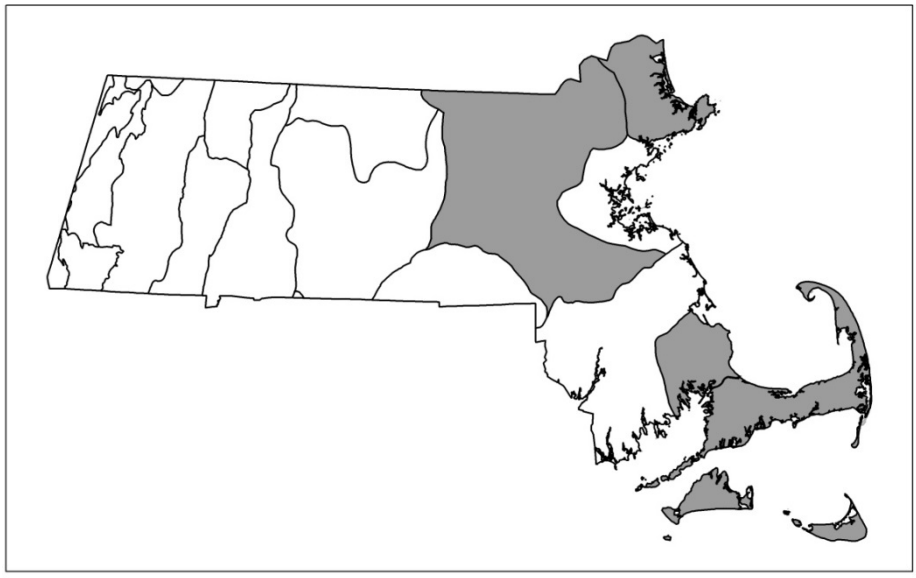
Management Needs: Build trails to avoid these areas and/or educate the public, so they understand how to protect the fragile areas. Controlled burns may be useful in keeping areas open.

USNVC/NatureServe: Part of NatureServe System Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571). In part A4110 *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Dwarf - shrubland Alliance - *Vaccinium angustifolium* - *Sorbus americana* Dwarf - shrubland [CEGL005094); included in A3314 *Picea rubens* / *Vaccinium angustifolium* Northern Rocky Woodland Alliance - *Picea rubens* / *Vaccinium angustifolium* / *Sibbaldiopsis tridentata* [CEGL006053].

Black Oak - Scarlet Oak Forest/Woodland

Community Code: CT1A3B0000

State Rank: S3S4



Concept: A fairly open oak/heath woodland maintained by regular light fire. Without fire, the community becomes a closed forest with more diversity of trees and a denser understory flora.

Environmental Setting: Black Oak - Scarlet Oak Woodland is a fairly open, short (<20m, ~60 ft., tall) oak / heath community maintained by regular light fire or other disturbance. The woodland occurs on dry sites, often sandy, gravelly, or rocky slopes. Without fire, there tends to be a deep accumulation of oak leaf litter that impedes germination of seeds that need mineral soil, restricting such species to small patches of disturbance. Except on the driest sites, without regular fire, the woodland community tends to succeed to more diverse, denser and taller Oak - Hemlock - White Pine Forest or one of its variants.

Vegetation Description: In Black Oak - Scarlet Oak Woodlands, black oak (*Quercus velutina*) is the dominant canopy species, with a high proportion of scarlet oak (*Q. coccinea*). White oak (*Q. alba*) and red maple (*Acer rubrum*) are common associates. A sparse subcanopy may have species of recent disturbance such as grey birch (*Betula populifolia*), black cherry (*Prunus serotina*), and sassafras (*Sassafras albidum*), as well as species less tolerant of fire such as flowering dogwood (*Benthamidia florida*) or shadbush (*Amelanchier spp.*). Lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*), huckleberry (*Gaylussacia baccata*), and scrub oak (*Quercus ilicifolia*) form a low shrub layer, with scattered sheep laurel (*Kalmia angustifolia*), maple-leaved viburnum (*Viburnum acerifolium*) and American hazelnut (*Corylus americana*). A sparse herbaceous layer includes scattered patches of Pennsylvania sedge (*Carex pensylvanica*), bracken fern (*Pteridium aquilinum*), and pink lady's slipper

(*Cypripedium acaule*). Wintergreen (*Gaultheria procumbens*) may be dense in areas with little past soil disturbance.

Differentiating Occurrences: Black Oak - Scarlet Oak Woodlands are part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species. Many of the 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 plants of the blueberry family. Black Oak - Scarlet Oak Woodlands are overtly woodlands: most canopy trees are relatively short (<20m, ~60 ft.) and the canopy is generally interrupted rather than continuous (~60% cover). Abundant scarlet oak with black oak is the key indicator of the type. 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 (black, scarlet, and white plus red oak (*Q. rubra*) and chestnut oak (*Q. montana*)) than Black Oak - Scarlet Oak Woodlands, as well as black birch (*Betula lenta*). The type is broadly defined and Black Oak - Scarlet Oak Woodlands 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 are 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).

Associated Fauna: Black Oak - Scarlet Oak Woodlands would be part of the habitat of wide-ranging or large animals. Acorns are important food for white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), grey squirrels (*Sciurus carolinensis*), other small rodents, Wild Turkeys (*Meleagris gallopavo*), and other birds. The understory of blueberries and huckleberries is used by many of these same species in areas with sufficiently large forests to provide all the habitat needs. Passerine birds of oak forests include Red-eyed Vireo (*Vireo olivaceus*), White-breasted Nuthatch (*Sitta carolinensis*), Ovenbird (*Seiurus aurocapillus*), Black-and-white Warbler (*Mniotilta varia*), Scarlet Tanager (*Piranga olivacea*), Great Crested Flycatcher (*Miarchus crinitus*), and Downy Woodpecker (*Picoides pubescens*). Orange Sallow Moth (*Pyrrhia aurantiago*) may be present when either of its host plants, smooth and fern-leaf false fox glove (*Aureolaria flava* and *A. pedicularia*), are present in sufficient abundance.

Public Access: Salisbury Marsh WMA, Salisbury; Clinton Bluff WMA, Clinton; Green Hill Park, Worcester; Cape Cod National Seashore, Truro.

Threats: Fire suppression, severe wildfire, and exotics. ATV trails.

Management Needs: Prescribed fire, exotic removal.

USNVC/NatureServe: A4209 *Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance - *Quercus coccinea - Quercus velutina / Sassafras albidum / Vaccinium pallidum* Forest [CEGL006375].

Calcareous Rock Cliff Community

Community Code: CT2A2C0000

State Rank: S3

Concept: Extremely sparse vegetation, in cracks and small ledges of nearly vertical cliff faces and any open talus at the base of the cliff. A more diverse community than found on acidic cliffs.

Environmental Setting: Rock cliff communities all occur on more or less vertical bedrock cliff faces. They have extremely sparse scattered vascular plants on ledges and in crevices. Lichens may be dense on the rock face. Calcareous Rock Cliff Communities occur on exposures of resistant limestone, dolomite, or other calcareous bedrock; cliffs often include ledges and open talus slopes below. There is minimal soil development. Surroundings tend to be northern hardwood forest, or sometimes Rich, Mesic Forests. Calcareous Rocky Summit/Rock Outcrop Communities may occur above calcareous cliffs, although much calcareous rock in Massachusetts is overlain by more resistant acidic rock. Rock cliffs less than about 5000 sq. ft. should be considered inclusions in the surrounding forest, or combined with larger talus or rock outcrops as appropriate.

Vegetation Description: The sparse vegetation of Calcareous Rock Cliff Communities is distinct and specific to the habitat. Purple cliff-brake (*Pellaea atropurpurea*), bulblet fern (*Cystopteris bulbifera*), maidenhair spleenwort (*Asplenium trichomanes*), blunt-lobed cliff-fern (*Woodsia obtusa*), walking fern (*Asplenium rhizophyllum*), and columbine (*Aquilegia canadensis*) are characteristic species of vascular plants. Harebell (*Campanula rotundifolia*) grow in drier open sites, and moister, shaded sites have early saxifrage (*Micranthes virginiensis*), rock-pellitory (*Parietaria pensylvanica*), small enchanter's nightshade (*Circaea alpina*), and several rock-cresses (hairy rock-cress, *Arabis pycnocarpa*; lyre-leaved rock-cress, *Arabidopsis lyrata*; and smooth rock-cress,

Boechera laevigata). Lichen and moss grow on the rock face and in small cracks. Surrounding forest often includes sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), basswood (*Tilia americana*), butternut (*Juglans cinerea*), and black and yellow birches (*Betula lenta* and *B. alleghaniensis*). Trees from the surrounding forest may shade the cliff face; shaded cliffs have less vegetation than sunny occurrences.

Differentiating Occurrences: Three types of very sparsely vegetated plant communities have been identified on rock cliff faces, depending on the chemistry of the rock: Acidic, Circumneutral, and Calcareous (alkaline, named for calcium availability). Circumneutral and Calcareous Rock Cliff Communities have species that don't occur on Acidic Rock Cliff Communities, which vegetationally are less distinctive. In distribution, Circumneutral Rock Cliff Communities overlap with and are more widespread than Calcareous Rock Cliff Communities, which are restricted to the Marble Valleys 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, and/or green rock-cress. Red cedar is more likely to be present in the vicinity of Circumneutral or Calcareous Rock Cliff Communities and associated outcrops than on Acidic Rock Cliff Communities and their associated rock outcrops. Calcareous Rock Cliff communities include species requiring high nutrient levels (nutrient richness) or high pH such as rock pellitory, 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. Rocky summits, rock outcrops, and Open Talus/Coarse Boulder Communities also have bare rock and could be confused with Circumneutral Rock Cliff Communities. The differentiation between cliffs and rock outcrops/summits is arbitrary: cliffs are defined as vertical to near vertical (~60% slope). Open Talus/Coarse Boulder communities have broken rock rather than continuous, near-vertical rock faces. Ridgetop Pitch Pine - Scrub Oak and Ridgetop Heathland Communities occur on rock ridges but are more densely vegetated than Circumneutral Cliff Communities, and are not near vertical overall.

Associated Fauna: All types of cliffs provide nesting habitat for Ravens (*Corvus corax*). In the past, Peregrine Falcons (*Falco peregrinus*) nested on cliffs before being extirpated from Massachusetts in 1955, and the offspring of Peregrine Falcons released in urban areas since 1984 have begun to return to the natural habitat to breed in the state. Cliffs were probably the native habitat of the Eastern Phoebe (*Sayornis phoebe*). No mammals, reptiles, or amphibians would be expected on the steep cliff faces.

Public Access: Calcareous cliffs are easily damaged by visitation. Most landowners do not want their sites publicized.

Threats: Rock climbing can break plants off of the cliff face, remove small pockets of soil, and wear lichens off of the rocks. Distinct trails appear on heavily used cliffs. Natural nest sites that Peregrine Falcons used in the past are being re-colonized as Peregrine numbers increase. However, at some cliff sites it is likely that rock-climbers disturb prospecting pairs of falcons sufficiently to keep the birds from

nesting, either just for that season or as a possible nest site at all. Ridgetops and tops of rock cliffs often have recreational trails along them that are eroded, lead to trampling of vegetation, or generally create disturbances that alter habitat for animals as well as plants. Calcareous Rock Cliffs are quarried for limestone and marble in the Berkshires. Quarrying removes existing vegetation along with underlying rocks, changing habitat characteristics, hydrology, and future vegetation. When quarries are abandoned, what is left is often bare of all but planted grass and invasive weeds.

Management Needs:

USNVC/NatureServe: Includes: *Cystopteris bulbifera* sparsely vegetated alliance - *Cystopteris bulbifera* sparse vegetation [provisional] [CECL004394]; includes some of: Laurentian-Acadian-Great Lakes Alkaline Cliff Alliance A4006 - *Pellaea atropurpurea* cliff sparse vegetation (CEGL006527).

Calcareous Rocky Summit/Rock Outcrop Community

Community Code: CT2A1C0000

State Rank: S2

Concept: An open community of shrubs and herbaceous plants, occurring on open calcareous ridgetops of the low hills edging the valleys in the Western New England Marble Valleys eco-region, as well as on steep, mid-slope calcareous ledges found in the same region.

Environmental Setting: Ridgetop calcareous outcrops are dry and typically are found on the ridgetops of low hills in the calcareous regions of Berkshire County. Their open aspect is maintained by trees uprooting and pulling away from the steep ridgetop areas. Because most calcareous bedrock in Massachusetts is overlain by more resistant acidic rocks, the community tends to be found on rock outcrops rather than actual rocky summits. The substrate grades from rock outcrops to steeper, but moister, shaded cliff faces that support Calcareous Rock Cliff Communities.

Vegetation Description: The ridgetop community supports relatively sparse herbaceous vegetation that includes ivory sedge (*Carex eburnea*), purple clematis (*Clematis occidentalis*), long-leaved bluet (*Houstonia longifolia*), balsam-ragwort (*Packera paupercula*) and lyre-leaved rock-cress (*Arabidopsis lyrata*). Shrubs include round-leaved dogwood (*Swida rugosa*) and roundleaf shadbush (*Amelanchier sanguinea*), as well as the less common northern prickly rose (*Rosa acicularis*), hairy honeysuckle (*Lonicera hirsuta*), and downy arrow-wood (*Viburnum rafinesquianum*). Calcareous rock outcrops off the summit ridges tend to be moister and are lightly shaded by trees characteristic of Rich, Mesic Forests, including sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), and hop-hornbeam (*Ostrya virginiana*). The herbaceous layer can include species characteristic of Rich, Mesic Forests, but typically has a high proportion of ferns such as bulblet fern (*Cystopteris bulbifera*), fragile fern (*C.*

tenuis), ebony spleenwort (*Asplenium platyneuron*), maidenhair spleenwort (*A. trichomanes*), walking fern (*Asplenium rhizophyllum*), and blunt-lobed wood-fern (*Woodsia obtusa*), along with the rarer ferns purple cliff-brake (*Pellaea atropurpurea*) and wall-rue spleenwort (*Asplenium ruta-muraria*). Other plants that are frequently found on these ledges include Pennsylvania sedge (*Carex pensylvanica*), harebell (*Campanula rotundifolia*), peduncled sedge (*Carex pedunculata*), early saxifrage (*Micranthes virginiensis*), smooth rock-cress (*Arabidopsis laevigata*), and columbine (*Aquilegia canadensis*). This community also has a number of non-native invasives, including Morrow's honeysuckle (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), and multiflora rose (*Rosa multiflora*).

Differentiating Occurrences: Calcareous Rocky Summit/Rock Outcrop Communities often include plantain-leaf sedge (*Carex plantaginea*), maidenhair spleenwort (*Asplenium trichomanes*), walking fern (*Asplenium rhizophyllum*), or herbaceous species typical of Rich, Mesic Forests. Columbine (*Aquilegia canadensis*), climbing fumitory (*Adlumia fungosa*), red cedar (*Juniperus virginiana*), pink corydalis (*Capnoides sempervirens*), broad-leaved woodland-sedge (*Carex platyphylla*), ebony spleenwort (*Asplenium platyneuron*}, bulblet fern (*Cystopteris bulbifera*), or fragile fern (*C. tenuis*) may be in either Calcareous or Circumneutral Rocky Summit/Rock Outcrop Communities, but not in Acidic Rocky Summit/Rock Outcrop Communities. The differentiation between cliffs and rock outcrops/summits is arbitrary: cliffs are vertical to near vertical (about 60% slope). The assignment to type would be based on overall conditions: it is expected that small (< 5000 sq. ft.) patches would be considered to be variation of the surrounding type and would be included in that type. Rocky summit/rock outcrop communities are dominated by bare rock. Ridgetop Pitch Pine - Scrub Oak Communities also occur on rocky ridges, with pitch pine (*Pinus rigida*) and scrub oak (*Quercus ilicifolia*), but 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. Ridgetop Heathland communities are dominated by heaths, usually low-bush blueberry (*Vaccinium angustifolium*). Depending on size, one site could have multiple types of these communities: if one community type is predominant and the others are in small patches within it, the dominant community type would be named with notes on the variation. Forested ridgetops on calcareous bedrock may include yellow oak (*Quercus muehlenbergii*). These ridgetops are then classified as Yellow Oak Dry Calcareous Forest, a calcareous equivalent of Hickory - Hop Hornbeam Forest/Woodland.

Associated Fauna: Most animals of rock outcrop communities are not sensitive to the chemistry of the rock, but rather are responding to the elevation and dryness of the habitat. Any differences in resident fauna between calcareous and acidic outcrops are most likely due to geographical differences in species distribution rather than to qualitative differences among the types of outcrops. Calcareous outcrops are in the western part of Massachusetts, and so have the species that don't occur in coastal areas, such as deer mouse (*Peromyscus maniculatus*), woodland jumping mouse

(*Napaeozapus insignis*), and smoky shrew (*Sorex fumeus*), as well as other, more widespread small mammals of dry habitats, such as white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*) and, in grassy/sedgy areas with some soil accumulation, meadow voles (*Microtus pennsylvanicus*). Outcrops tend to be fairly small and only a part of the habitat of most vertebrate animals. Snakes would be those of dry areas, such as black racer (*Coluber constrictor*), ringneck (*Diadophis punctatus*), and redbelly snake (*Storeria occipitomaculata*). No turtles, frogs or toads would be expected. Ravens (*Corvus corax*) are all around high elevations, especially near cliffs where they nest. Invertebrates include tiger beetles.

Public Access: Bartholomew's Cobble, The Trustees of Reservations, Sheffield; Rounds Rock, Mt. Greylock State Reservation, New Ashford/Cheshire.

Threats: These communities can be threatened by development and by invasive species. This community has a number of non-native invasives, including Morrow's honeysuckle (*Lonicera morrowii*), Japanese barberry (*Berberis thunbergii*), and multiflora rose (*Rosa multiflora*).

Management Needs: Control of invasive species.

USNVC/NatureServe: Includes: CEGL006180 *Juniperus virginiana - Ostrya virginiana*/*Carex eburnea* Woodland.

Chestnut Oak Forest/Woodland

Community Code: CT1A3A0000

State Rank: S4

Concept: Oak forest of dry ridgetops and upper slopes, dominated by chestnut oak with an often dense understory of scrub oak, heaths, or mountain laurel.

Environmental Setting: Chestnut Oak Forests/Woodlands occur as long narrow bands along dry ridges and upper slopes with thin soil over acidic bedrock. They may extend down steep, convex, rocky, often west- or south-facing slopes where soil is shallow and dry. The canopy is closed to partially open (>25% cover). There tends to be deep oak leaf litter with slow decomposition. Often many trees have multiple fire scars and charred bases; fire appears to play a role in maintaining the community occurrences. Chestnut Oak Forests/Woodlands often occur in a mosaic with closed oak or pine - oak forests down slope and more open communities above.

Vegetation Description: The canopy of Chestnut Oak Forests/Woodlands is dominated, often completely, by chestnut oak (*Quercus montana*). Less abundant associates include other oaks (black (*Q. velutina*), red (*Q. rubra*), and/or white (*Q. alba*), and less commonly, scarlet (*Q. coccinea*)), with red maple (*Acer rubrum*), and white or pitch pines (*Pinus strobus*, *P. rigida*). The subcanopy layer is sparse and consists of canopy species, black birch (*Betula lenta*), and sassafras (*Sassafras albidum*). Tall shrubs are lacking or the shrub layer may have scattered tree saplings, mountain laurel (*Kalmia latifolia*), striped maple (*Acer pensylvanicum*), American chestnut (*Castanea dentata*), and witch hazel (*Hamamelis virginiana*). Short shrubs are dense in patches dominated by black huckleberry (*Gaylussacia baccata*) and lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*), with scattered sheep laurel (*K. angustifolia*). The herbaceous layer is sparse and dominated by wintergreen (*Gaultheria procumbens*), with occasional false foxgloves (*Aureolaria flava*, *A.*

pedicularia, and *A. virginica*), sedges (particularly *Carex pensylvanica*), and bracken fern (*Pteridium aquilinum*).

Differentiating Occurrences: 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. Mixed Oak Forests/Woodlands have more oak species (black, scarlet, white, red, and chestnut oak) than most other types of oak forests and birches 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 in local dense patches. Abundant scarlet oak with black oak is the key indicator of Black Oak - Scarlet Oak Woodlands. Open Oak Woodlands occur on hill slopes with short red and white oak trees scattered over a grassy or low shrub 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.

Associated Fauna: Mature upland forest types provide valuable structural attributes such as tree cavity den sites (used by a variety of bird and mammal species) and large woody material (used by various amphibian, reptile, and invertebrate species). Because chestnut oak acorns are particularly sought after by wildlife, Chestnut Oak Forests/Woodlands provide seasonally preferred foraging habitat for large and small mammals and birds, including turkeys. The understory of blueberries and huckleberries is used by many of these same species. Song birds, moths, butterflies, and other insects of the oak forest continuum occur in Chestnut Oak Forests.

Public Access: Copicut WMA, Fall River; Leadmine Mtn. Conservation Area, Sturbridge; Tekoa Mountain WMA, Russell/Montgomery.

Threats:

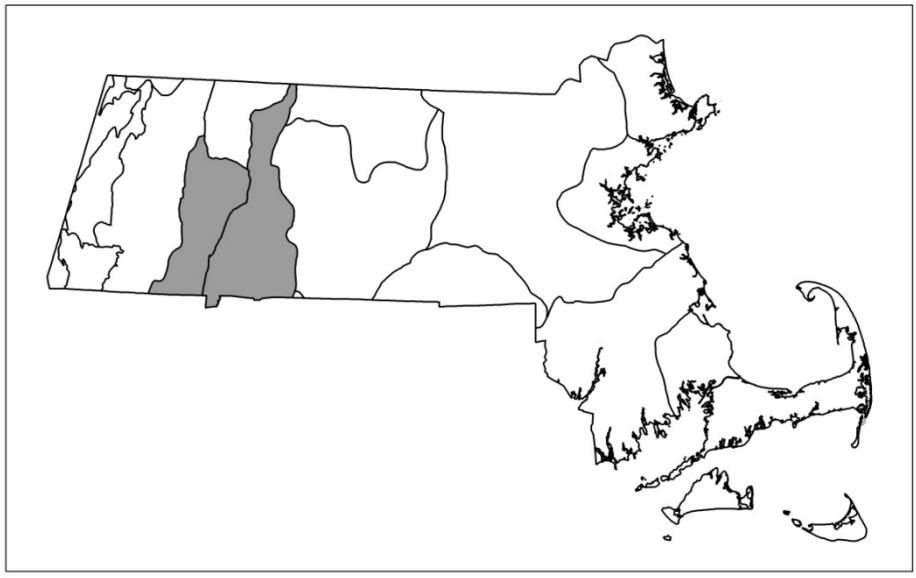
Management Needs:

USNVC/NatureServe: A0248 *Quercus prinus* - *Quercus coccinea* Forest Alliance -- *Quercus prinus* - *Quercus* (*rubra*, *velutina*)/*Gaylussacia baccata* forest [CEGL006282].

Circumneutral Rock Cliff Community

Community Code: CT2A2B0000

State Rank: S3



Concept: A community of extremely sparse scattered vascular plants on small ledges and in crevices within a vertical substrate of rocks and any open talus at the base of the cliff. Lichens are occasionally dense. Circumneutral Rock Cliff Communities tend to have a greater diversity of vascular plants than found in Acidic Rock Cliff Communities.

Environmental Setting: Rock cliff communities all occur on more or less vertical bedrock cliff faces. They have extremely sparse scattered vascular plants on ledges and in crevices. Lichens may be dense on the rock face. Circumneutral Rock Cliff Communities develop on sandstone, traprock, conglomerate or other non-acidic, non-calcareous rock. Included with Circumneutral Rock Cliffs are sandstone cliffs and associated very steep sandstone-derived slopes that support dry, grassy communities with scattered shrubs. Plants in the sparsely vegetated Circumneutral Rock Cliff Communities grow on small ledges and in crevices on a circumneutral cliff face in dry to moist conditions. There is often circumneutral talus below the cliff, and sometimes rocky summits or rock outcrops above. Rock cliffs less than about 5000 sq. ft. should be considered inclusions in the surrounding forest, or combined with larger talus or rock outcrops as appropriate.

Vegetation Description: The sparse vegetation of Circumneutral Rock Cliff Communities includes species of dry, open areas such as pink corydalis (*Capnoides sempervirens*), bearberry (*Arctostaphylos uva-ursi*), plantain-leaved pussytoes (*Antennaria plantaginifolia*), columbine (*Aquilegia canadensis*), marginal wood-fern (*Dryopteris marginalis*), little bluestem grass (*Schizachyrium scoparium*), ebony spleenwort (*Asplenium platyneuron*), rusty cliff-fern (*Woodsia ilvensis*), and lichens and mosses. Red cedar

(*Juniperus virginiana*) is typically in the area or on adjoining rock outcrops, and red elderberry (*Sambucus racemosa*) may grow in moist cracks in talus below. Trees from the surrounding forest may shade the cliff face; shaded cliffs have less vegetation than sunny occurrences. Cliffs are small areas within surrounding forest, and reflect the vegetation of the surroundings.

Differentiating Occurrences: Three types of very sparsely vegetated plant communities have been identified on rock cliff faces, depending on the chemistry of the rock: Acidic, Circumneutral, and Calcareous (alkaline, named for calcium availability). Circumneutral and Calcareous Rock Cliff Communities have species that don't occur on Acidic Rock Cliffs, which vegetationally are less distinctive. 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 and/or and rock pellitory. Red cedar is more likely to be present in the vicinity of Circumneutral Rock Cliffs and associated outcrops than on either Acidic or Calcareous Cliffs and their associated rock outcrops. 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, that are not usually found in Circumneutral Rock Cliff Communities. Rocky summits, rock outcrops, and Open Talus/Coarse Boulder Communities also have bare rock and could be confused with Circumneutral Rock Cliff Communities. The differentiation between cliffs and rock outcrops/summits is arbitrary: cliffs are defined as vertical to near vertical (~60% slope). Open Talus/Coarse Boulder Communities have broken rock rather than continuous near-vertical rock faces. Ridgetop Pitch Pine - Scrub Oak and Ridgetop Heathland Communities occur on rock ridges, but are more densely vegetated than Circumneutral Cliff Communities, and are not near vertical overall.

Associated Fauna: All types of cliffs provide nesting habitat for Ravens (*Corvus corax*) and, increasingly, Peregrine Falcons (*Falco peregrinus*), as the offspring of Peregrine Falcons released in urban areas since 1984 have begun to return to the natural habitat to breed. Cliffs were probably the native habitat of the Eastern Phoebe (*Sayornis phoebe*). No mammals, reptiles, or amphibians would be expected on the steep cliff faces.

Public Access: Rocky Mountain Park, Greenfield; Mt. Tom State Reservation, Easthampton/ Holyoke; Mt. Sugarloaf State Reservation, Deerfield.

Threats: Rock climbing can break plants off of the cliff face, remove small pockets of soil, and wear lichens off of the rocks. Distinct trails appear on heavily used cliffs. Development in the vicinity of cliffs can be a threat, although most cliffs themselves are seldom directly threatened by development.

Management Needs:

USNVC/NatureServe: Includes some of: *Asplenium ruta-muraria - Pellaea atropurpurea* sparsely vegetated alliance -- *Asplenium ruta-muraria - Pellaea atropurpurea* sparse vegetation [CEGL004476]; *Juniperus virginiana - Corydalis sempervirens* cliff sparse vegetation (CEGL006422).

Circumneutral Rocky Summit/Rock Outcrop Community

Community Code: CT2A1B0000

State Rank: S2S3

Concept: A sparsely vegetated open community of grasses, sedges, and herbaceous plants occurring on rocky summits, ridges, or outcrops where the exposed bedrock is circumneutral.

Environmental Setting: This community is found on traprock ridges where it occurs on open ridgetops or steep slopes on exposed traprock. It is found on slopes facing southeast through southwest. These relatively small open areas are often found within an oak-forest matrix near hickory-hop hornbeam communities, with which it shares a number of herbaceous species. The community is also found on other types of circumneutral substrates such as conglomerate. The Circumneutral Rocky Summit/Rock Outcrop Community grades into the Circumneutral Rock Cliff Community near cliffs. Both types of sites are dry with soil confined to cracks in the rock.

Vegetation Description: Grasses, sedges, and forbs dominate this community. Occasional isolated trees of eastern red cedar (*Juniperus virginiana*), shagbark hickory (*Carya ovata*), sweet pignut hickory (*Carya glabra*), and white ash (*Fraxinus americana*) can also be found, so that some examples have an open, savanna-like appearance. The exposed rock is often covered with lichen and mosses (*Polytrichum* sp.). Except for the Carolina rose (*Rosa carolina*) and bearberry (*Arctostaphylos uva-ursi*), which are found on a number of sites, shrubs, including the less common hackberry (*Celtis occidentalis*), are usually restricted to the edge of the openings. The herbaceous layer can be patchy, occupying area between outcrops of rocks, or can be almost continuous where rocks are broken. Dominant species include Pennsylvania sedge (*Carex pensylvanica*), parasol-sedge (*C. umbellata*), poverty grass (*Danthonia spicata*), and little bluestem grass (*Schizachyrium scoparium*). Other species

typically encountered include rusty cliff fern (*Woodsia ilvensis*), rock spikemoss (*Selaginella rupestris*), early saxifrage (*Micranthes virginiensis*), arrow-leaved violet (*Viola sagittata*), small-flowered bittercress (*Cardamine parviflora*), skunk meadow-rue (*Thalictrum revolutum*), strawberry (*Fragaria virginiana*), dwarf dandelion (*Krigia virginica*), pink corydalis (*Capnoides sempervirens*), sleepy catchfly (*Silene antirrhina*), Venus's looking glass (*Triodanis perfoliata*), blue curls (*Trichostema dichotoma*), several species of goldenrods (*Solidago bicolor*, *S. nemoralis*), and other grasses (such as *Aristida dichotoma*, *Panicum* spp., and *Sorghastrum nutans*).

Differentiating Occurrences: Acidic and Calcareous Rocky Summit/Rock Outcrop communities: Presence of columbine (*Aquilegia canadensis*), climbing fumitory (*Adlumia fungosa*), red cedar (*Juniperus virginiana*), pink corydalis (*Capnoides sempervirens*), broad-leaved woodland-sedge (*Carex platyphylla*), ebony spleenwort (*Asplenium platyneuron*), bulblet fern (*Cystopteris bulbifera*), or fragile fern (*C. tenuis*) usually indicates less acidic conditions since these species typically occur in circumneutral outcrops. Presence of plantain-leaf sedge (*Carex plantaginea*), maidenhair spleenwort (*Asplenium trichomanes*), or walking fern (*Asplenium rhizophyllum*) more firmly indicate calcareous conditions. Acidic, Circumneutral, and Calcareous Rock Cliffs: the differentiation between cliffs and rock outcrops/summits is arbitrary. Cliffs are vertical to near vertical (about 60% slope). The assignment to type would be based on overall conditions; it is expected that small (less than about 5000 sq. ft.) patches would be considered to be variation of the surrounding type and would be included in that type. Rocky summit/rock outcrop communities are dominated by bare rock. Ridgetop Pitch Pine - Scrub Oak Communities also occur on rocky ridges, with pitch pine (*Pinus rigida*) and scrub oak (*Quercus ilicifolia*), but 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, but little bare rock is present. Ridgetop Heathland Community is dominated by heaths, usually lowbush blueberry (*Vaccinium angustifolium*). Depending on size, one site could have multiple types of these 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.

Associated Fauna: Most animals of rock outcrop communities are not sensitive to the chemistry of the rock, but rather are responding to the elevation and dryness of the habitat. Any differences in resident fauna between calcareous and acidic outcrops are most likely due to geographical differences in species distribution rather than to qualitative differences among the types of outcrops. Outcrops tend to be fairly small, and only a part of the habitat of most vertebrate animals. Small mammals of rock outcrop communities include those of dry habitats such as white-footed mouse (*Peromyscus leucopus*), short-tailed shrew (*Blarina brevicauda*) and, in grassy/sedgy areas with some soil accumulation, meadow voles (*Microtus pennsylvanicus*). Snakes would be those of dry areas, such as black racer (*Coluber constrictor*), ringneck (*Diadophis punctatus*), and redbelly snake (*Storeria occipitomaculata*). No turtles, frogs or toads would be expected. Ravens (*Corvus*

corax) are all around high elevations, especially near cliffs where they nest. Invertebrates include tiger beetles.

Public Access: Palmer WMA, Palmer; Mt. Holyoke Range State Park, Amherst/South Hadley/Granby; Mt. Tom State Reservation, Holyoke; Middlesex Fells, Stoneham.

Threats: The major threats are trampling and other uses by people including use of the outcrops as viewpoints. Succession appears to be proceeding slowly, if at all, on many of these sites. However, grazing and possibly fire may contribute to helping keep the areas open. Most sites that are not too steep have evidence of deer browse.

Management Needs: Trails should be kept away from these areas because readily accessible sites are used as viewpoints and picnic areas. Planning of trails should take the fragility of the sites into consideration.

USNVC/NatureServe: *Juniperus virginiana* Woodland Alliance -- *Juniperus virginiana - Fraxinus americana/Danthonia spicata - Poa compressa* Woodland [CEGL006002]; Related to: Central Appalachian Pine-Oak Rocky Woodland (CES202.600) *Schizachyrium scoparium - Danthonia spicata - Carex pensylvanica/Cladonia* spp. Herbaceous Vegetation (not cross-walked to MA from NVC).

Coastal Forest/Woodland

Community Code: CT1A2A2000

State Rank: S4

Concept: Coastal Forest/Woodlands are often shorter than forests further inland, but taller than Maritime Forest/Woodlands. There is often a dense shrub layer and vines, particularly near the edges.

Environmental Setting: Coastal Forest/Woodlands occur in protected areas along the coast, such as behind dunes and on slopes away from the ocean, and behind Maritime Forest/Woodlands. They are sheltered from direct daily maritime influences (they are not in the daily salt spray zone), but receive wind and salt during storms. The coastal climate has more moisture and warmer winters and cooler summers than more inland areas. The heights of Coastal Forest/Woodlands are variable but often 10-20m (~ 30 to 60 ft.) - not as tall as further inland, but taller than Maritime Forest/Woodlands. The deciduous canopy is often closed (>75% cover) with a dense to open shrub layer, some vines in openings and along edges, and a typically scattered herbaceous layer.

Vegetation Description: The Coastal Forest/Woodland is a variant of the widespread broadly defined Oak - Hemlock - White Pine Forest that includes a continuum of communities dominated by tree oaks and pines. Coastal Forest/Woodlands occur in the coastally moderated, moister part of the habitat spectrum and include multiple species with primarily southern distributions, such as American holly (*Ilex opaca*), black gum (*Nyssa sylvatica*), and sassafras (*Sassafras albidum*), all of which are regular associates. Tree oaks (scarlet oak (*Quercus coccinea*), black oak (*Q. velutina*), white oak (*Q. alba*), and chestnut oak (*Q. montana*)) are the dominant species of the Coastal Forest/Woodland, with post oak (*Q. stellata*) important in occurrences along Buzzards Bay and on Martha's Vineyard. Red maple (*Acer rubrum*), black

cherry (*Prunus serotina*), beech (*Fagus grandifolia*), pitch pine (*Pinus rigida*), and white pine (*P. strobus*) commonly occur in low percentages, but are occasionally abundant. American holly is a regular associate in southeastern occurrences. Red cedar (*Juniperus virginiana*) can be scattered in the forests, and sometimes is a dominant in woodland thickets. Sweet pepper-bush (*Clethra alnifolia*) is abundant in many sites. A low-shrub heath layer dominated by lowbush blueberries (*Vaccinium pallidum*, *V. angustifolium*) and black huckleberry (*Gaylussacia baccata*) is characteristic. The herbaceous layer is usually sparse, with Pennsylvania sedge (*Carex pensylvanica*), bracken fern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), and wild sarsaparilla (*Aralia nudicaulis*) being typical. Most occurrences of coastal forests have many vines on forest edges and in openings. Poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), grape (*Vitis* spp.), and greenbriers (*Smilax* spp.) can be locally abundant.

Differentiating Occurrences: Coastal Forest/Woodlands grade into Maritime Forest/Woodlands along the coast in the areas of daily salt spray; 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 sq. ft.) 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. They are not affected by salt spray on a daily basis, but receive storm winds and spray. They are predominantly deciduous forests with canopies usually at about 10-20m (~30-60 ft.) and an often dense shrub layer consisting primarily of lowbush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylussacia baccata*).Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and have stunted canopies of mixed tree species. Oak - Hemlock - White Pine Forests and its named variants, including but not limited to Pitch Pine - Oak Forest/Woodlands, White Pine - Oak Forests, and Mixed Oak Forest/Woodlands abut and grade into Coastal Forest/Woodlands. They receive much less storm spray and mature examples are taller than 20m (~60 ft.). Forests dominated by pines are identified as those forest types.

Associated Fauna: No animal species are restricted to Coastal Forest/Woodlands. Animal are those of typical coastal oak areas such as the birds Eastern Towhee (*Pipilo erythrophthalmus*), Gray Catbird (*Dumetella carolinensis*), Common Yellowthroat (*Geothlypis trichas*), Ovenbird (*Seiurus aurocapillus*), and Black-and-white Warbler (*Mniotilta varia*). Small mammals, such as meadow voles (*Microtus pennsylvanicus*), and white-footed mice (*Peromyscus leucopus*), are common, with gray squirrels (*Sciurus carolinensis*) abundant in mainland forests. Eastern box turtles (*Terrapene carolina*) use Coastal Forest/Woodlands as parts of their habitats. Moths, butterflies, and other insects of the southeastern oak and oak-pine forest occur in Coastal Forest/Woodlands, including some uncommon species. High white-tailed deer (*Odocoileus virginianus*) densities may have an impact on the abundance of native species, particularly woody seedlings such as oaks, as well as on herbaceous plants.

Public Access: William Forward WMA, Rowley; Acushnet WMA, Freetown; Nasketucket Bay State Reservation, Mattapoisett; Moraine Trail, Falmouth; Provincetown Beech Forest, Provincetown; Manuel F. Correllus State Forest, West Tisbury.

Threats: Invasive exotics, development.

Management Needs:

USNVC/NatureServe: A4209 *Quercus velutina* - *Quercus falcata* - *Pinus rigida* Coastal Plain Forest Alliance - *Quercus velutina* - *Quercus coccinea* - *Quercus prinus*/*Kalmia latifolia* Forest [CEGL006374]; *Quercus coccinea* - *Quercus velutina*/*Sassafras albidum*/*Vaccinium pallidum* Forest [CEGL006375]; *Quercus velutina*/*Ilex opaca* Forest [CEGL006378]; in part, *Pinus strobus* - *Quercus alba*/*Ilex glabra* Forest [CEGL006382].

Cultural Grassland

Community Code: CT2B2A1000

State Rank: SNR

Map: No Cultural Grasslands are documented in the NHESP database.

Concept: Requiring high maintenance, these communities usually result from plowing and sowing non-native grasses. They are normally maintained by frequent mowing and are primarily of conservation interest for the grassland bird community. The concept ideal for this community is pastures and hayfields: fields that are, or were recently, cultivated. Old fields, lands that were cleared and left to succession, usually contain more broad-leaved species than are intended in this concept.

Environmental Setting: Cultural Grasslands as a classification unit are intended to be grasslands that are cultivated or the results of cultivation, dominated by non-native agricultural grasses, maintained for pasture or hayfields; some airport grasslands and cemeteries with planted grasses would be included in the type. Cultural Grasslands occur in all areas of the state on a variety of soils, and surroundings reflect the regional variations. Most Cultural Grasslands are mowed at least annually to maintain the grassland stage. Hayfields have fewest native species, but some support grassland birds which are the primary conservation interest in Cultural Grasslands.

Vegetation Description: Cultural Grasslands are dominated by planted, non-native grasses such as timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), smooth brome (*Bromus inermis*), and redtop (*Agrostis gigantea*). Pastures and hayfields provide different habitats and support different species of plants and animals.

Differentiating Occurrences: Cultural Grasslands as a classification unit are intended to be grasslands that are cultivated or the results of cultivation dominated by non-native agricultural grasses. Old fields, lands that were cleared and cultivated, then left to succession, usually contain more broad-leaved species than are intended in the cultural grassland concept (pastures and hayfields were the models). Sandplain Grasslands - Inland Variant and Sandplain Grasslands are dominated by native grasses, often the distinctive little bluestem (*Schizachyrium scoparium*). 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 (*Quercus ilicifolia*), black huckleberry (*Gaylussacia baccata*), and/or lowbush blueberry (*Vaccinium angustifolium* and/or *V. pallidum*) which may be dominant.

Associated Fauna: Distance to the coast and size of the grassland strongly affect the species that use pastures and hayfields. Many species of birds that use grasslands are more common in the midwestern prairies and agricultural fields. Grassland birds are found in a variety of habitats: for example, Bobolinks (*Dolichonyx oryzivorus*) in taller grasses found in hayfields and Eastern Meadowlarks (*Sturnella magna*) in shorter grasses found in pastures. Other grassland birds include Killdeer (*Charadrius vociferus*) and

Horned Larks (*Eremophila alpestris*). Meadow voles (*Microtus pennsylvanicus*), meadow jumping mice (*Zapus hudsonius*), and northern short-tailed shrews (*Blarina brevicauda*) would be expected in most grasslands. They would be hunted by garter snakes (*Thamnophis sirtalis*), long-tailed weasels (*Mustela frenata*), American Kestrels (*Falco sparverius*), and wintering Northern Harriers (*Circus cyaneus*), Snowy Owls (*Nyctea scandiaca*), and Short-eared Owls (*Asio flammeus*). Some of the lepidopteran fauna of Sandplain Grasslands would make use of Cultural Grasslands. Hayfields may attract grassland birds, but depending on the mowing schedule, may be population sinks when young are not able to fledge before mowing.

Public Access: Not tracked by NHESP.

Threats: Mowing too early for birds to fledge.

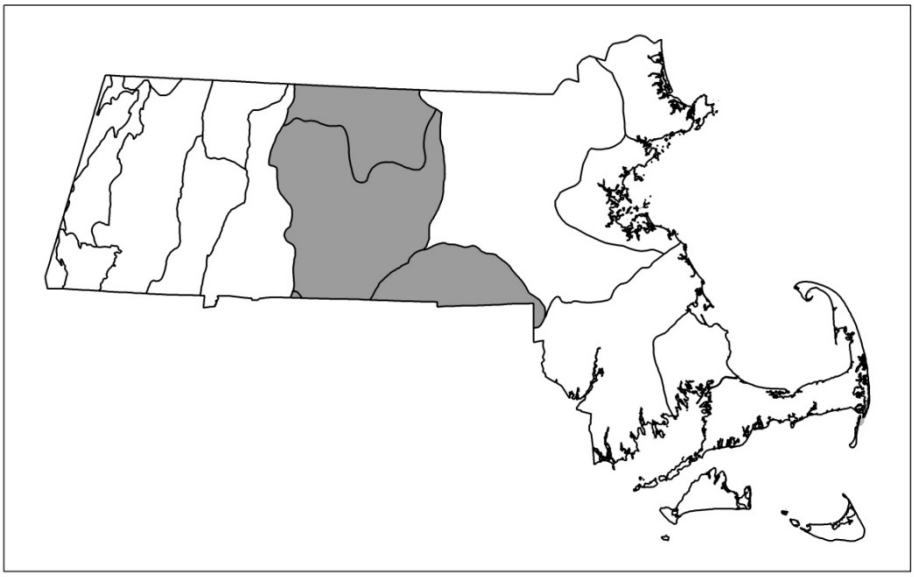
Management Needs:

USNVC/NatureServe: Related to: System: Semi-natural/Altered Vegetation and Conifer Plantations (CES203.074): Northeastern Old Field: CEGL006107 - *Dactylis glomerata* - *Phleum pratense* - *Festuca* spp. - *Solidago* spp. Herbaceous Vegetation.

Dry, Rich Oak Forest/Woodland

Community Code: CT1B1B0000

State Rank: S4



Concept: Deciduous, predominantly oak, forest with a rich understory of herbaceous plants and graminoids. The shrub layer has fewer ericaceous plants than other oak forests.

Environmental Setting: The oak-dominated canopy of Dry, Rich Oak Forest is somewhat open (50 - 75% cover) to mostly closed. This forest occurs on southwest-facing mid-slopes and coves, with well-drained, slightly acidic, often rocky soils of intermediate fertility. The steep slopes may include open rocky glades or occur near rock outcrop communities. A rich understory often includes legumes and false foxgloves. Most occurrences show evidence of recurrent fires (i.e., charred bases of trees, dead blackened shrubs or sprouts, burned duff) that maintain the open conditions.

Vegetation Description: In Dry, Rich Oak Forests, the tree canopy is dominated by a mixture of oaks (including red (*Quercus rubra*), black (*Q. velutina*), and white (*Q. alba*)), with lower amounts of sugar and red maple (*Acer saccharum* and *A. rubrum*), American beech (*Fagus grandifolia*), white ash (*Fraxinus americana*), and shagbark and other hickories (*Carya ovata*, *C. glabra*, and *C. tomentosa*). Eastern hemlock (*Tsuga canadensis*) is an occasional part of the canopy. Scattered hop-hornbeam (*Ostrya virginiana*) and flowering dogwood (*Benthamidia florida*) form an open subcanopy. A fairly sparse shrub layer includes saplings of canopy tree species, witch hazel (*Hamamelis virginiana*), and maple-leaved viburnum (*Viburnum acerifolium*). A rich herbaceous flora includes blunt-lobed hepatica (*Anemone americana*), perfoliate bellwort (*Uvularia perfoliata*), four-leaved milkweed (*Asclepias quadrifolia*), early meadow-rue (*Thalictrum dioicum*), false foxgloves (*Aureolaria flava*, *A. pedicularia*, and *A. virginica*), wild coffee (*Triosteum aurantiacum*), bush clovers (including *Lespedeza procumbens*), tick-trefoils (*Desmodium rotundifolium* and others), and

sedges such as reflexed sedge (*Carex retroflexa*), ribbed sedge (*Carex virescens*), and big star-sedge (*Carex rosea*).

Differentiating Occurrences: 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, such as Mixed Oak, Open Oak, and Black Oak - Scarlet Oak Forests/Woodlands. On the rich end of the continuum, Dry, Rich Oak Forests are related to Sugar Maple - Oak - Hickory Forests that 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 Forests has fewer legumes and more spring ephemerals than Dry, Rich Oak Forests, and herbaceous species indicative of rich conditions such as herb Robert, wild geranium, and baneberry . Red Oak – Sugar Maple Transition Forests have a greater dominance of red oak and sugar maple than Dry, Rich Oak Forests, and they have a less dense and rich herbaceous layer, particularly lacking the legumes and false foxgloves. 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.

Associated Fauna: Dry oak forests support a smaller mix of animal species than are found in moister communities. There are no species known to be restricted to the Dry, Rich Oak Forest community. Common species of dry sites include short-tailed shrew (*Blarina brevicauda*), white-footed mouse (*Peromyscus leucopus*), and chipmunks (*Tamias striatus*). Snakes of dry forest sites include garter snakes (*Thamnophis sirtalis*) and redbelly snakes (*Storeria occipitomaculata*). Birds that nest in dry oak forests include Eastern Wood-Pewee (*Contopus virens*), Red-eyed Vireo (*Vireo olivaceus*), Scarlet Tanager (*Piranga olivacea*), and Ovenbird (*Seiurus aurocapillus*).

Public Access: Northfield State Forest, Northfield.

Threats: Exotics; Japanese barberry (*Berberis thunbergii*) is reported from several sites.

Management Needs: Removal of exotics in exemplary cases.

USNVC/NatureServe: No direct equivalents: related to A3303 *Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance -- *Acer saccharum - Quercus rubra/Hepatica nobilis* var. *obtusa* Forest [CEGL006046] which is better crosswalked to Sugar Maple - Oak - Hickory Forest. Other descriptions are close to various Oak - Hickory Forest associations, including *Quercus rubra - Carya* (*glabra*, *ovata*)/*Ostrya virginiana Carex lucorum*

Forest (Oak-Hickory/Hop hornbeam/Sedge Forest) [CEGL006301] in A2053 *Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance.

Forest Seep Community

Community Code: CT1C2B1000

State Rank: S4

Concept: Small (usually <0.25 ac) pockets in forests on slopes, with small springs and seeps on mucky soils. The canopy is from or similar to the surrounding forest, but shrub and herbaceous layers species are typical of wetlands or moist areas.

Environmental Setting: Forest Seep Communities are very small (often <<1 ac) wetlands in upland forests. They occur where groundwater emerges, often on a slope or at the base of one, as patches or linear areas perpendicular to slopes. Seeps may produce or be near stream headwaters, or may be isolated with the water absorbed into the surroundings. Upland trees rooted in the surrounding forest form the canopy, but species of the shrub and herbaceous layers are predominantly those of wetlands or moist areas. Seeps support diverse herbaceous layers suggesting nutrient enrichment relative to the surroundings. Downed logs are common due to the slopes and wet soils promoting periodic windthrow. The ground surface is generally dominated by plant litter, though there may be areas of bare soil and scattered stones. The soils are generally mineral, although a shallow organic layer may form.

Vegetation Description: In Forest Seep Communities, the canopy is primarily (>75% cover) from trees from the surrounding forest that are rooted outside the seep. Because Forest Seep Communities occur statewide in all types of forest, the canopy cover trees may be northern hardwoods, conifers, oak, or mixed. The shrub layer is variable, dense, or barely present, and may include mixed wetland and upland plants including (depending on location) highbush blueberry (*Vaccinium corymbosum*), mountain laurel (*Kalmia latifolia*), hobble-bush (*Viburnum lantanoides*), swamp dewberry (*Rubus hispidus*), silky dogwood (*Swida amomum*), winterberry (*Ilex verticillata*), and, in coastal areas, sweet pepperbush (*Clethra alnifolia*). Many Forest Seep

Communities have dense herbaceous layers, with species dependent on location in the state. Golden saxifrage (*Chrysosplenium americanum*) primarily occurs in seeps. Jewelweeds (*Impatiens* spp.), golden ragwort (*Packera aurea*), and crooked-stemmed aster (*Symphyotrichum prenanthoides*) are typical, but not restricted to seeps. Scouring rush (*Equisetum hyemale*), water avens (*Geum rivale*), and an assortment of sedges, including eastern rough sedge (*Carex scabrata*), bladder sedge (*Carex intumescens*), and three-seeded sedge (*Carex trisperma*), are among the other plants regularly found at seeps. A mix of wetland and upland ferns may also be present, including cinnamon fern (*Osmundastrum cinnamomeum*), ostrich fern (*Matteuccia struthiopteris*), silvery spleenwort (*Deparia acrostichoides*), rattlesnake fern (*Botrychium virginianum*), and Christmas fern (*Polystichum acrostichoides*). Some Forest Seep Communities have dense, shallow patches of sphagnum or other non-vascular plants. Invasive species can include multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), and common buckthorn (*Rhamnus cathartica*).

Differentiating Occurrences: The intention of defining Forest Seep Communities is to identify small areas that retain the overstory of the surrounding upland forest, but are wet and may not show up as wetlands on wetlands maps. Sites where wetland trees rooted in a seep contribute >25% of the canopy cover are defined as swamps. Swamps may receive seepage waters at upland edges; however, the vegetation of such areas is considered to be a variation in the swamp community and not separated out as separate community types. Seeps in forested edges of streams or stream corridors, including intermittent streams, can produce linear versions of this community, or grade into floodplain or alluvial forests dominated by wetland tree species. Riverside Seep Communities occur at the base of steep riverbanks where groundwater emerges out of the upland slope; they are generally not forested and are associated with High-energy Riverbank Communities along high-gradient, fast-flowing rivers. Many calcareous wetland communities receive seepage waters, but are defined as separate communities with distinct floras. Rich, Mesic Forests on slopes can have seasonally seepy patches that are included in the forest variation and not separated as distinct communities.

Associated Fauna: These small communities provide parts of the habitats of the species of surrounding communities. Most tree-dwelling species would not be affected by the presence of small seeps below. Star-nosed moles (*Condylura cristata*) would be expected in seeps of any kind. If the water from the seeps stays in topographic low areas, those may function as vernal pools and support vernal pool breeding species. Where mounds of sphagnum moss build up, four-toed salamanders (*Hemidactylium scutatum*) may be found, and in larger patches, southern bog lemmings (*Synaptomys cooperi*) may be present.

Public Access: Russell Millpond Conservation Area, Plymouth; Southeast Mass Bioreserve, Fall River; Warwick State Forest, Warwick; Hiram Fox WMA, Huntington.

Threats: Invasive exotic species include multiflora rose (*Rosa multiflora*), Japanese barberry (*Berberis thunbergii*), common buckthorn (*Rhamnus cathartica*), water-cress

(*Nasturtium officinale*), forget-me-not (*Myosotis scorpioides*), and yellow iris (*Iris pseudacorus*). Water flow needs to be maintained (could be impacted by large wells). Several locations have had natural mud or rock slides

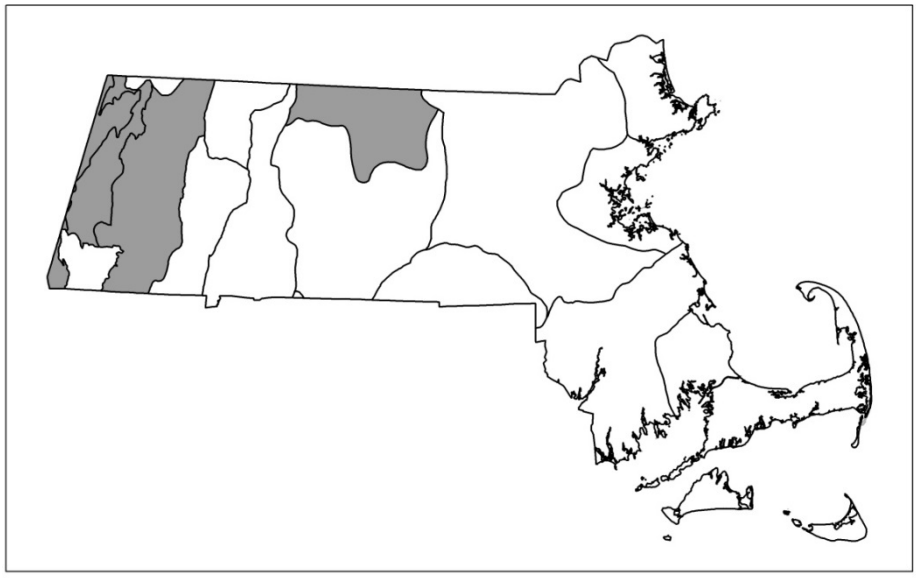
Management Needs: Exotic removals in sites where practical.

USNVC/NatureServe: A1685 *Carex scabrata - Chrysosplenium americanum* Herbaceous Seep Alliance -- *Chrysosplenium americanum* Herbaceous Vegetation [CEGL006193]; and A3374 *Impatiens capensis - Symplocarpus foetidus - Tiarella cordifolia* Herbaceous Seep Alliance -- *Symplocarpus foetidus - Impatiens capensis* Herbaceous Vegetation [CEGL006567] and *Symplocarpus foetidus* - Mixed Forbs Seep [CEGL002385]. Calcareous seeps are explicitly within definition of Rich, Mesic Forest *Acer saccharum - Fraxinus americana - Tilia americana/Acer spicatum/Caulophyllum thalictroides* Forest [CEGL005008].

Hemlock Forest

Community Code: CT1C1C0000

State Rank: S4



Concept: Dense canopies dominated by hemlocks, with 80 to 100% closure. Little understory grows in the shade of the hemlocks.

Environmental Setting: Hemlock Forests are broadly defined in Massachusetts. A dense canopy with at least 50% cover of eastern hemlock is the key characteristic. The closed conifer canopy allows little light through and restricts growth in lower layers. Hemlock Forests are often on rocky north or north-west facing slopes in sheltered ravines, and along high-gradient streams. The soils are usually acidic and nutrient-poor, with a thick, poorly decomposed duff layer. The forest floor is covered by needles, twigs, and small branches.

Vegetation Description: Hemlock Forests are dominated by eastern hemlock (*Tsuga canadensis*). In this widespread community, associated species, all occurring at very low percentages, vary with location: red spruce (*Picea rubens*) or white pine (*Pinus strobus*) may be present with maples (*Acer rubrum*, *A. saccharum*), American beech (*Fagus grandifolia*), yellow or black birch (*Betula alleghaniensis* and *lenta*), or oaks (scarlet, chestnut, red, white, and black) (*Quercus coccinea*, *prinus*, *rubra*, *alba*, and *velutina*). The shrub layer is sparse with saplings of the canopy species and small patches of mountain laurel (*Kalmia latifolia*), witch hazel (*Hamamelis virginiana*), striped maple (*Acer pensylvanicum*), or hobblebush (*Viburnum lantanoides*) growing in occasional canopy gaps created by windthrows. Eastern hemlock saplings may persist in the understory for many decades, to be released to grow into maturity when canopy gaps occur. The herbaceous layer is essentially non-existent except in scattered opening that may have Canada mayflower (*Maianthemum canadense*), starflower (*Lysimachia borealis*), wild sarsaparilla (*Aralia nudicaulis*), rock polypody

(*Polypodium virginianum*), hay-scented fern (*Dennstaedtia punctilobula*), intermediate wood fern (*Dryopteris intermedia*), or mountain wood fern (*D. campyloptera*), with occasional patches of shining fir-moss (*Huperzia lucidula*). Non-vascular plants may form dense patches. The non-native invasive species hemlock woolly adelgid (*Adelges tsugae*) is killing eastern hemlock across the state; black birch is common following the death of hemlocks.

Differentiating Occurrences: Many forests have eastern hemlock as a component of the canopy but Hemlock Forests are differentiated by having eastern hemlock as the dominant canopy species (>50% canopy cover) throughout the community. Forests with scattered patches of hemlock that are functionally variations in the surrounding forest include Oak - Hemlock - White Pine Forest and Northern Hardwoods - Hemlock - White Pine Forest. These mixed forests 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.

Associated Fauna: Birds that nest or forage in canopies or mid sections of conifers don't differentiate between wet or dry sites: many birds of upland conifer forest also use conifer swamps. Acadian Flycatchers (*Empidonax virescens*) are a near-obligate of Hemlock Forests in Massachusetts, although their habitats are broader to the north. Other species that use Hemlock Forest tend to be northern or conifer-preferring forest species, including birds such as Black-throated Green Warbler (*Dendroica virens*), Blackburnian Warbler (*D. fusca*), Louisiana Waterthrush (*Parkesia motacilla*), and Winter Wren (*Troglodytes hiemalis*). In the winter, mixed flocks are common with chickadees (*Poecile atricapillus*), kinglets (*Regulus* spp.), and nuthatches (*Sitta* spp.). Mammals include those that are widespread and typical of northern and coniferous forests: red squirrels (*Tamiasciurus hudsonicus*), red-backed voles (*Clethrionomys gapperi*), smoky shrews (*Sorex fumeus*), and white-footed mice (*Peromyscus leucopus*).

Public Access: Mt. Everett State Reservation, Mount Washington; Otis State Forest, Sandisfield; Windsor State Forest, Windsor; Monroe State Forest, Monroe.

Threats: Hemlock hosts the non-native hemlock woolly adelgid (*Adelges tsugae*), which usually kills a hemlock tree after it is fully infested. Elongate hemlock scale (*Fiorinia externa*) is another non-native insect that can cause death to hemlocks.

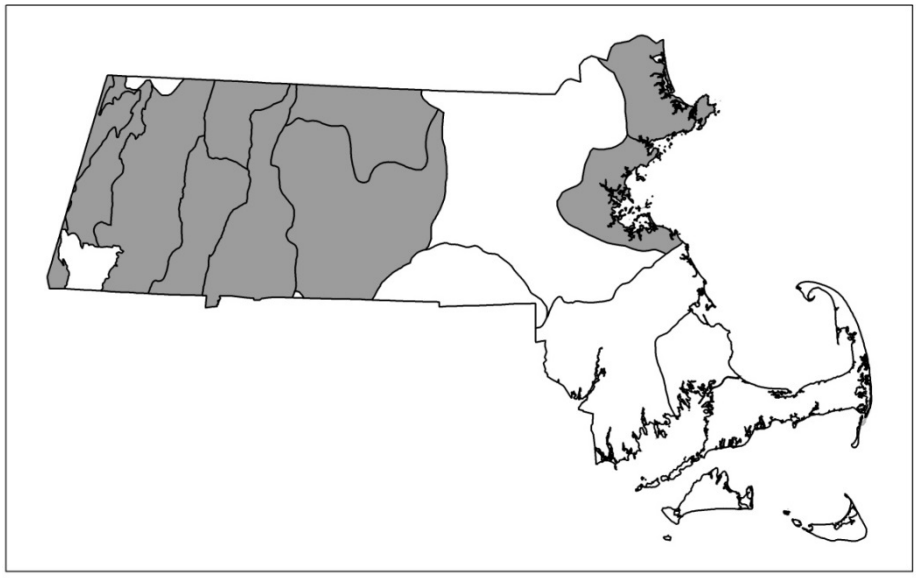
Management Needs:

USNVC/NatureServe: A3251 *Pinus strobus* - *Tsuga canadensis* Forest Alliance - *Tsuga canadensis* - (*Betula alleghaniensis*) - *Picea rubens*/*Cornus canadensis* Forest [CEGL006129] and *Tsuga canadensis* - *Betula alleghaniensis* - *Acer saccharum*/*Dryopteris intermedia* Forest [CEGL006638]; A3302-*Tsuga canadensis* - *Betula lenta* - *Betula alleghaniensis* Forest Alliance - *Pinus strobus* - *Tsuga canadensis* Lower New England, Northern Piedmont Forest [CEGL006328].

Hickory – Hop Hornbeam Forest/Woodland

Community Code: CT1B2B1000

State Rank: S2



Concept: Mixed-hardwood, open forests with a sparse shrub layer. A nearly continuous cover of graminoids includes a rich diversity of herbaceous flora.

Environmental Setting: Hickory - Hop Hornbeam Forests/Woodlands are typically short with a variable canopy cover, often ~ 60%, contributing to a characteristic park-like appearance, produced by a sparse shrub layer and a nearly continuous graminoid cover. In Massachusetts, many Hickory - Hop Hornbeam Forest/Woodlands are associated with traprock (basaltic) ridges of the Connecticut River Valley Highlands where they are found on mid-slopes (15-20 degrees) with southern or eastern exposures. Occurrences of the community tend to be very small patches (< 10 acres, with some notable exceptions), often clustered within the surrounding matrix forest on thin, well-drained soils, generally on somewhat flattish midslopes with steeper slopes above and below. They are often below balds and rock outcrops of somewhat nutrient-enriched rock. There is great variation in environmental conditions among sites, perhaps reflecting past land use that included sheep pasturing.

Vegetation Description: Hickory - Hop Hornbeam Forests/Woodlands typically have shagbark, pignut, and mockernut hickories (*Carya ovata*, *C. glabra*, and *C. tomentosa*) as the dominant overstory trees, mixed with red oak (*Quercus rubra*) and white ash (*Fraxinus americana*). Red and sugar maples (*Acer rubrum* and *A. saccharum*) can also be present in lower numbers. Hop hornbeam (*Ostrya virginiana*) is a regular and abundant subcanopy tree. The shrub layer is generally sparse. The forest floor is characteristically covered by patches of long-beaked Pennsylvania sedge (*Carex lucorum*) with Pennsylvania sedge (*C. pensylvanica*), other sedges such as long-stalked sedge (*C. pedunculata*) and loose-flowered woodland-sedge (*C.*

laxiflora), and grasses including bottlebrush grass (*Elymus hystrix*), poverty grass (*Danthonia spicata*), and the non-native Canada bluegrass (*Poa compressa*), with scattered violets (*Viola palmata*), blunt-lobed hepatica (*Anemone americana*), wood sorrels (*Oxalis* spp.), and several species of tick-trefoils (including *Hylodesmum glutinosum* and *Desmodium paniculatum*). Some sites have dense late summer forbs including asters (such as big-leaved and white wood asters (*Eurybia macrophylla* and *E. divaricata*), blue heart-leaf aster (*Symphyotrichum cordifolium*), and stiff aster (*Ionactis linariifolia*)), goldenrods (*Solidago* spp.), and bonesets (*Eupatorium* spp.).

Differentiating Occurrences: 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. 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 Hickory - Hop Hornbeam Forests/Woodlands. 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 Forests/Woodlands.

Associated Fauna: These are small community occurrences and tend to be part of the habitat of species using the surrounding forests. Species of dry sites are most likely to occur in the community occurrences.

Public Access: Catamount WMA, Colrain; Walnut Hill WMA, Middlefield; Joseph Skinner State Park, Hadley; Palmer WMA, Palmer; Wachusett Meadow Wildlife Sanctuary (Massachusetts Audubon Society), Princeton; Middlesex Fells, Medford.

Threats: Exotics: black swallow-wort (*Cynanchum louiseae*), common buckthorn (*Rhamnus cathartica*).

Management Needs: Control exotics where possible. Limit trails.

USNVC/NatureServe: A2053 *Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance -- *Quercus rubra* - *Carya* (*glabra*, *ovata*)/*Ostrya virginiana*/*Carex lucorum* Forest [CEGL006301].

High Elevation Spruce – Fir Forest/Woodland

Community Code: CT1D300000

State Rank: S1

Concept: Forest/woodland with trees dwarfed from wind on the ridgeline of the tallest, most exposed mountain in Massachusetts. Conifers (balsam fir and red spruce) dominate and often form dense thickets.

Environmental Setting: High Elevation Spruce - Fir Forests/Woodlands are very uncommon in Massachusetts, occurring only above 915 m (3000 ft.) at the highest elevations in the state on the upper and often very steep northern slopes of the Mt. Greylock massif. Strong winds and heavy winter snow and ice sculpt and stunt plant growth producing a dense, short (approximately 5-10m (15-33 ft.)), and often patchy tree canopy. The soils are generally thin, acidic, and nutrient-poor and often there are areas of exposed granite, schist, or gneiss bedrock. The evergreen canopy trees and their associates are adapted to severe weather conditions with a relatively short growing season and low average temperatures. Species diversity is naturally low, but includes plants and animals that, like the community, are very rare here but more common to the north. Due to the cold temperatures and acidity of the habitat and conifer needles, decomposition of the organic matter is slow, resulting in a thick humus layer.

Vegetation Description: High Elevation Spruce - Fir Forests/Woodlands are low-diversity coniferous forest of high elevations, usually on steep stony, upper slopes or level ridgetops. Balsam fir (*Abies balsamea*) is dominant, associated with red spruce (*Picea rubens*). Paper birch, heart-leaf paper birch (*Betula papyrifera* and *B. cordifolia*), and yellow birch (*B. alleghaniensis*) occur in lower numbers. Where there is light, shrubs such as mountain maple (*Acer spicatum*), mountain holly (*Ilex mucronata*), American mountain ash (*Sorbus americana*), and hobblebush (*Viburnum lantanoides*) may

grow. A few sedges are present in low amounts, including northern stalked sedge (*Carex debilis* var. *rudgei*) and New England sedge (*C. novae-angliae*). Bluebead lily (*Clintonia borealis*), mountain wood-sorrel (*Oxalis montana*), bunchberry (*Chamaepericlymenum canadense*), bristly clubmoss (*Spinulum annotinum*), and shining fir-moss (*Huperzia lucidula*) grow scattered on a thick layer of needles or on mosses that form thick mats on fallen logs and on the forest floor.

Differentiating Occurrences: In Massachusetts, High Elevation Spruce - Fir Forest/Woodland occurs only on the Greylock massif at the very highest elevations in the state. It has short, sculpted trees with >75% spruce and fir combined, with the rest of the canopy dominated by birches with other northern hardwoods. Downslope they grade into Spruce - Fir - Northern Hardwoods Forests that 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 a dominant or at least present with other conifers including balsam fir and eastern hemlock, as well as northern hardwoods. If spruce or fir is present in Northern Hardwoods - Hemlock - White Pine Forests or Successional Northern Hardwood Forests, it is as scattered individuals, <25% cover.

Associated Fauna: The top of Massachusetts's highest, most exposed mountain provides habitat for some northern animals such as Swainson's Thrush (*Catharus ustulatus*) and Yellow-bellied Flycatcher (*Empidonax flaviventris*), as well as several state-protected species. Also expected would be more widespread species that use conifer forests, such as snowshoe hare (*Lepus americanus*), porcupine (*Erethizon dorsatum*), northern flying squirrel (*Glaucomys sabrinus*), deer mouse (*Peromyscus maniculatus*), and birds such as Olive-sided Flycatcher (*Contopus cooperi*).

Public Access: Mt. Greylock State Reservation, Adams.

Threats: Development of the summit, clearing for paving, trails, ski lift facilities, or communications towers. In these areas, some non-native invasive grasses such as sweet vernalgrass (*Anthoxanthum odoratum*) and other graminoid species can be a problem. Climate change is expected to affect the community in Massachusetts, as they only occur at our coolest, highest elevations now. The forest pests and fungi that affect red spruce and balsam fir may be more vigorous in a warmer climate, further damaging trees that have other environmental stresses as well.

Management Needs: Due to the rarity of this forest type in the state, efforts to remove non-native invasive species should be pursued. It is very important to protect the remaining acreage of this community from avoidable disturbances, such as increased clearing for parking and road work and ongoing problems of siltation and sedimentation from existing roadways and parking lots. Long-term monitoring of the species composition of this community would be helpful in order to increase understanding and protection efforts.

USNVC/NatureServe: A0150 *Picea rubens - Abies balsamea* Forest Alliance -- *Abies balsamea*- (*Betula papyrifera* var. *cordifolia*) Forest [CEGL006112]; A3314 *Picea rubens* Woodland

Alliance -- *Picea rubens*/*Vaccinium angustifolium* - *Sibbaldiopsis tridentata* Woodland [CEGL006053].

Maritime Beach Strand Community

Community Code: CT2B1A0000

State Rank: S3

Concept: Sparsely vegetated, long, narrow community between wrack line of high tide and foredunes.

Environmental Setting: Usually part of a barrier beach system, seaward of dunes, but above the daily high tides. Beach strands are subject to overwash during storms and spring tides. Sand is the primary substrate for the community, but cobble substrate is included in the community type.

Vegetation Description: Sparsely vegetated community with scattered cover of sea-rocket (*Cakile edentula* ssp. *edentula*) and dunegrass (*Ammophila breviligulata* ssp. *breviligulata*). Beach pea (*Lathyrus japonicus*), seabeach orache (*Atriplex cristata*), seabeach sandwort (*Honckenya peploides*), seaside-flatsedge (*Cyperus filicinus*), seabeach saltwort (*Salsola kali* ssp. *kali*) and seaside goldenrod (*Solidago sempervirens*) occasionally occur at the foot of the dunes or on protected beaches, along with the non-native Russian thistle (*Salsola tragus*). The wrack line has seed sources for (re)establishment of plants on the beach.

Differentiating Occurrences: Maritime Beach Strand Communities are above the daily high tides, between the wrack line and the dunes, and have scattered vascular plants. 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 Community is non-vascular.

Associated Fauna: Several species of shorebird are beach specialists, nesting and foraging on beach strands, including Least Terns (*Sterna antillarum*), Piping Plover (*Charadrius*

melodus), and American Oystercatcher (*Haematopus palliatus*). Beach strands are important shorebird staging areas: migratory shorebirds use barrier beach systems, including the beach strand community, for resting and congregating before and during migration. Merlins (*Falco columbarius*) and Peregrine Falcons (*Falco peregrinus*) forage on beaches during migrations. No amphibians or reptiles regularly occur on beaches. Mammal use of beaches tends to be for feeding, often on debris brought in with wrack and invertebrates under the wrack line, by species such as red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), and coyote (*Canis latrans*). Generalist small mammals feed on debris, seeds, and invertebrates in the wrack line. Seals (mostly *Phoca vitulina*) haul out on beaches to rest. Invertebrate specialists include several species of tiger beetles, beach flies, and, on the south side of the Cape, ghost crabs at their northern limit of distribution.

Public Access: Cape Cod National Seashore; Monomoy National Wildlife Refuge, Orleans/ Chatham; Horseneck Beach State Reservation, Westport; Parker River National Wildlife Refuge, Newbury; Boston Harbor Islands, Boston area.

Threats: Recreational use, foot and vehicular traffic. Invasive species: seabeach poppy (*Glaucium flavum*). Raking. Sea-level rise will swamp existing beach strand communities.

Management Needs: Allow natural disturbances: deposition and erosion, and exposure to overwash and salt spray with wrack material left in place. Restrict or eliminate vehicle traffic.

USNVC/NatureServe: Includes: Sand Flats- *Cakile edentula* Sparsely Vegetated Alliance -- *Cakile edentula* ssp. *edentula* - *Chamaesyce polygonifolia* Sparse Vegetation [CEGL004400]. (Park name at Cape Cod National Seashore - North Atlantic Upper Ocean Beach). In Ecological Systems: Northern Atlantic Coastal Plain Sandy Beach (CES203.301) Central Atlantic Coastal Plain Sandy Beach (CES203.064)

Maritime Dune Community

Community Code: CT2B1B0000

State Rank: S3

Concept: This is the classic community of dynamic sand dunes, with patches of herbaceous plants interspersed with areas of bare sand and shrubs, often part of a barrier beach system.

Environmental Setting: Maritime Dune Communities are usually in barrier beach systems in a mosaic with other communities on the dynamic system's shifting sands in an extremely harsh physical environment. Winds move and carry salt; wind-blown sands prune and bury plants. Together, the salt and sand limit species diversity. The dunes behind the beachfront may occur as a single ridge or a series of parallel ridges that extend back through shrub and forest thickets to salt marsh and tidal flats associated with the protected bay or estuarine system. The dunes directly behind the beach are the most severely stressed by wind and airborne salt. These shifting foredunes are stabilized by colonies of beachgrass. Few other plants in the beach/dune community grow out into the unprotected foredunes. On back dunes, Maritime Dune Communities are sparsely vegetated with patches of herbaceous or low shrubby plants interspersed with areas of bare sand, and often grade into shrubland or woodland communities in more sheltered areas. Vegetation in wet areas between dunes is classified separately as a distinct Interdunal Marsh/Swale community. Ability of dunes to move is an important part of the habitat they provide.

Vegetation Description: The Maritime Dune Community is characterized by expanses of dunegrass (*Ammophila breviligulata* ssp. *breviligulata*) and beach heather (*Hudsonia tomentosa*), with seaside goldenrod (*Solidago sempervirens*) and beach pea (*Lathyrus japonicus*). Poison ivy (*Toxicodendron radicans*) is often dense. Shrubs

such as bearberry (*Arctostaphylos uva-ursi*), bayberry (*Morella pensylvanica*), lowbush blueberry (*Vaccinium angustifolium*), sweet fern (*Comptonia peregrina*), and beach plum (*Prunus maritima*) grow on protected slopes and some interdunal areas; shrubs can become abundant and form extensive shrublands. Salt hay (*Spartina patens*), common hairgrass (*Deschampsia flexuosa*), little bluestem (*Schizachyrium scoparium*), and poverty grass (*Danthonia spicata*) can be common grasses in protected areas of the community. Beach pinweed (*Lechea maritima*), and jointweed (*Polygonum articulatum*) grow mixed with beach heather. Scattered pitch pines (*Pinus rigida*) occur in some dune systems. Actual composition and structure of the vegetation depends upon recent dune stability (deposition and erosion) and distance from the ocean.

Differentiating Occurrences: 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. Sandplain Heathlands are structurally similar to Maritime Dune Communities in that they have low shrubby herbaceous and grassy plants with patches of bare soil. Along the edges of dunes, Sandplain Heathlands and Maritime Dune Communities may overlap: Maritime Dune Communities are on dunes and dominated by beach grass and beach heather, which are much less dominant in the mix of species in Sandplain Heathlands. However, the communities may be so similar or change so gradually that it may be necessary to arbitrarily assign to a type based on the land form or the prevailing type. Maritime Dune Communities are the most sparsely vegetated communities on the dune systems, with scattered patches of low shrubs, including red cedar, pitch pines, bayberry, herbaceous species, and grasses with bare sand. The various maritime shrubland, woodland, and forest communities all have dominance of woody plants in larger areas than occur in the dune community, but may also be on dunes and could be considered to be subtracted from the broad definition of maritime communities on dunes. These include Maritime Juniper Woodland/Shrubland, Maritime Pitch Pine Woodlands on Dunes, and Maritime Shrubland communities. Very small patches of any type within another community should be considered to be part of the variation of the other community.

Associated Fauna: A variety of seabirds, shorebirds, and songbirds nest at the base and sides of dunes and in the interdunal area. The particular species depend upon topography, hydrologic regime, and the amount and type of plant cover. Vernal pools occur in some dune systems, serving as important feeding and breeding areas for a variety of reptiles and amphibians, invertebrates, and birds and mammals. Diamondback terrapins (*Malaclemys terrapin*) use dunes for nesting. The state-listed dune noctuid moth (*Sympistis riparia*, Special Concern) occurs in dunes.

Public Access: Sandy Neck Beach Conservation Area, Barnstable; Cape Cod National Seashore, Wellfleet; Boston Harbor Islands, Hingham; Parker River National Wildlife Refuge, Newburyport.

Threats: Exotics (*Lonicera morrowii*, *Lythrum salicaria*, *Artemisia stelleriana*). Traffic (foot as well as vehicular) breaks the surface structure and removes vegetation. Road cuts change wind patterns and so alter deposition, erosion, and vegetation.

Management Needs: Removal of exotics at the best sites. An important threat to dunes is direct disturbance to the integrity of dunes from off-road vehicles, mountain bicycle, or even foot traffic. Loss of vegetation accelerates erosion, and rapid sand loss may not be balanced by new sand from the beach. Protection from damaging access is essential. Although measures to address unusual erosion may be needed to restore disturbed sites, some erosion is a normal part of dune systems and provides important habitat for specialized species.

USNVC/NatureServe: NVC System includes: CES203.264 Northern Atlantic Coastal Plain Dune and Swale. Includes multiple associations (others are wooded and not part of MA Dune community): (*Morella pensylvanica*)/*Schizachyrium littorale- Aristida tuberculosa* Shrub Herbaceous Vegetation (CEGL006161, GNR); *Ammophila breviligulata - Lathyrus japonicus* Herbaceous Vegetation (CEGL006274, G4?); *Deschampsia flexuosa* Herbaceous Vegetation (CEGL006621, GNR); *Hudsonia tomentosa - Arctostaphylos uva-ursi* Dwarf-shrubland (CEGL006143, G2G3); *Morella pensylvanica/Schizachyrium littorale- Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2); *Smilax glauca - Toxicodendron radicans* Vine-Shrubland (CEGL003886, G1G2).

Maritime Erosional Cliff Community

Community Code: CT2B1E0000

State Rank: S2

Concept: Extremely sparse vegetation on cliffs being actively eroded by the sea.

Environmental Setting: The Maritime Erosional Cliff Community occurs on cliffs being actively eroded by the sea; storms particularly cause dramatic changes. The seaward-facing unconsolidated cliff faces above beach strand communities are in the salt spray zone where wind and salt spray constantly dry the vegetation. The cliffs themselves may be glacial deposits, best developed on terminal moraines usually with mixed material, including boulders, gravel, sand, and lenses of clay. There are also cliffs of sand from glacial outwash or dunes. The unconsolidated cliff material generally does not hold water which, combined with the wind, produces a very dry environment. Freshwater flowing through the cliff material may emerge as seepage at the base. With the constant erosion there is little soil development on the cliff face. Maritime Erosional Cliffs may be 100 ft. (~33m) or more high above the ocean and beach below.

Vegetation Description: The Maritime Erosional Cliff Community generally has extremely sparse vegetation that is typical of surrounding areas: shrubs and vines may include poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), wild roses (*Rosa carolina* and *R. rugosa*), bayberry (*Morella pensylvanica*), sweet fern (*Comptonia peregrina*), beach plum (*Prunus maritima*), black cherry (*Prunus serotina*), huckleberry (*Gaylussacia baccata*), bearberry (*Arctostaphylos uva-ursi*), catbriar (*Smilax rotundifolia*) or the non-native bush honeysuckles (*Lonicera* spp.) or multiflora rose (*Rosa multiflora*). Scattered herbaceous plants include native seaside yarrow and non-native yarrow (*Achillea millefolium* ssp. *lanulosa* and *A. millefolium* ssp. *millefolium*), non-native mugwort (*Artemisia vulgaris*), and other

species typical of disturbed areas. Vegetation is densest on less steep areas, especially steps in the cliff face that may support dunegrass (*Ammophila breviligulata* ssp. *breviligulata*) and non-native grasses. Some sites have dense non-native vegetation. The base of erosional cliffs is often moist from seeps. In areas with freshwater seepage common horsetail (*Equisetum arvense*) and the non-native orache (*Atriplex patula*) often grow.

Differentiating Occurrences: Maritime Erosional Cliff Communities are made of mixed unconsolidated material. Maritime Rock Cliff Communities are bedrock. Both are in the salt spray zone next to the ocean. The vegetation of the Maritime Erosional Cliff Community is sparse and species are typically weedy species from the surroundings. The substrate is steep and close to vertical in places, and usually is actively eroding.

Associated Fauna: Bank Swallows (*Riparia riparia*) nest in the top parts of the cliffs. Migrating Peregrine Falcons (*Falco peregrinus*) regularly perch on and hunt from the upper part of sea cliffs during the fall migration.

Public Access: Maritime Erosional Cliffs are extremely fragile and visitation is discouraged due to potential for erosion from disturbance.

Threats: Bank stabilization interferes with natural processes of erosion. But erosion becomes severe with added human-induced disturbance, including from foot traffic and climbing.

Management Needs: Naturally disturbed, but don't want to enhance the disturbances. Continue to keep pedestrian traffic off cliff faces.

USNVC/NatureServe: A3992 Erosional Bluffs Alliance Maritime Erosional Cliffs CEGL006618. (described for BoHa); inclusions of *Smilax glauca* - *Toxicodendron radicans* Vine-Shrubland (CEGL003886). In Ecological system: Northeastern Erosional Bluff (CES203.498). Sand Cliffs are similar to Sand Dunes with *Ammophila breviligulata* - *Lathyrus japonicus* Herbaceous Vegetation (Beachgrass Dune) and *Cakile edentula* ssp. *edentula* - *Chamaesyce polygonifolia* Sparse Vegetation.

Maritime Forest/Woodland

Community Code: CT1A2A1000

State Rank: S2

Concept: Deciduous or mixed deciduous/evergreen forest/woodland within the salt spray zone near the ocean. The trees tend to be short, <10 m (~ 30 ft.).

Environmental Setting: Maritime communities occur near the ocean on exposed bluffs, the back or inland side of dunes, interdunal areas, and salt marsh borders, in mosaics of vegetation structure and species mixes. Strong winds, shifting sands, and flooding with saltwater create a dynamic system that maintains a variety of stages of early successional vegetation. Maritime Forest/Woodlands have a mixture of deciduous and evergreen trees in the canopy that is lower than typical in more inland areas, averaging about 30 feet (10m) tall. Many trees are multiple-stemmed and contorted from pruning by winds carrying salt and sand. Soils are usually sands with a surface layer of organic material that can slow moisture infiltration and keep the areas moister than more exposed surroundings. In addition, groundwater may be close to the surface in some low interdunal areas. Such low interdunal areas may be quite mesic and support relatively high species diversity. Where groundwater is lower, plant species are limited to those with deep-delving root systems. While sandy soils are generally acidic and low in nutrients, these soils may have higher pH and nutrient levels than expected due to the accumulation of leaf litter, fragments of sea shells, and input from salt spray (which can, of course, produce conditions too salty for many plants).

Vegetation Description: Trees are usually short relative to interior forests. Black oak (*Quercus velutina*), scarlet oak (*Q. coccinea*), white oak (*Q. alba*), other oaks, hickories (*Carya* spp.), American holly (*Ilex opaca*), sassafras (*Sassafras albidum*), black gum (*Nyssa sylvatica*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*) are

commonly present. American beech (*Fagus grandifolia*) is often present and occasionally dominant, sometimes in almost mono-dominant stands on moraines or areas near freshwater ponds. Basswood (*Tilia americana*) is in several occurrences. Pitch pine (*Pinus rigida*) and red cedar (*Juniperus virginiana*) occur in variable, generally low, amounts. One occurrence is dominated by hackberry (*Celtis occidentalis*) and sassafras. Vines may be dense, especially on the edges of openings; vines include greenbrier (*Smilax rotundifolia*), poison ivy (*Toxicodendron radicans*), Virginia creeper (*Parthenocissus quinquefolia*), grape (*Vitis aestivalis*), and the non-native Oriental bittersweet (*Celastrus orbiculatus*). The shrub and herbaceous components can be diverse and include species usually found in less acidic areas. Shrubs include bayberry (*Morella pensylvanica*), inkberry (*Ilex glabra*), winged sumac (*Rhus copallinum*), shadbush (*Amelanchier spp.*) and sweet pepper-bush (*Clethra alnifolia*). The understory often includes non-native shrubs that can form dense thickets of Japanese barberry (*Berberis thunbergii*), Japanese honeysuckle (*Lonicera japonica*), Morrow honeysuckle (*L. morrowii*), common buckthorn (*Rhamnus cathartica*), and/or multiflora rose (*Rosa multiflora*). The herbaceous layer is also highly variable and includes bracken fern (*Pteridium aquilinum*), Canada mayflower (*Maianthemum canadense*), partridgeberry (*Mitchella repens*), starflower (*Lysimachia borealis*), Pennsylvania sedge (*Carex pensylvanica*), and other sedges and grasses. Microtopography and local conditions strongly influence the species assemblage. Low (but not as wet as swales) interdunal areas often include species of wetlands such as swamp azalea (*Rhododendron viscosum*), viburnums (*Viburnum* spp.), winterberry (*Ilex verticillata*), and highbush blueberry (*Vaccinium corymbosum*). The herbaceous layer of these wetter areas sometimes includes species usually associated with rich, moist sites such as columbine (*Aquilegia canadensis*), starry Solomon's seal (*Maianthemum stellatum*), painted trillium (*Trillium undulatum*), and skunk meadow-rue (*Thalictrum revolutum*).

Differentiating Occurrences: 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. Maritime Forests/Woodlands are very near the ocean, receive regular salt spray, and have stunted canopies of mixed tree species. Maritime Pitch Pine Woodlands on Dunes are dominated by pitch pine, have sparser canopies, and are usually more exposed and closer to the ocean. Maritime Juniper Woodland/Shrublands are dominated by red cedar, and also usually closer 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 lowbush blueberry (*Vaccinium angustifolium*) and black huckleberry (*Gaylussacia baccata*). Determining actual boundaries among the communities in a maritime mosaic is difficult and may require arbitrary assignments. Patches that are <5000 sq. ft. should be noted in descriptions, but considered to be part of the variation of the surrounding community.

Associated Fauna: There are no animal species known to be restricted to Maritime Forests/Woodlands. Animal species are those of typical coastal oak areas such as the birds Eastern Towhee (*Pipilo erythrophthalmus*), Gray Catbird (*Dumetella carolinensis*), Common Yellowthroat (*Geothlypis trichas*), Ovenbird (*Seiurus aurocapillus*), and Black-and-white Warbler (*Mniotilta varia*). Small mammals such as meadow voles (*Microtus pennsylvanicus*), white-footed mice (*Peromyscus leucopus*), and gray squirrels (*Sciurus carolinensis*) are common in Massachusetts forests. Moths, butterflies, and other insects of the southeastern oak and oak-pine forest occur in maritime forests. Generally, in more salt-influenced environments, fewer animals will be expected. As in all communities on peninsulas such as Cape Cod or on islands, the more remote occurrences have fewer species than those closer to the mainland sources. High white-tailed deer (*Odocoileus virginianus*) densities may have an impact on the abundance of native species, particularly woody seedlings such as oaks, as well as on herbaceous plants.

Public Access: Cape Cod National Seashore, Wellfleet; Sandy Neck Beach Conservation Area, Barnstable; Demarest Lloyd State Park, Dartmouth; Salisbury Salt Marsh WMA and Carr Island Wildlife Sanctuary, Salisbury; Parker River National Wildlife Refuge, Newburyport.

Threats: Exotics, such as Morrow's honeysuckle (*Lonicera morrowii*), dune stabilization, roads through the dunes. Over-abundant deer populations can strongly impact which species survive to reproduce.

Management Needs: Exotic control on the best examples.

USNVC/NatureServe: A2032 *Quercus velutina - Fagus grandifolia - Ilex opaca* Maritime Forest Alliance - *Quercus stellata - Quercus velutina/Morella pensylvanica/Deschampsia flexuosa* Forest (CEGL006373); A0237 *Prunus serotina - Amelanchier* spp. - *Juniperus virginiana* Maritime Scrub Forest Alliance - *Prunus serotina - Sassafras albidum - Amelanchier canadensis - Quercus velutina/Smilax rotundifolia* Forest (CEGL006145).

Maritime Juniper Woodland/Shrubland

Community Code: CT1A2A1100

State Rank: S1

Concept: Predominantly evergreen woodland/shrubland within the coastal salt spray zone, often on dunes or bluffs over the ocean. The trees tend to be short (less than 5 m (about 15 feet)) and scattered. Tops of trees and shrubs are sculpted by winds and salt spray.

Environmental Setting: Maritime communities occur along the coast within the area of direct influence of the ocean and salt spray, but not in areas flooded by saltwater. They are usually somewhat protected from direct spray by the crests of dunes. Juniper-dominated maritime communities tend to occur on the sand of interdunal areas, backs of dunes, exposed bluffs, and salt marsh borders, and, to a lesser extent, on rocky headlands.

Vegetation Description: Trees are usually short relative to interior forests. The Maritime Juniper Woodland/Shrubland community occurs as part of a continuum of sparse shrubland to forest, and deciduous to evergreen dominants, in areas of continuous changes of levels of salt spray and substrate types. Virginia juniper, also called red cedar (*Juniperus virginiana*), dominates but occurs in variable, usually low, densities in association with scattered trees and shrubs typical of the surrounding forest such as pitch pine (*Pinus rigida*), various oaks (*Quercus* spp.), American holly (*Ilex opaca*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), bayberry (*Morella pensylvanica*), and winged sumac (*Rhus copallinum*). Greenbriar (*Smilax rotundifolia*) can be abundant in more established woodlands, particularly along open edges. The herbaceous layer is highly variable, with little bluestem grass (*Schizachyrium scoparium*), dunegrass (*Ammophila breviligulata* ssp. *breviligulata*), and sedges, often with scattered beach heather (*Hudsonia tomentosa*) or seabeach

sandwort (*Honckenya peploides*). Microtopography and local conditions strongly influence the species assemblage.

Differentiating Occurrences: Maritime Juniper Woodland/Shrubland intergrades and interdigitates with Maritime Pitch Pine Woodland on Dunes, Maritime Forest/Woodland (behind stable dunes in low protected interdunal moist areas), and Interdunal Marshes/Swales. The Maritime Juniper Woodland/Shrubland community grades from sparse shrubland to woodland, in a continuum of other communities with deciduous to evergreen dominants, in areas of constant changes of levels of salt spray and substrate stability. Even in stable situations, community edges may not be clear. Different types of communities grade into and interdigitate with each other. Very small patches of any type within another community should be considered to be part of the variation of the other community. Maritime Pitch Pine Woodlands on Dunes communities share species with the Maritime Juniper Woodland/Shrubland community, but are dominated by pitch pine. Maritime Shrubland communities are dominated by a dense mixture of primarily deciduous shrubs, but may include red cedar. Bare sand dominates Maritime Dune Communities, which are only sparsely vegetated with very scattered patches of low shrubs, including red cedar, pitch pines, herbaceous species, and grasses. The most similar vegetation to Maritime Juniper Woodland/Shrubland is old-field red cedar (which is not separated out as a community type in this classification). These are successional woodlands dominated by red cedar growing in abandoned pastures and fields and along major highways. Oldfield red cedar shrublands may be quite difficult to separate from nearby Maritime Juniper Woodland/Shrublands; they may be extensions of them, but are not maintained by salt spray, are not on steep slopes, would be expected to succeed to more forested communities, and are often more diverse. 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.

Associated Fauna: There are no animal species known to be restricted to maritime woodlands/shrublands. As with all maritime shrublands and woodlands, these habitats are important feeding and resting/roosting areas for migrating birds. Animal species are those of typical coastal oak areas such as the birds Eastern Towhee (*Pipilo erythrophthalmus*), Gray Catbird (*Dumetella carolinensis*), Common Yellowthroat (*Geothlypis trichas*), Ovenbird (*Seiurus aurocapillus*), and Black-and-white Warbler (*Mniotilta varia*). Small mammals such as meadow voles (*Microtus pennsylvanicus*), white-footed mice (*Peromyscus leucopus*), and gray squirrels (*Sciurus carolinensis*) are common in Massachusetts forests. Moths, butterflies, and other insects of the southeastern oak and oak-pine forest occur in maritime forests. Generally, in more salt-influenced environments, fewer animals will be expected. As in all communities on peninsulas such as Cape Cod or on islands, the more remote occurrences have fewer species than those closer to the mainland sources.

Public Access: Sandy Neck Beach Conservation Area, Barnstable; Cape Cod National Seashore, Wellfleet; Boston Harbor Islands, Hingham.

Threats: Exotics, including Oriental bittersweet (*Celastrus orbiculatus*); dune stabilization; roads through the dunes. As with other communities on dunes, these communities are sensitive to disturbance and easily damaged even by foot traffic.

Management Needs: Exotic control on the best examples. Because this is a dynamic community that moves or changes size, shape, and composition as the dunes move, large properties where natural changes can be accommodated provide long-term protection. Dune communities will be best maintained where they are part of a complex of beach and dune, woodland and shrubland, which have adequate buffers and connections between and among patches. Changes in climate that result in higher sea levels or increased severity of storms also pose direct, long-term threats.

USNVC/NatureServe: Includes: *Prunus serotina - Amelanchier spp. - Juniperus virginiana* Maritime Scrub Forest Alliance -- *Juniperus virginiana* var. *virginiana*/*Morella pensylvanica* Woodland [CEGL006212].

Maritime Pitch Pine Woodlands on Dunes

Community Code: CT2A1A1200

State Rank: S1

Concept: Scattered pitch pines on sand dunes, many with trunks at least partially buried. Open canopy, with bare ground and scattered shrubs, herbaceous plants, and patches of lichen.

Environmental Setting: Occurring as small patch communities on sand dunes on barrier beaches and other sandy shores, Maritime Pitch Pine Woodlands on Dunes tend to have linear occurrences on back dunes just beyond the reach of daily salt spray. The moderately stabilized back dunes, and thus the communities on them, are created and maintained by the movement of sand by wind; boundaries or an entire dune can change as sand is moved. During storms, back dunes receive windblown sand and salt that prune trees. The community appearance is open, with scattered, partially buried but living, pitch pine trees separated by bare sand with lichens and pine needles. On older, fairly stable dunes, a sedge lawn may cover the ground between trees. The pitch pine patches are in a mosaic of communities on dunes, with open dune communities in exposed areas, Maritime Juniper Woodland/Shrublands interdigitating in areas with more salt spray, denser deciduous shrublands and woodlands forming in stable moist swales, and open interdunal swales in exposed areas with regular active sand movement. The woodland communities are not in areas normally subject to saltwater flooding, which kills the pine trees.

Vegetation Description: Maritime Pitch Pine Woodland on Dunes is an open woodland community with short, scattered individuals of pitch pine (*Pinus rigida*) dominating the low tree layer. Pines that are very exposed may be short, with taller trees in more protected areas where grasses and sedges may cover the ground. Between the pines,

scattered beach heather (*Hudsonia tomentosa*) and bearberry (*Arctostaphylos uva-ursi*) form a patchy, very low shrub layer among areas of bare sand with lichens and earth star fungus.

Differentiating Occurrences: Maritime forests, woodlands, and shrublands on dunes grade into each other and into more open dry shrubby or shrubless dunes, as well as into wetland communities in interdunal swales. Differentiating between open-canopy Maritime Pitch Pine Woodland on Dunes and closed-canopy Pitch Pine - Oak Forests or Maritime Forests/Woodlands would be based on the canopy openness and dominance of pitch pine, and on the paucity of other species. Active sand movement would be much less in closed woodlands, which have little bare ground, more soil development, a litter layer composed of more than pine needles, and more species diversity. 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. Related open communities include the Maritime Juniper Woodland/Shrubland, in which red cedar dominates with about 25-75% of the cover. Pitch pine and other widespread early successional shrubs and trees, such as red maple and black cherry, are usually present in lower abundances. Bare sand dominates Maritime Dune Communities that are only sparsely vegetated with very scattered patches of low shrubs, herbaceous plants, and grasses. Maritime Pitch Pine Woodland on Dunes occur in a complex of these and other barrier beach communities in a shifting mosaic as storm winds move sand, burying vegetation and restarting communities. Maritime Pitch Pine Woodland on Dunes intergrades and interdigitates with Maritime Juniper Woodland/Shrubland, Maritime Forest/Woodland (behind stable dunes in low protected interdunal moist areas), and Interdunal Swales. Occurrences of small patches within another community would be considered to be part of the variation of the other community. Areas of temporary stability allow succession to more mixed forests.

Associated Fauna: There are no animal species known to be restricted to maritime forests. The open pitch pine areas are particularly harsh and exposed, and support fewer animals than more closed communities. Generally, in more salt-influenced environments, fewer animals will be expected. As in all communities on peninsulas such as Cape Cod or on islands, the more remote occurrences have fewer species than those closer to the mainland sources. Moths, butterflies, and other insects of the southeastern oak-pine forest occur in maritime forests.

Public Access: Cape Cod National Seashore, Wellfleet; Sandy Neck Beach Conservation Area, Barnstable; Horseneck Beach State Reservation, Westport; Parker River National Wildlife Refuge, Newbury.

Threats: As with other communities on dunes, these communities are sensitive to disturbance and easily damaged even by foot traffic.

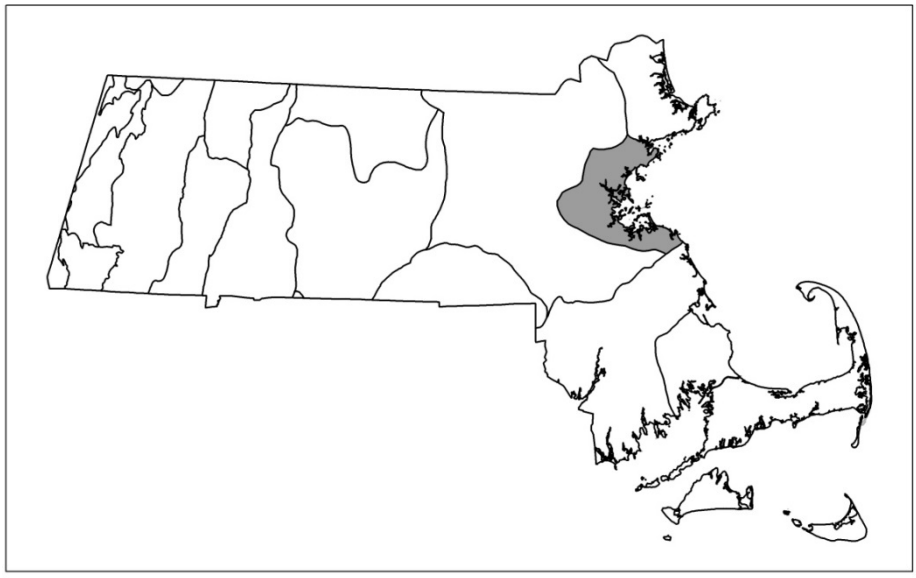
Management Needs:

USNVC/NatureServe: *Pinus rigida* woodland alliance -- *Pinus rigida*/*Hudsonia tomentosa* Woodland [CEGL006117] *Pinus rigida* - *Quercus* (*coccinea*, *velutina*) Woodland Alliance -- *Pinus rigida* - *Quercus velutina*/*Hudsonia tomentosa* Woodland [CEGL006120].

Maritime Rock Cliff Community

Community Code: CT2A4B0000

State Rank: S2



Concept: Sparsely vegetated rock areas with plants in cracks and ledges where soil collects, within the salt spray zone, but above normal high tides.

Environmental Setting: Maritime Rock Cliff Communities occur on the ocean side of rocky headlands and coastal bedrock outcrops, above the rocky intertidal, but within the salt spray zone where they are very exposed to storms. Vegetation grows in small pockets where the soil is augmented by droppings from gulls, cormorants, and other cliff-perching birds.

Vegetation Description: The Maritime Rock Cliff Community is sparsely vegetated by low, scattered, salt- and wind-hardy, often somewhat weedy plants, such as knotted pearlwort (*Sagina nodosa* ssp. *nodosa*), saltworts (*Salicornia* spp.), common rush (*Juncus effusus*), seaside plantain (*Plant ago maritima*), poison ivy (*Toxicodendron radicans*), blue toadflax (*Nuttallanthus canadensis*), seaside goldenrod (*Solidago sempervirens*), Scotch lovage (*Ligusticum scothicum*), common hairgrass (*Deschampsia flexuosa*), and native and non-native red fescues (*Festuca rubra*). Species from the top of the headland, often from a Maritime Shrubland community, occur in less exposed ledges. Plants of extremely exposed maritime rock cliffs and outcrops, such as on the outer Boston Harbor Islands, tend to be tough, non-native herbaceous perennials including mugwort (*Artemisia vulgaris*), black mustard (*Brassica nigra*), smartweed (*Persicaria lapathifolia*), and curly dock (*Rumex crispus*).

Differentiating Occurrences: Rock cliffs are arbitrarily defined as near vertical (>60% slope). Maritime Rock Cliff Communities derive from bedrock of a variety of different types, but are

consolidated material. Maritime Erosional Cliff Communities are made of mixed unconsolidated material. Both are steep shores in the salt spray zone above the intertidal shores. The vegetation of both communities is sparse and typically composed of weedy species from the surroundings. They are next to the ocean in the salt spray zone, above the twice-daily flooded area of the Marine Intertidal Rocky Shore Community. The Maritime Beach Strand Community is not on bedrock and is not close to vertical. Maritime Shrubland Communities occur outside of the daily salt spray zone and are generally flatter; they share species with Maritime Rock Cliff Communities, but are much more densely covered.

Associated Fauna: Harbor seals (*Phoca vitulina*) use the rocks below the cliffs to haul out and rest. The exposed rock face itself does not provide habitat for specialized fauna.

Public Access: Maritime Rock Cliffs are sensitive to visitation; care should be taken not to disturb plants during a visit. Slate Island, Boston Harbor Islands, Weymouth.

Threats: Exotics; Oriental bittersweet and Scotch lovage being abundant with mullein, Morrow's honeysuckle, sow thistle, yarrow, and sheep fescue.

Management Needs:

USNVC/NatureServe: Maritime Rock Cliffs (CEGL006619).

Maritime Shrubland

Community Code: CT2A4A1000

State Rank: S3

Concept: Shrub community, dominated by patches of dense shrubs with scattered more open areas of low growth or bare ground. Cover of tree canopy is less than about 25%.

Environmental Setting: Maritime Shrubland communities occur along the coast within the area of direct influence of the ocean and salt spray, such as on barrier beach dunes, next to tidal marshes or on bluffs or rocky headlands. Maritime Shrublands often occur on sand or bedrock that does not hold water. They may extend inland in areas with droughty soils or extreme exposure to ocean winds that inhibit tree growth. Offshore islands can have extensive areas of Maritime Shrublands. They are dominated by patches of dense shrubs with scattered areas of more open low growth or bare ground, and have less than about 25% tree canopy. Plants in these communities are exposed to the direct influences of salt and constant ocean wind, which select for stress-tolerant species. The species of Maritime Shrublands do not withstand flooding by saltwater, but they tolerate or recover from salt deposits on their leaves. Fire was an important part of this environment prior to the establishment of fire suppression regimes in settled areas. Without regular disturbance, the community may succeed to forest.

Vegetation Description: Maritime Shrublands are within the northeastern oak and oak-pine forest region; species of these communities are species of oak forests. They often have dense patches of shrubs, up to about 3m (10 ft.) tall, with various species dominating in different areas. Huckleberry (*Gaylussacia baccata*), bayberry (*Morella pensylvanica*), or red cedar (*Juniperus virginiana*) areas are often distinctive. Large areas with dense red cedar are separated out as Maritime Juniper Woodland/Shrubland. Black cherry (*Prunus serotina*), beach plum (*Prunus*

maritima), chokeberry (*Aronia melanocarpa*), lowbush blueberry (*Vaccinium angustifolium*), and bearberry (*Arctostaphylos uva-ursi*) may be abundant. Catbrier (*Smilax rotundifolia*) and poison ivy (*Toxicodendron radicans*) often cover other plants or grow in dense patches on their own. Non-native species are often abundant including Oriental bittersweet (*Celastrus orbiculatus*) and Morrow's honeysuckle (*Lonicera morrowii*). The herbaceous layer is usually sparse.

Differentiating Occurrences: 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 less than 40%, the community is considered to be something else, often Sandplain Heathland. Tree cover should be less than 25% overall. The differences among the communities and associations are often gradual, making differentiation on the ground difficult at times. Maritime Dune Communities 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.

Associated Fauna: Shrub thickets provide nesting areas for Northern Harriers (*Circus cyaneus*), Eastern Towhee (*Pipilo erythrophthalmus*), and Song Sparrow (*Melospiza melodia*). Maritime shrublands are heavily used during fall migrations for cover and forage; many of the plants have fruit attractive to migrants. White-tailed deer (*Odocoileus virginianus*) maintain large populations in shrubland habitats. In such shrub areas, white-footed mice (*Peromyscus leucopus*) are also very abundant, and in the openings meadow voles (*Microtus pennsylvanicus*) are common. Eastern moles (*Scalopus aquaticus*) have an affinity to the sand substrate in the southern part of the state. Long-tailed weasels (*Mustela frenata*) occur in the grass-dominated areas where they hunt meadow voles. Eastern hognose snakes (*Heterodon platirhinos*) occur in sandy, open areas of shrubland community areas. Coastal plain shrublands are habitat to the state-listed moth, chain dot geometer (*Cingilia catenaria*, Special Concern), whose larvae feed on a variety of the typical shrubs.

Public Access: Halibut Point State Park, Rockport; Boston Harbor Islands, Weymouth; Demarest Lloyd Memorial State Park, Dartmouth; Quivett Creek/Paines Creek Marsh (town conservation area), Brewster.

Threats: Invasive exotics in many occurrences. Shrubby honeysuckle (*Lonicera morrowii*) and Oriental bittersweet (*Celastrus orbiculatus*) are invasive in many of the locations. Japanese barberry (*Berberis thunbergii*), glossy buckthorn (*Frangula alnus*), and Japanese black pine (*Pinus thunbergiana*) are locally dense.

Management Needs: Removal of invasive exotics.

USNVC/NatureServe: Includes: *Prunus serotina - Amelanchier canadensis - Quercus* spp. Shrubland Alliance -- *Prunus serotina - Rhus typhina/Cakile edentula* Shrubland [CEGL006399]; *Myrica pensylvanica* - (*Prunus maritima*) Shrubland Alliance -- *Myrica pensylvanica-Rosa rugosa* Shrubland [CEGL006295].

Mixed Oak Forest/Woodland

Community Code: CT1A300000

State Rank: S5

Concept: A broadly defined forest community of tree oaks that grades into other more narrowly defined communities. Includes areas with open canopies that could be considered woodlands.

Environmental Setting: Mixed Oak Forest/Woodland is a deciduous forest or woodland community, dominated by multiple species of tree oak that occurs on dry soils and exposed acidic talus or rocky slopes. The canopy may be closed or somewhat open (typically having ~70% cover) at ~20m (~60 ft.). More mature forest examples tend to have denser canopy cover. Trees in many examples are small (young or stunted with broken tops) with diameters 6-8", and only occasionally are there larger trees >10" diameter. The tall shrub layer may be patchy, over an often extensive lower shrub layer. The herbaceous cover is variable. The litter layer is predominantly undecomposed oak leaves.

Vegetation Description: In Mixed Oak Forest/Woodland, the canopy has a variable mix of oak species (black (*Quercus velutina*), white (*Q. alba*), red (*Q. rubra*), scarlet (*Q. coccinea*), and chestnut (*Q. montana*)), with birches (black (*Betula lenta*) and white (*B. papyrifera*)), and red maple (*Acer rubrum*). White pine (*Pinus strobus*), if present, typically makes up much <25% of the canopy. The canopy is generally somewhat open. An understory of saplings of canopy species with (depending on location) gray birch (*Betula populifolia*), striped maple (*Acer pensylvanicum*), mountain maple (*A. spicatum*), witch hazel (*Hamamelis virginiana*), shadbush (*Amelanchier spp.*) and/or chestnut (*Castanea dentata*) is dense in patches. The shrub layer may be extensive or at least also dense, with patches of blueberries (*Vaccinium angustifolium* and *V. pallidum*), huckleberry (*Gaylussacia baccata*), and mountain

laurel (*Kalmia latifolia*). A scattered herbaceous layer is often primarily wild sarsaparilla (*Aralia nudicaulis*) and Pennsylvania sedge (*Carex pensylvanica*).

Differentiating Occurrences: Mixed Oak Forests/Woodlands are 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), and birches. They lack abundant pines or hemlock, and lack hop-hornbeam and indicators of rich sites. 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 locally dense patches. Black Oak - Scarlet Oak Woodlands are woodlands. Abundant scarlet oak with black oak is the key indicator of the type. Open Oak Woodlands occur on hill slopes with short red and white oak trees scattered over a grassy or low shrub understory around small rock outcrops. They often occur 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 Forest/Woodlands have>25% cover of pitch pine overall (not just local patches).

Associated Fauna: Mature upland forest types provide valuable structural attributes, such as tree cavity den sites (used by a variety of bird and mammal species) and large woody material (used by various amphibian, reptile, and invertebrate species). Mixed Oak Forests/Woodlands may constitute only parts of the habitats of many animals found in them. Acorns in all oak forests are important for wildlife, including white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), grey squirrels (*Sciurus carolinensis*), and other small rodents. Birds include Wild Turkeys (*Meleagris gallopavo*). The understory of blueberries and huckleberries is used by many of these same species in areas with sufficiently large forests to provide all the habitat needs. Passerine birds of oak forests include Red-eyed Vireo (*Vireo olivaceus*), Ovenbird (*Seiurus aurocapillus*), Black-and-white Warbler (*Mniotilta varia*), Scarlet Tanager (*Piranga olivacea*), Great Crested Flycatcher (*Miarchus crinitus*), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*P. villosus*) and Red-bellied Woodpecker (*Melanerpes carolinus*). Amphibians expected include northern redback salamanders (*Plethodon cinereus*) and spotted salamanders (*Ambystoma maculatum*). Ringneck snakes (*Diadophis punctatus*) and redbelly snakes (*Storeria occipitomaculata*) would be expected. Moths, including the orange sallow moth (*Pyrrhia aurantiago*), butterflies, and other insects of the southeastern oak and oak-pine forest occur in Mixed Oak Forest/Woodlands.

Public Access: Mt. Tekoa WMA, Russell; Minute Man National Historical Park, Lexington; Douglas State Forest, Douglas; Palmer WMA, Palmer.

Threats: This widespread acidic community has few exotics, but could be susceptible to those adapted to acidic conditions. Lack of light fire is more of a threat than fire itself.

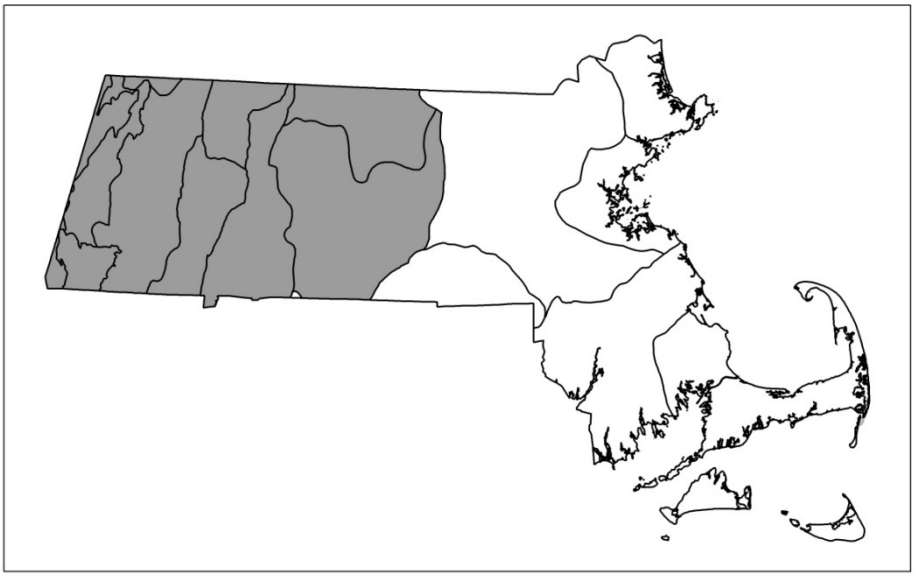
Management Needs: This mid-successional forest is currently widespread and most occurrences are maturing: management for the type is not necessary. However, without very occasional disturbance, the oaks could be replaced by more shade-tolerant, fire-sensitive species.

USNVC/NatureServe: NatureServe related to: A0624 *Quercus rubra* - *Quercus prinus* Woodland Alliance *Quercus rubra* - (*Quercus prinus*)/*Vaccinium* spp./*Deschampsia flexuosa* Woodland (CEGL006134); *Quercus rubra* - *Betula lenta*/*Polypodium virginianum* Woodland [CEGL006585]; A2048 *Quercus velutina* - *Quercus alba* Eastern Forest Alliance - *Quercus* (*velutina*, *alba*)/*Vaccinium pallidum*/*Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest [CEGL006018].

Northern Hardwoods – Hemlock – White Pine Forest

Community Code: CT1C000000

State Rank: S5



Concept: A matrix forest of northern areas, with a closed canopy dominated by a mix of deciduous and evergreen trees, with sparse shrub and herbaceous layers.

Environmental Setting: The Northern Hardwoods - Hemlock - White Pine Forest is the prevailing, or matrix, forest in higher elevations of western and north-central Massachusetts, with smaller occurrences throughout on north-facing slopes and in ravines. It is an uneven-aged forest with a closed canopy dominated by a mix of long-lived deciduous and evergreen trees, with sparse shrub and herbaceous layers. The forest structure is dominated by single tree falls and replacements, with occasional small to medium blowdown events; stand replacement events are uncommon. The community occurs on neutral to moderately acidic soils with moderate levels of nutrients that retain some moisture except during extreme droughts. Sugar maple leaf litter is relatively high in nitrogen and decomposes rapidly which leads to a shallow layer of leaf litter and rapid turnover of nutrients.

Vegetation Description: Dominant and characteristic species of Northern Hardwoods - Hemlock - White Pine Forests occur in different combinations between and within occurrences: occurrences are generally predominantly deciduous with scattered hemlocks and white pines, but may have internal patches of nearly pure conifers. Canopies include variable combinations of sugar maple (*Acer saccharum*), white ash (*Fraxinus americana*), yellow birch (*Betula alleghaniensis*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), red oak (*Quercus rubra*), bitternut hickory (*Carya cordiformis*), eastern hemlock (*Tsuga canadensis*), and, usually, emergent white pine (*Pinus strobus*). There are often scattered red maple (*Acer rubrum*), paper birch (*Betula papyrifera*), and aspen (*Populus tremuloides*). A

subcanopy may include any of the tree species, particularly the successional species, as well as hop-hornbeam (*Ostrya virginiana*) or striped maple (*Acer pensylvanicum*). The shrub layer is usually open, but often has scattered clumps of hobblebush (*Viburnum lantanoides*), striped maple, red-berried elderberry (*Sambucus racemosa*), or fly-honeysuckle (*Lonicera canadensis*). The herbaceous layer is sparse, but fairly diverse, with intermediate wood fern (*Dryopteris intermedia*), Christmas fern (*Polystichum acrostichoides*), clubmosses (*Dendrolycopodium*, *Diphasiastrum*, *Huperzia*, and *Lycopodium* spp.), Canada mayflower (*Maianthemum canadense*), white wood aster (*Eurybia divaricata*), and wild oats (*Uvularia sessilifolia*). Occasional spring herbaceous species include painted or purple trilliums (*Trillium undulatum* and *T. erectum*), early yellow violet (*Viola rotundifolia*), broad-leaved spring beauty (*Claytonia caroliniana*), and trout-lily (*Erythronium americanum*).

Differentiating Occurrences: Northern Hardwoods - Hemlock - White Pine Forests are the generalized northern deciduous forests. They lack the abundant spruce and/or fir found to the north and upslope in Spruce - Fir - Northern Hardwoods Forests. Red spruce (*Picea rubens*) and/or balsam fir are abundant in Spruce - Fir - Northern Hardwoods Forests, and white pine uncommon. 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. Successional Northern Hardwood Forests are best distinguished by the abundance of white birch and / or aspens in the canopy and northern hardwood species generally occurring in the subcanopy or shrub layer, not 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 Forests lack 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 (*Betula lenta*). Other northern hardwoods are occasional associates. Spring ephemerals are not abundant. Oak - Hemlock - White Pine Forests occur to the south and in warmer areas; they are dominated by a mix of oak species that except for red oak do not occur in Northern Hardwoods - Hemlock - White Pine Forest, plus sugar maple is lacking. 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.

Associated Fauna: Northern Hardwoods - Hemlock - White Pine Forests are the common type of forest in the cooler parts of the state and provide habitat for many common wide-ranging species. Geographical variation, structure, size, and local conditions will affect which actual species are present. The best occurrences of Northern Hardwoods - Hemlock - White Pine Forest are large and incorporate variation in species and structure, including multiple layers of vegetation, snags, tree cavity den

sites (used by a variety of bird and mammal species), and fallen large woody material (used by various amphibian, reptile, and invertebrate species). Covering large areas means inclusions of variation such as interior forest, dense conifer stands, beech seed production, seeps, pockets of wetland, and small patches of dense, earlier successional shrub species. Many species of neo-tropical migrant songbirds nest in large numbers in larger occurrences, including a variety of warblers. Northern Goshawk (*Accipiter gentilis*), Barred Owl (*Strix varia*), and Pileated Woodpeckers (*Dryocopus pileatus*) are also to be expected. It is hard to overstate the wildlife value of beechnuts in Northern Hardwoods - Hemlock - White Pine Forest for black bear (*Ursus americanus*) and other seed-eating omnivores and herbivores. Mammals include red squirrel (*Tamiasciurus hudsonicus*), gray squirrel (*Sciurus carolinensis*), chipmunk (*Tamias striatus*), redbacked vole (*Clethrionomys gapperi*), short-tailed shrew (*Blarina brevicauda*), masked and smoky shrews (*Sorex cinereus* and *S. fumeus*), and white-footed mouse (*Peromyscus leucopus*). At elevation, deer mouse (*P. maniculatus*) and woodland jumping mouse (*Napaeozapus insignis*) also occur in the forest type. Amphibians include redbacked salamanders (*Plethodon cinereus*) and wood frogs (*Rana sylvatica*), and expected reptiles include redbelly snakes (*Storeria o. occipitomaculata*).

Public Access: Chalet WMA, Cheshire; Mohawk Trail State Forest, Charlemont; Three Mile Pond WMA, Sheffield; Tully Mtn. WMA, Orange.

Threats: Exotics do well in the community. Hemlock hosts the non-native wooly adelgid, which usually kills a hemlock tree after it is fully infested.

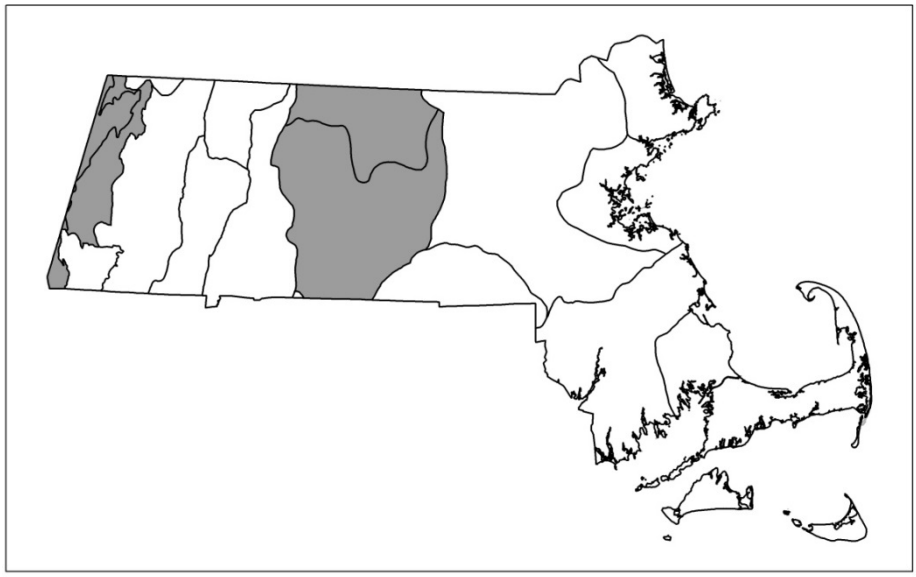
Management Needs: Exotic control where appropriate/possible.

USNVC/NatureServe: A4072 *Tsuga canadensis - Betula alleghaniensis - Acer saccharum* Forest Alliance - *Acer saccharum - Pinus strobus/Acer pensylvanicum* Forest [CEGL005005],*Tsuga canadensis - Fagus grandifolia* Forest [CEGL006088]; and *Tsuga canadensis - Betula alleghaniensis* Lower New England, Northern Piedmont Forest [CEGL006109]; A3301 *Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance - *Acer saccharum - Fagus grandifolia - Fraxinus americana/Arisaema triphyllum* Forest [CEGL006632]; A3302 *Tsuga canadensis - Betula lenta - Betula alleghaniensis* Forest Alliance - *Pinus strobus - Tsuga canadensis* Lower New England/Northern Piedmont Forest [CEGL006328], *Tsuga canadensis - Acer saccharum - Fagus grandifolia/Dryopteris intermedia* Forest [CEGL006639]; A3224 *Acer saccharum - Fagus grandifolia - Betula alleghaniensis* Forest Alliance - *Acer saccharum - Betula alleghaniensis - Fagus grandifolia/Viburnum lantanoides* Forest [CEGL006631; A3240 *Acer saccharum - Tilia americana - Fraxinus americana* Forest Alliance - *Acer saccharum* - (*Fraxinus americana*)/*Arisaema triphyllum* Forest [CEGL006211].

Oak – Hemlock – White Pine Forest

Community Code: CT1B100000

State Rank: S5



Concept: A mixed conifer-hardwood forest normally occurring in the southern part of the state or on south-facing slopes, often on somewhat dry, acidic slopes. The matrix forest of much of the state.

Environmental Setting: The Oak - Hemlock - White Pine Forest is the broadly defined matrix forest of lower-elevation areas of eastern and south-central Massachusetts, with extensions north and west on warm south-facing slopes. Oak - Hemlock - White Pine Forests are commonly on mid- and upper slopes on acidic soils. Reforestation after farm abandonment and ongoing human land use establish and maintain early- and mid-successional forests, as well as blurring the line between the Oak - Hemlock - White Pine Forest and northern hardwoods-dominated forests in cooler areas. Within the general Oak - Hemlock - White Pine Forest type, specific recurrent variants are named: many are successional stages, some are distinct species mixes of particular conditions. Many of the sites called Oak - Hemlock - White Pine Forest lack distinctive characteristics of named subtypes.

Vegetation Description: Oaks (*Quercus alba*, *Q. coccinea*, *Q. montana*, *Q. velutina*, *Q. rubra*), black birch (*Betula lenta*), American beech (*Fagus grandifolia*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*), in association with scattered hemlock (*Tsuga canadensis*) and white pine (*Pinus strobus*). Relative proportions of the species vary greatly among sites. Either conifer may occur in small patches. In pre-settlement forests, white pine would have been present in lower numbers than today. Some white pines emerge above the deciduous canopy. American chestnut (*Castanea dentata*) sprouts are common. The shrub layer is generally patchy and sparse, with

witch-hazel (*Hamamelis virginiana*), mountain laurel (*Kalmia latifolia*), lowbush blueberry (*Vaccinium angustifolium*), huckleberry (*Gaylussacia baccata*), and maple-leaved viburnum (*Viburnum acerifolium*) characteristically present. The herbaceous layer also tends to be somewhat sparse with little diversity. Indian cucumber (*Medeola virginiana*), wintergreen (*Gaultheria procumbens*), wild sarsaparilla (*Aralia nudicaulis*), wild oats (*Uvularia sessilifolia*), starflower (*Lysimachia borealis*), fringed bindweed (*Fallopia cilinodis*), and Canada mayflower (*Maianthemum canadense*) are typical.

Differentiating Occurrences: Oak - Hemlock - White Pine Forest is the most broadly defined of a continuum of oak-dominated forests, with more specific types 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. Occurrences have a large amount of internal variation. 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/Woodland tends 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 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 Forest, the only oak is red oak and the only hickory is bitternut hickory, which is not common in Oak - Hemlock - White Pine Forest.

Associated Fauna: The fauna of this community is richer than but overlaps with that of the mixed oak communities. There is a large suite of neotropical migrant birds that are more likely to be found here, in some of the larger sites, including about 15-16 species of warblers, Eastern Wood-Pewee (*Contopus virens*), and Great Crested Flycatcher (*Miarchus crinitus*). Where mountain laurel occurs with beech trees, Black-throated Blue Warblers (*Setophaga caerulescens*) may occur, and if there are low spots with large trees and fairly dense shrubs, Canada Warblers (*Wilsonia canadensis*) often occur. In large sites, large mammals, such as bear and moose, occur with the forest as part of their habitat. Common small mammals include smoky shrew (*Sorex fumeus*), masked shrew (*S. cinereus*), short-tailed shrew (*Blarina brevicauda*), woodland jumping mouse (*Napaeozapus insignis*), white-footed mouse (*Peromyscus leucopus*), gray squirrel (*Sciurus carolinensis*), chipmunk (*Tamias*

striatus), and red squirrel (*Tamiasciurus hudsonicus*), where hemlock are dominant. Amphibians would include the ubiquitous northern redback salamanders (*Plethodon cinereus*) and red efts, the juvenile stage of red-spotted newts (*Notophthalmus v. viridescens*). All of the upland forest types provide valuable structural attributes, such as tree cavity den sites (which are utilized by a variety of bird and mammal species) and large woody material (which is utilized by various amphibian, reptile, and invertebrate species). Perhaps the biggest difference in wildlife habitat between forest types in Massachusetts is that oak acorn production, an important source of wildlife food, is substantially greater in oak forest types than in northern forest types, while beech nut production is greater in northern hardwood types. Oaks and acorns play a fundamental role in the organization and dynamics of eastern wildlife communities.

Public Access: Hiram Fox WMA, Worthington; East Brimfield Lake Flood Risk Management Project (US Army Corps of Engineers), Brimfield; Conant Brook Dam Flood Risk Management Project (US Army Corps of Engineers), Monson; Wolf Swamp WMA, Brookfield; 19th Hill WCE, Winchendon.

Threats: Exotic invasives, including insects such as gypsy moth. Red maple has become more abundant in the forest type with reduction of fires and from being a less desirable wood for human use.

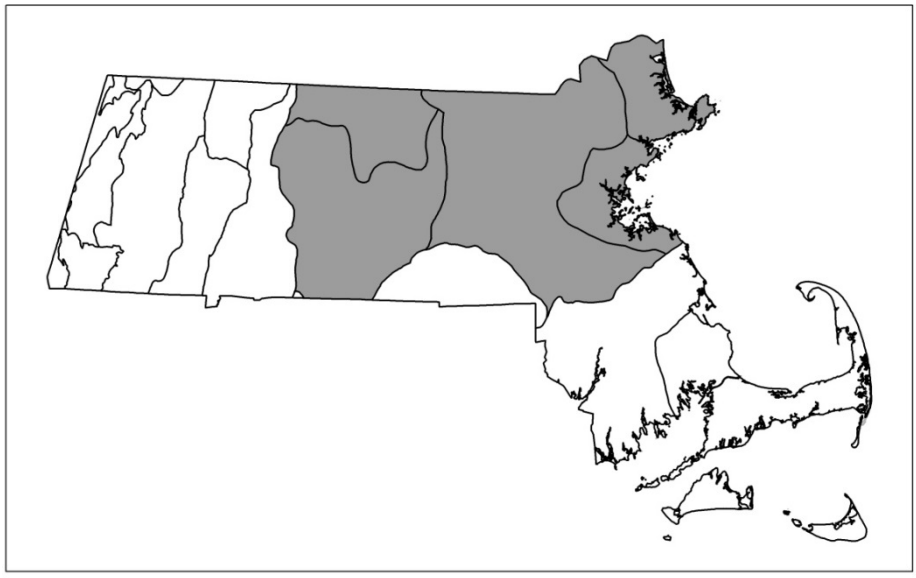
Management Needs:

USNVC/NatureServe: A2080 *Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance - *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest [CEGL006454] (mid successional); A4128 *Pinus strobus* - *Quercus alba* Allegheny Forest and Woodland Alliance - *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest [CEGL006293].

Oak – Hickory Forest

Community Code: CT1B2B0000

State Rank: S4



Concept: A somewhat enriched hardwood forest dominated by a mixture of oaks, with hickories mixed in at a lower density.

Environmental Setting: Oak - Hickory Forest is a somewhat enriched hardwood forest dominated by a mixture of oaks, with hickories mixed in at a lower density. They occur on well-drained sites, such as ridgetops or slopes, often with southwest-, south-, or southeast-facing aspects. The canopy is closed to interrupted (~67% cover), the shrub layer diverse with dense patches, and the herbaceous layer diverse but scattered. The duff layer may be deep with undecomposed oak leaves. Many occurrences are rocky. A fire history is evident at some of these sites. The forest may include or surround small patches of rock outcrop or Hickory – Hop Hornbeam Woodland, and be surrounded itself by White Pine – Oak or Oak – Hemlock – White Pine Forests.

Vegetation Description: Oak - Hickory Forest is a broadly defined, variable forest type. The canopy is dominated by one or several oaks (*Quercus rubra*, *Q. alba*, and *Q. velutina* with *Q. coccinea* and/or *Q. montana*). Mixed in are lower densities of one or several hickories (*Carya ovata*, *C. tomentosa*, *C. glabra*, or *C. cordiformis*). Occasional other trees include white ash (*Fraxinus americana*), black birch (*Betula lenta*), sassafras (*Sassafras albidum*), and red maple (*Acer rubrum*). If present, conifers (white pine (*Pinus strobus*) and/or eastern hemlock (*Tsuga canadensis*)) constitute <25% cover. A subcanopy/tall shrub layer (usually 25-50% cover) commonly includes hop hornbeam (*Ostrya virginiana*), flowering dogwood (*Benthamidia florida*), downy shadbush (*Amelanchier arborea*), American chestnut (*Castanea dentata*), and witch-hazel (*Hamamelis virginiana*). Low shrubs are often diverse and generally

sparse, but dense in patches: maple-leaved viburnum (*Viburnum acerifolium*), blueberries (*Vaccinium angustifolium* and *V. pallidum*), beaked and American hazelnut (*Corylus cornuta* and *C. americana*), and gray dogwood (*Swida racemosa*) may be present. The herbaceous layer is also richer than in many oak forests. Plants typical of the herbaceous layer include silverrod (*Solidago bicolor*), tick-trefoils (*Desmodium glutinosum* and *D. paniculatum*), wild sarsaparilla (*Aralia nudicaulis*), rattlesnakeweed (*Hieracium venosum*), false Solomon's seal (*Maianthemum racemosum*), pink lady's slipper (*Cypripedium acaule*), and patches of long-beaked Pennsylvania sedge (*Carex lucorum*) or Pennsylvania sedge (*C. pensylvanica*).

Differentiating Occurrences: Oak - Hickory Forests are in the middle to moist end of a continuum of dry, acidic forests that are dominated by tree oaks. They are more diverse in all the forest layers than many oak forests/woodlands in the continuum. The canopies of Oak - Hickory Forests are generally closed or almost closed (averaging > 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. Hickory - Hop Hornbeam Forests/Woodlands have a park-like appearance, with a 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. Both lack abundant sugar maple, basswood, and white ash, and lack spring ephemerals and herbaceous species indicative of rich conditions found in Sugar Maple - Oak - Hickory Forests. 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 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 matrix 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).

Associated Fauna: There are no species known to be restricted to Oak - Hickory Forests. Wide-ranging species would include occurrences of this forest type as parts of their habitats, particularly when acorns are available. Wild Turkeys (*Meleagris gallopavo*) are found in primarily oak areas. Dry oak forests support a smaller mix of animal species than are found in moister communities. Common species of dry sites include short-tailed shrew (*Blarina brevicauda*), white-footed mouse (*Peromyscus leucopus*), and chipmunk (*Tamias striatus*). Snakes of dry forest sites include garter snakes (*Thamnophis sirtalis*) and redbelly snakes (*Storeria o. occipitomaculata*). Birds that nest in oak forests include Eastern Wood-Pewee (*Contopus virens*), Red-eyed Vireo (*Vireo olivaceus*), Scarlet Tanager (*Piranga olivacea*), and Ovenbird

(*Seiurus aurocapillus*). Moths, butterflies, and other insects of Oak - Hickory Forests include the orange sallow moth (*Pyrrhia aurantiago*, Special Concern).

Public Access: J.C. Phillips Sanctuary, Boxford; Wachusett Meadow Wildlife Sanctuary (Massachusetts Audubon Society), Princeton; Camels Hump, Quabbin Reservoir Watershed, Petersham; Palmer WMA, Palmer; Moose Hill Wildlife Sanctuary (Massachusetts Audubon Society), Sharon.

Threats: Invasive species, especially in richer areas. Many occurrences are remnants of formerly larger forests; further fragmentation would increase isolation.

Management Needs:

USNVC/NatureServe: A2053 *Quercus alba* - *Carya* spp. - *Fraxinus americana* Forest Alliance -- *Quercus* (*alba*, *rubra*, *velutina*) - *Carya* spp./*Viburnum acerifolium* Forest [CEGL006336]. Broadly includes (CEGL006301 in A2053) but that is more explicitly Dry, Rich Oak Forest and Hickory Hop Hornbeam (although the colloquial name is Oak-Hickory/Hop Hornbeam/Sedge Forest).

Oak – Tulip Tree Forest

Community Code: CT1B2C0000

State Rank: S1

Concept: A forest on gentle, moist, concave slopes (coves), or on well-drained flats at the base of the slopes. Soils are circumneutral to slightly acidic. One site is rocky.

Environmental Setting: Oak - Tulip Tree Forests are tall closed-canopy forests that occur from upper mid-slope to the bottom of moist, concave, north- or east-facing slopes. The forest grades into wetland forests on flats at the base of the slopes. Soils are moist and generally well-drained. They are circumneutral to acidic, with intermediate fertility. Some sites are very rocky. Leaf litter covers most of the ground with moss-covered rocks and a patchy diverse herbaceous layer.

Vegetation Description: Tulip trees (*Liriodendron tulipifera*) are emergent (over 100 ft.) above an already tall canopy dominated by red oak (*Quercus rubra*) with red and sugar maples (*Acer rubrum* and *saccharum*), black and yellow birches (*Betula lenta* and *alleghaniensis*), white and black oaks (*Quercus alba* and *velutina*), sassafras (*Sassafras albidum*), white ash (*Fraxinus americana*), and additional tulip trees. A subcanopy/tall shrub layer may include the same species with scattered white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), striped maple (*A. pensylvanicum*), and witch-hazel (*Hamamelis virginiana*). Witch-hazel is often the most dominant shrub with abundant maple-leaf viburnum (*Viburnum acerifolium*). Other sites have patches of mountain laurel (*Kalmia latifolia*) and beaked hazelnut (*Corylus cornuta*) in the shrub layer. The diverse herbaceous layer covers about a third of the ground, with leaf litter covering the rest. Common herbaceous species include small jack-in-the-pulpit (*Arisaema triphyllum*), false Solomon's seal (*Maianthemum racemosum*), ground pine (*Dendrolycopodium obscurum*), New York fern (*Parathelypteris noveboracensis*), Indian cucumber (*Medeola virginiana*), Christmas

fern (*Polystichum acrostichoides*), white wood-aster (*Eurybia divaricata*), wild oats (*Uvularia sessilifolia*), and two-leaved toothwort (*Cardamine diphylla*). Wetland species such as skunk cabbage (*Symplocarpus foetidus*), sweet pepperbush (*Clethra alnifolia*), and highbush blueberry (*Vaccinium corymbosum*) can become common towards the base of the slopes when the community grades into wetlands.

Differentiating Occurrences: The key feature that differentiates Oak - Tulip Tree Forests from other communities is the presence of multiple mature tulip trees (not just occasional individuals) with a strong dominance of red oak (>25%) in association with both northern and central hardwoods. Red Oak - Sugar Maple Transition Forest is very similar but lacks the tulip trees, and lacks a strong mix of species of northern areas (sugar, mountain, and striped maples and bluebead lily) combined with more southern or coastal species (called central hardwoods), such as tulip tree and sassafras. Other types of oak forest lack large populations of tulip trees and sugar maples.

Associated Fauna: All upland forest types provide valuable structural attributes such as tree cavity den sites (used by a variety of bird and mammal species) and large woody material (used by various amphibian, reptile, and invertebrate species). These small patch communities would constitute only parts of the habitats of many animals found in them. Acorns are important for wildlife including white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), grey squirrel (*Sciurus carolinensis*), and other small rodents. Birds include Wild Turkeys (*Meleagris gallopavo*) in areas with sufficiently large forests to provide all the habitat needs. Passerine birds of oak forests include Red-eyed Vireo (*Vireo olivaceus*), Ovenbird (*Seiurus aurocapillus*), Black-and-white Warbler (*Mniotilta varia*), Scarlet Tanager (*Piranga olivacea*), Great Crested Flycatcher (*Miarchus crinitus*), Downy Woodpecker (*Picoides pubescens*), Hairy Woodpecker (*P. villosus*), and Red-bellied Woodpecker (*Melanerpes carolinus*). Likely amphibians include northern redback salamanders (*Plethodon cinereus*) and spotted salamanders (*Ambystoma maculatum*). Ringneck snake (*Diadophis punctatus*) and redbelly snake (*Storeria occipitomaculata*) would be expected.

Public Access: Robinson State Park, Agawam; Douglas State Forest, Douglas.

Threats: Major threat is invasive plants, particularly *Berberis thunbergii*. Exotic species, including *Rosa multiflora* and *Alliaria petiolata*, may be present in the shrub and herb layers of disturbed stands.

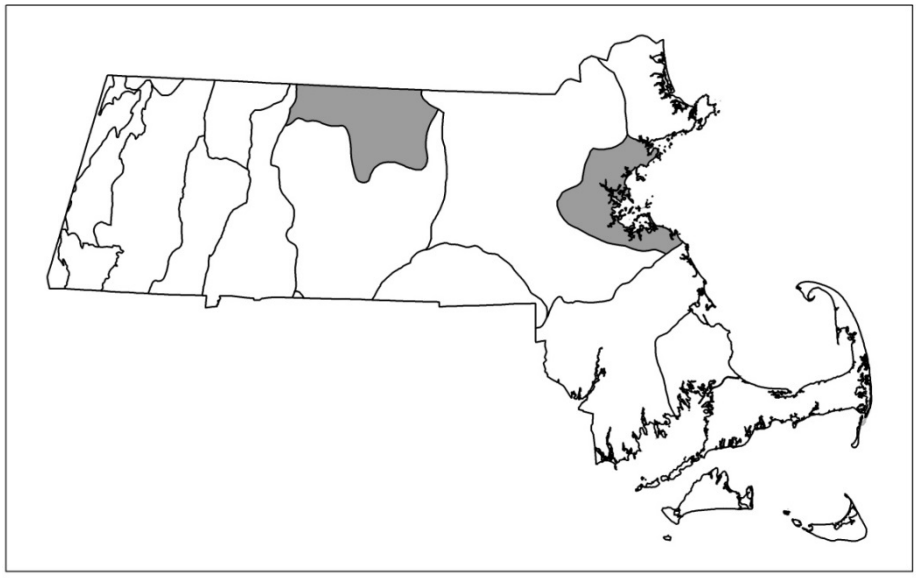
Management Needs:

USNVC/NatureServe: A3303 *Quercus rubra* - *Acer saccharum* - *Betula lenta* Forest Alliance High Allegheny Rich Red Oak - Sugar Maple Forest [CEGL006125]; A2054 *Fagus grandifolia* - *Quercus rubra*/*Cornus florida* Forest Alliance.

Open Oak Forest/Woodland

Community Code: CT1A3D0000

State Rank: S3



Concept: Open Oak Forests/Woodlands are savanna or park-like communities on mountain slopes, with short trees scattered over a grassy or low shrub understory around small rock outcrops. They often occur between a rocky summit and the surrounding taller forest.

Environmental Setting: Open Oak Forests/Woodlands are short (commonly <10m (~30 ft.), but up to <20m (~60 ft.) tall) oak/heath communities with interrupted or parklike tree canopies (commonly ~ 37%, but up to ~60% cover). These savanna-like areas are on slopes or near the summit of mountains with rock outcrops. The open oak area may include small areas of rocky summit or rock outcrop, which if larger (>~5000 sq. ft.) would be identified as separate community occurrences. Although often associated with rocky summit/rock outcrop communities, Open Oak Forests/Woodlands seem to need gradual rather than steep slopes below the summits. Soils are very shallow to bedrock. Surrounding landscape is forested. Fire may be important to maintaining the community; some sites have abundant charcoal, charred wood, and charring on the bases of sprouting oaks.

Vegetation Description: The short, interrupted canopies of Open Oak Forests/Woodlands are dominated by red oak (*Quercus rubra*), with a lower cover of white oak (*Q. alba*) and red maple (*Acer rubrum*). Many of the trees are multiple-stemmed. A sparse (<25% cover) subcanopy (<5m, < ~18 ft.)) has hop hornbeam (*Ostrya virginiana*) and striped maple (*A. pensylvanicum*). A slightly shorter tall shrub layer of approximately 30% cover is dominated by striped maple, red and white oaks, and maple-leaf viburnum (*Viburnum acerifolium*). A denser low shrub layer has patches of huckleberry (*Gaylussacia baccata*), chokeberry (*Aronia melanocarpa*), mountain laurel (*Kalmia*

latifolia), and early sweet lowbush blueberry (*Vaccinium pallidum*) with other scattered woody species. The herbaceous layer is continuous, except on the rock outcrops, with patches of different dominants. Lowbush blueberry (*Vaccinium angustifolium*) dominates (approx. 67% in patches) and seedlings of forest trees (oaks, maple, hemlock) with grasses and sedges, forbs, ferns, and mosses make up the rest of the layer. Common hairgrass (*Deschampsia flexuosa*) is common in the balds and in the Open Oak Forest/Woodland. Other species include pale corydalis (*Capnoides sempervirens)*, early goldenrod (*Solidago juncea*), spreading ricegrass (*Oryzopsis asperifolia*), fringed bindweed (*Fallopia cilinodis*), running shadbush (*Amelanchier spicata*), downy goldenrod (*Solidago puberula*), and wild columbine (*Aquilegia canadensis*).

Differentiating Occurrences: 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. Open Oak Forests/Woodlands occur on hill slopes, with short red and white oak trees scattered over a grassy or low shrub understory around small rock outcrops. They often occur between a rocky summit and the surrounding taller forest. Black Oak - Scarlet Oak Forest/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 Forest/Woodlands (black, scarlet, and white, plus red oak (*Q. rubra*) and chestnut oak (*Q. montana*)), and black birch (*Betula lenta*). 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).

Associated Fauna: Open Oak Forest/Woodlands are small patch communities of transition areas that would constitute only parts of the habitats of most animals found in them. Acorns are important foods for white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), grey squirrels (*Sciurus carolinensis*), other small rodents, as well as Wild Turkeys (*Meleagris gallopavo*) and other birds. The understory of blueberries and huckleberries is used by many of these same species. Passerine birds of oak forests include Red-eyed Vireo (*Vireo olivaceus*), White-breasted Nuthatch (*Sitta carolinensis*), Ovenbird (*Seiurus aurocapillus*), Black-and-white Warbler (*Mniotilta varia*), Scarlet Tanager (*Piranga olivacea*), Great Crested Flycatcher (*Miarchus crinitus*), and Downy Woodpecker (*Picoides pubescens*). Small mammals would include those of dry habitats, such as white-footed mouse

(*Peromyscus leucopus*) and short-tailed shrew (*Blarina brevicauda*). Snakes would be those of dry areas, such as black racer (*Coluber constrictor*), ringneck (*Diadophis punctatus*), and redbelly snake (*Storeria occipitomaculata*). No turtles, frogs, or toads would be expected.

Public Access: Little Watatic Mt., Ashburnham State Forest, Ashburnham; Wright's Pond, Middlesex Fells, Medford.

Threats: Trampling (Great Blue Hills and Watatic Mtn.). The Palmer site has invading white pine.

Management Needs:

USNVC/NatureServe: Related to but not the same as: CEGL006134 is Chestnut Oak and but CEGL006018 is closed canopy mixed oak forest: A0624 *Quercus rubra* - *Quercus prinus* Woodland Alliance - *Quercus rubra* - (*Quercus prinus*)/*Vaccinium* spp./*Deschampsia flexuosa* Woodland (CEGL006134); A2048 *Quercus velutina* - *Quercus alba* Eastern Forest Alliance - *Quercus* (*velutina*, *alba*)/*Vaccinium pallidum*/*Pteridium aquilinum* High Allegheny Plateau, Western Allegheny Plateau Forest [CEGL006018].

Open Talus/Coarse Boulder Community

Community Code: CT2A2D0000

State Rank: S2

Concept: Sparsely vegetated community of vines and scattered herbaceous plants on exposed moss- or lichen-covered boulders, with deciduous litter in crevices and little to no tree canopy.

Environmental Setting: Open Talus/Coarse Boulder Communities are usually below cliffs or rock outcrops or in boulder fields left by glaciers. Sparse vines and scattered herbaceous plants grow in dry, shallow soil or from moist, loamy, deciduous-litter-filled crevices among moss- or lichen-covered boulders. The Open Talus/Coarse Boulder Community may be replaced lower on the slope by a forest or woodland type, if tree canopy cover is greater than 25%. There may be a gradient from short, sparse vegetation on exposed rocks at the top of the talus slope, through scattered, clumped, somewhat dwarfed trees and tall shrubs, to forest at the base of the slope. Open talus occurs in Massachusetts where there are bedrock outcrops high enough to break off and fall to create talus slopes.

Vegetation Description: In unshaded, open talus communities, lichens often cover the exposed rocks. Growing from between rocks, rock polypody (*Polypodium virginianum*), Virginia creeper (*Parthenocissus quinquefolia*), poison ivy (*Toxicodendron radicans*), and occasionally fringed bindweed (*Fallopia cilinodis*) contribute to the herbaceous and vine flora which can be quite sparse. Clematis (*Clematis* spp.), climbing fumitory (*Adlumia fungosa*), marginal wood fern (*Dryopteris marginalis*), and pink corydalis (*Capnoides sempervirens*) may be present, particularly when the talus is formed by less acidic rocks. Raspberries (*Rubus* spp.) and grapes vines (*Vitis* spp.) are sometimes abundant. The plants of talus slopes reflect the regional vegetation where they occur.

Differentiating Occurrences: Rocky summits, rock outcrops, rock cliffs, and talus 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. Acidic, Circumneutral, and Calcareous Rock Cliff Communities are on vertical to near vertical (~60% slope), with sparse vegetation that is similar to the vegetation of Open Talus/Coarse Boulder Communities. 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 also have bare rock and could be confused with Open Talus/Coarse Boulder Communities which have broken rock rather than the smoother bedrock of outcrops. Small (<5000 sq. ft.) 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. Or 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 variation within it.

Associated Fauna: Most animals respond to the size of boulders, cover, moisture, and surroundings of the talus slope. Porcupines (*Erethizon dorsatum*) den in large boulder fields and turkey vultures (*Cathartes aura*) make nests in other large boulder fields, but snakes, for example, north American racer (*Coluber constrictor*), eastern milk snake (*Heterodon platirhinos*), eastern ratsnake (*Pantherophis alleghaniensis*) and timber rattlesnakes (*Crotalus horridus*), hibernate in dens in talus with smaller stones. For many animals associated with talus slopes, the talus is just part of their larger habitat that includes adjacent rock habitats and surrounding forests; the animals may move among them over the course of a day, a season, or a year. Songbirds of talus slopes tend to be those of the surrounding forests.

Public Access: Palmer WMA, Palmer; Blue Hills State Reservation, Milton.

Threats: Invasives including Oriental bittersweet (*Celastrus orbiculatus*) and black nightshade (*Solanum dulcamara*). Alteration of surrounding areas, such as by development, would fragment and reduce the overall habitat available for those species for which talus is only part of their habitats. Several of the species of talus slopes, such as some of the snakes, do best away from humans. Protecting areas around the talus slopes that provide their habitat is the best way to protect them and the other species that depend on these habitats.

Management Needs: The calcium enrichment and moistness of the lower areas of the circumneutral and calcareous talus slopes attract invasive exotic species as well as the native species. Because invasive exotic species often enter a natural community after some form of disturbance, restricting human-derived disturbances would help keep invasive species out. However, since natural disturbances are part of the normal processes in talus, the best occurrences need to be monitored for invasive species. They should be controlled and removed where practical. Although acidic talus is much less attractive to invasive species than the richer areas, excellent occurrences should also be monitored.

USNVC/NatureServe: *Polypodium* (*virginianum*, *appalachianum*)/Lichen spp. Nonvascular Vegetation (CEGL006534); System: Laurentian-Acadian Acidic Cliff and Talus (CES201.569). Possibly *Quercus rubra - Betula lenta*/*Polypodium virginianum* Woodland CEGL006585 which is <50% canopy with large acidic talus boulders (but includes circumneutral species).

Pitch Pine – Oak Forest/Woodland

Community Code: CT1A200000

State Rank: S4

Concept: Dry oak/pine forests and woodlands of moraines, till, outwash, southerly exposures, and rocky slopes. Matrix forest of southeastern Massachusetts. The proportions of different species are variable, and range from predominantly pine with scattered oaks to predominantly oak with scattered pines. The structure ranges from open canopy with a thick understory, to closed canopy with scattered clumps of shrubs.

Environmental Setting: Pitch Pine - Oak Forests/Woodlands occur on dry, low-nutrient, acidic soils of southerly exposures, moraines, rocky slopes, and sandplains with only sporadic disturbances, inland away from regular oceanic influences. In southeastern Massachusetts, Pitch Pine - Oak Forests/Woodlands often form a matrix community surrounding and mixed with smaller patch Pitch Pine - Scrub Oak communities, coastal plain ponds, and Sandplain Grasslands and Heathlands. Near the ocean, Pitch Pine - Oak Forests/Woodlands grade into Coastal Forests/Woodlands. The forest structure ranges from open canopy with a dense understory to closed canopy with scattered clumps of shrubs. Without fire or other disturbances that favor pitch pines and oaks, the community succeeds to less fire-tolerant species. The time since disturbance is also a factor in the proportion of pitch pine to oaks, and which oak species are present and abundant.

Vegetation Description: Pitch Pine - Oak Forests/Woodlands have a canopy of pitch pine (*Pinus rigida*) and tree oaks (black (*Quercus velutina*), scarlet (*Q. coccinea*), chestnut (*Q. montana*), and white (*Q. alba*)). The proportions of canopy species differ among sites, ranging from predominantly pine with scattered oaks to predominantly oak with scattered pines (>25% cover). White pine (*Pinus strobus*) and red maple (*Acer rubrum*) are occasional in the canopy, increasing with time since the last fire or other

disturbance. Scattered patches of scrub oak (*Quercus ilicifolia*) and dwarf chinquapin oak (*Q. prinoides*) can be dense. Blueberries (*Vaccinium angustifolium* and *V. pallidum*), black huckleberry (*Gaylussacia baccata*), and other ericaceous shrubs form an often continuous low shrub layer. Catbrier and other briers (*Smilax rotundifolia* and *Smilax* spp.) often make dense barriers around low, damp openings. The herb layer is generally sparse, with bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), wintergreen (*Gaultheria procumbens*), Pennsylvania sedge (*Carex pensylvanica*), and, less commonly, pink lady's-slipper (*Cypripedium acaule*).

Differentiating Occurrences: Pitch Pine - Oak Forest/Woodland is part of a continuum of dry, acidic communities dominated by a variety of tree oak and pine species. Related communities often mix on the ground, with successional stages present that are strongly influenced by historic and recent disturbances, with topography, soils, and local climate controlling the broader vegetation types. Pitch Pine - Oak Forest/Woodland has >25% pitch pine in the canopy, growing with tree oaks, producing a canopy of >40% cover. 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. 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 it may include some pitch pine and many oaks with other trees.

Associated Fauna: Pitch Pine - Oak Forest/Woodland provides habitat for many common and listed moths dependent on the oaks, pine, and heath shrubs. Box turtles (*Terrapene carolina*) use these forests as well as others in the southeastern part of the state. The bird fauna is similar that of oak woodlands; Rufous -sided Towhee (*Pipilo erythrophthalmus*), Pine Warbler (*Dendroica pinus*), and Ruffed Grouse (*Bonasa umbellus*) are common. Most common species of mammals of Massachusetts have populations that make Pitch Pine – Oak Forests part of their habitat but none are particularly characteristic.

Public Access: Myles Standish State Forest, Plymouth; Hyannis Ponds WMA, Barnstable; Francis Crane WMA, Falmouth; Montague Plains WMA, Montague; Mt. Everett State Reservation, Mt. Washington.

Threats: Many acres have been lost resulting in fragmentation of occurrences. Fire exclusion is changing the character of the community, allowing less fire-tolerant species to establish, which sometimes results in more severe fires when they do occur.

Management Needs: Reintroduction of fire with prescribed fire in manageable conservation areas.

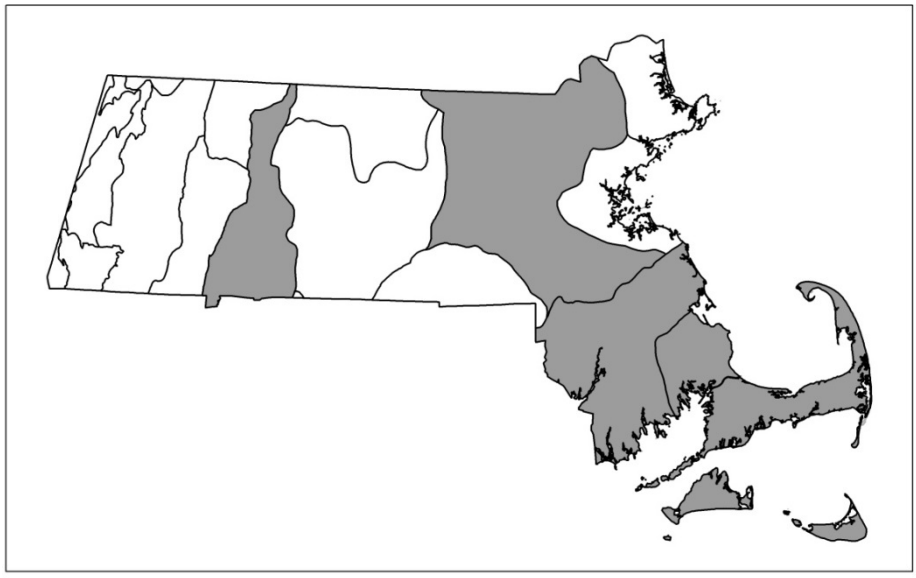
USNVC/NatureServe: A0524, *Pinus rigida* Woodland Alliance, *Pinus rigida*/*Vaccinium* spp. - *Gaylussacia baccata* Woodland, [CEGL005046]; *Pinus rigida*/*Quercus ilicifolia*/*Lespedeza capitata* Woodland [CEGL006025]; *Pinus rigida*/*Carex pensylvanica* Woodland

[CEGL006385]. A4209 *Quercus velutina - Quercus falcata - Pinus rigida* Coastal Plain Forest Alliance-- *Pinus rigida - Quercus* (*velutina*, *prinus*) Forest [CEGL006290].

Pitch Pine – Scrub Oak Community

Community Code: CT2B1F0000

State Rank: S2



Concept: Shrub-dominated communities with scattered to dense trees and scattered openings. Shrubs are usually very dense.

Environmental Setting: Pitch Pine - Scrub Oak Communities are dominated by dense shrubs with scattered to patchily dense trees and occasional openings. They occur on droughty, acidic, low-nutrient soils, usually deep, coarse, well-drained sands derived from glacial outwash, in the coastal plain, the Connecticut River Valley, and other scattered areas throughout the state. Pitch Pine - Scrub Oak Communities are fire-maintained and fire-dependent communities; most species in the community recover well from fire. Prescribed burns that remove accumulated dead needles and leaves on a regular basis help maintain the natural community and reduce the danger from wildfires. The community succeeds to Pitch Pine - Oak Forests/Woodlands without fire or other site disturbances. The openings grade into Sandplain Heathland and Grassland communities, which are separated out as distinct community occurrences when larger than about an acre. In pitted outwash plains or rolling moraines, some low bowls, or kettles, are frost pockets that have more heath and lichen and less oak and pine. Deeper kettles that intersect the water table may have a coastal plain pond or a small peatland.

Vegetation Description: Pitch Pine - Scrub Oak Communities are not very diverse floristically; the combination of few species plus the physical structure of the vegetation is characteristic of the natural community. Scattered (to patchily dense) pitch pine (*Pinus rigida*) trees form an open canopy (from about 10% to about 25%, although there can be denser patches). This canopy is over an often continuous understory of scrub oak (*Quercus ilicifolia*) and dwarf chinquapin oak (*Q. prinoides*) 2-4 meters

(7-15 feet) tall, with shorter huckleberry (*Gaylussacia baccata*) about a meter (3 feet) tall in a mosaic with lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*), bearberry (*Arctostaphylos uva-ursi*), and large patches of lichens, intermixed with sedges (primarily *Carex pensylvanica* with others) or little bluestem (*Schizachyrium scoparium*) in openings between the taller shrubs. Other species regularly occurring in low numbers include golden heather (*Hudsonia ericoides*), cow wheat (*Melampyrum lineare*), and mayflower (*Epigaea repens*). Inland occurrences of Pitch Pine - Scrub Oak Communities have successional areas with trembling aspen (*Populus tremuloides*), gray birch (*Betula populifolia*), black cherry (*Prunus serotina*), and pin (or fire) cherry (*Prunus pensylvanica*). Areas with tree oaks or more than 40% canopy cover by pitch or white pine trees are considered to be woodland or forest.

Differentiating Occurrences: The Pitch Pine - Scrub Oak Community grades into Pitch Pine - Oak Forest/Woodlands, which have >40% canopy and tree oaks that do not occur in the Pitch Pine - Scrub Oak Community. Scrub oak is much less abundant and less dense in the forest/woodland situation, which usually occur in less dry environments and have more soil development. Maritime Pitch Pine Woodlands on Dunes have little scrub oak and generally much sparser pines. Ridgetop Pitch Pine - Scrub Oak Communities are on bedrock outcrops, often ridges. In order to name and map Scrub Oak Shrublands, Sandplain Heathlands, and/or Sandplain Grasslands included in a Pitch Pine - Scrub Oak Community, those would need to occupy significant area or topographic differences where they are distinct (large frost pockets for example).

Associated Fauna: Many species of lepidopterans are restricted to the Pitch Pine - Scrub Oak Community and its openings. The bird fauna is generally that of oak woodlands; Rufous-sided Towhee (*Pipilo erythrophthalmus*), Pine Warbler (*Dendroica pinus*), and Ruffed Grouse (*Bonasa umbellus*) are common. At one Pitch Pine - Scrub Oak Community site, Prairie Warblers (*Setophaga discolor*) were very abundant, with their densest populations in the state. Whip-poor-will (*Caprimulgus vociferus*) and Common Nighthawk (*Chordeiles minor*) are now increasingly restricted to sandy openings of Pitch Pine - Scrub Oak Communities. American Woodcock (*Philohela minor*) also use the openings. Heath hens (*Tympanuchus cupido cupido*), a now extinct subspecies of prairie chicken, were adapted to scrub oak communities: they ate scrub oak acorns and berries in the openings, and used scrub oak for cover. Exclusion of fire followed by very large, hot fires in their habitat likely contributed to their extinction. The dense shrubs of Pitch Pine - Scrub Oak Communities in southeastern Massachusetts provide habitat for New England cottontail (*Sylvilagus transitionalis*). A variety of mice and voles use the scrub oak for cover and feed where they find acorns or berries. Larger mammals seem to prefer woodlands where they can move more easily.

Public Access: Myles Standish State Forest, Plymouth; Mashpee Pine Barrens WMA, Mashpee; Manuel F. Correllus State Forest, West Tisbury; Montague Plains WMA, Montague.

Threats: Development and fragmentation; succession from fire exclusion.

Management Needs: Reintroduction of fire according to fire management plans. Many areas that have not burned for more than 20 years may need to have fuels mechanically reduced (logging or brushcutting) before prescribed fires are attempted.

USNVC/NatureServe: Includes: *Pinus rigida* Woodlands Alliance -- *Pinus rigida*/*Quercus ilicifolia*/*Lespedeza capitata* Woodlands [CEGL006025] and *Pinus rigida* Woodlands Alliance -- *Pinus rigida*/*Quercus ilicifolia*/*Morella pensylvanica* Woodlands [CEGL006315].

Red Oak – Sugar Maple Transition Forest

Community Code: CT1B300000

State Rank: S4

Concept: Forests with species of northern hardwoods (maples) and a smaller proportion of central hardwoods (oaks) together. Has few of the extreme northern or southern indicators.

Environmental Setting: Red Oak - Sugar Maple Transition Forests are tall forests with closed, predominantly deciduous canopies, with conifers usually providing <20% of the cover. Lower layers have variable density, often with scattered individual trees and shrubs; the herbaceous layer is typically sparse. Red Oak - Sugar Maple Transition Forests are often on north- to northeast-facing, well-drained to moist slopes. The soils are often rocky, somewhat acidic, and of intermediate fertility. Most occurrences are at low to mid-elevations, usually under 475m (~1560 ft.).

Vegetation Description: Red Oak - Sugar Maple Transition Forests have a closed (>75% cover) canopy dominated by (>~25% cover) of northern red oak (*Quercus rubra*) with sugar maple (*Acer saccharum*), and variable proportions of beech (*Fagus grandifolia*), black birch (*Betula lenta*), and <20% conifers (white pine (*Pinus strobus*) and hemlock (*Tsuga canadensis*)). White and black oaks (*Quercus alba* and *Q. velutina*), red maple (*Acer rubrum*), white ash (*Fraxinus americana*), and yellow birch (*B. alleghaniensis*) are regular minor associates. Shrubs are usually sparse; typical species include striped maple (*Acer pensylvanicum*), maple-leaved viburnum (*Viburnum acerifolium*), beaked hazelnut (*Corylus cornuta*), mountain laurel (*Kalmia latifolia*), and witch hazel (*Hamamelis virginiana*). The herbaceous layer is often patchy and dominated by ferns such as intermediate wood fern (*Dryopteris intermedia*), Christmas fern (*Polystichum acrostichoides*), hay-scented fern (*Dennstaedtia punctilobula*), and clubmosses (*Lycopodium clavatum* and *Dendrolycopodium obscurum*). Typical forest

species may be present, including wild sarsaparilla (*Aralia nudicaulis*), Indian cucumber (*Medeola virginiana*), Canada mayflower (*Maianthemum canadense*), and whorled wood-aster (*Oclemena acuminata*), with broad-leaved woodland-sedge (*Carex platyphylla*) in the less acidic sites.

Differentiating Occurrences: Red Oak - Sugar Maple Transition Forest is differentiated from Northern Hardwood - Hemlock - White Pine Forest by its greater amount of oak, and from Oak - Hemlock - White Pine and other oak forests by its greater prominence of northern hardwoods and lack of widespread blueberry family shrubs. Like Rich, Mesic Forest, Red Oak - Sugar Maple Transition Forest is usually in Northern Hardwood - Hemlock - White Pine Forest or the transition between Northern Hardwood - Hemlock - White Pine Forest and the oak-dominated forests to the south. Rich, Mesic Forest lacks oaks and beech, and the occasional conifers that are important in Red Oak - Sugar Maple Transition Forests. The understory of Rich, Mesic Forest has dense spring ephemerals and lacks the abundant evergreen wood fern, Christmas fern, and wild sarsaparilla found in Red Oak - Sugar Maple Transition Forests, which may have scattered spring ephemerals. Sugar Maple - Oak - Hickory Forest includes multiple species of hickories and oaks in more abundance than occur in Red Oak - Sugar Maple Transition Forests. They tend to occur to the south and east in the state, but overlap with the distribution of Red Oak - Sugar Maple Transition Forests. 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 Forest, with undecomposed oak leaves covering the forest floor.

Associated Fauna: This widespread forest type provides habitat to many, particularly opportunistic, animal species. All upland forest types provide valuable structural attributes such as tree cavity den sites (used by a variety of bird and mammal species) and large woody material (used by various amphibian, reptile, and invertebrate species). Large mammals include Red Oak - Sugar Maple Transition Forest as parts of their habitat, but are usually more dependent on size of undisturbed forest than on the precise type. White-tailed deer (*Odocoileus virginianus*) are classic users of this forest type, although certainly not limited to it. Fisher (*Martes pennanti*) use larger, older examples. Most of the widespread small mammals would be expected in larger occurrences of the community. Frogs and salamanders breed in vernal pools and other wetlands and use the surrounding uplands in the rest of the year.

Public Access: South Mountain, Berkshire Natural Resources Council, Pittsfield; Monroe State Forest, Monroe.

Threats: Invasive species occur in less acidic sites with more nutrient availability.

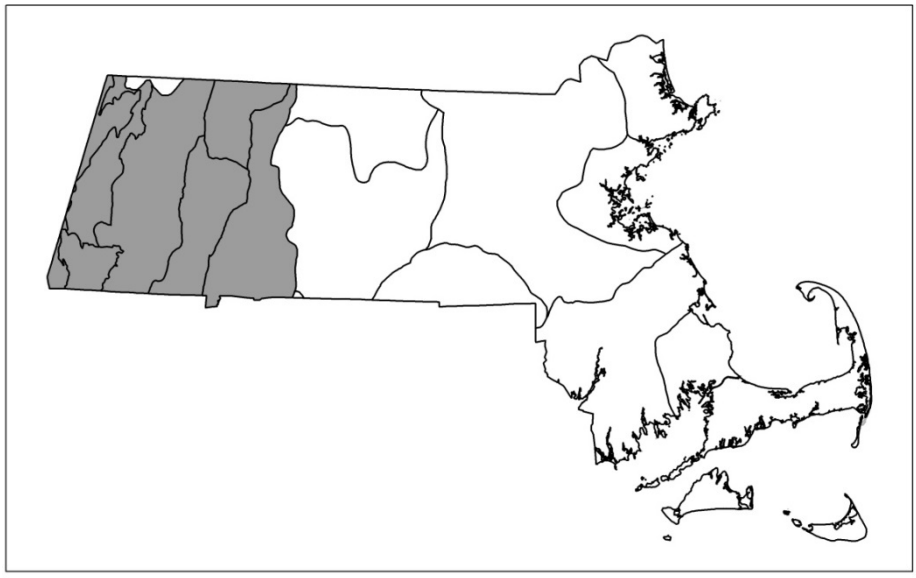
Management Needs: Some occurrences, especially with abundant white pine, are old-field successional, and others have been managed as woodlots and were selectively cut in the past, or may continue to be logged to the present. The understory reflects the history of the sites.

USNVC/NatureServe: A3241 *Quercus rubra - Acer saccharum* Forest Alliance - *Betula alleghaniensis - Quercus rubra/Polypodium virginianum* Woodland [CEGL006584]; *Quercus rubra - Acer saccharum - Fagus grandifolia/Viburnum acerifolium* Forest [CEGL006633]; A3297 *Acer saccharum - Tilia americana* Limestone Woodland Alliance - *Acer saccharum - Tilia americana - Fraxinus americana/Ostrya virginiana/Geranium robertianum* Woodland [CEGL005058](more northern than SMOHF, less rich than RMF); A3303 *Quercus rubra - Acer saccharum - Betula lenta* Forest Alliance - *Quercus rubra - Betula alleghaniensis/Osmunda cinnamomea* Forest -- *Quercus rubra - Betula alleghaniensis/Osmunda cinnamomea* Forest [CEGL006000]; *Quercus rubra - Acer saccharum* - (*Q. alba*) Forest Alliance -- *Acer saccharum - Quercus rubra/Hepatica nobilis* var. *obtusa* Forest [CEGL006046]; *Quercus rubra - Acer saccharum/Viburnum acerifolium - Lindera benzoin* Forest [CEGL006635].

Rich, Mesic Forest

Community Code: CT1C2A0000

State Rank: S3



Concept: A variant of the northern hardwood forest where sugar maple is usually dominant and there is a diverse herbaceous layer with abundant spring ephemerals, in a moist, nutrient-rich environment.

Environmental Setting: Occurring in western Massachusetts, Rich, Mesic Forests are restricted to elevations below 2,400 ft. (about 650 m), usually on east- or southeast-facing, concave, mid- to lower slopes with downslope movement of nutrients and organic matter. Rich refers to rich in nutrients; they are also rich in species. Mesic is the moderate moisture regime. Soils are usually deep, with leaves and other plant litter quickly incorporated into the soil, so that there is rarely more than one year's accumulation of leaves on the forest floor. The dominant trees of Rich, Mesic Forests are very shade-tolerant and able to establish and grow under low-light conditions of a full canopy. Species of lower layers are also shade-tolerant and can make use of transient light patches from small canopy gaps. Rich, Mesic Forests are noted for having abundant herbaceous species: spring ephemerals (plants that flower before tree leaf out and have foliage that disappears in late spring) are characteristic, along with slightly later bloomers that keep their leaves into summer and others that flower later.

Vegetation Description: Rich, Mesic Forests are dominated by sugar maple (*Acer saccharum*), with white ash (*Fraxinus americana*), bitternut hickory (*Carya cordiformis*), elm species (*Ulmus* spp.), and basswood (*Tilia americana*) being other characteristic trees. Butternut (*Juglans cinerea*) usually grows in Rich, Mesic Forests but is infrequent. Hop hornbeam (*Ostrya virginiana*) is common as a subcanopy tree. Although the shrub layer is usually sparse, pagoda dogwood (*Swida alternifolia*), leatherwood (*Dirca*

palustris), or red-berried elderberry (*Sambucus racemosa*) may be present. Typically, spring ephemerals are very abundant. The dense herbaceous layer typically has combinations of species that include some of bloodroot (*Sanguinaria canadensis*), maidenhair fern (*Adiantum pedatum*), late blue cohosh (*Caulophyllum thalictroides*), sweet cicely (*Osmorhiza claytonii*), Dutchman's breeches (*Dicentra cucullaria*), squirrel corn (*Dicentra canadensis*), toothwort (*Cardamine diphylla*), wild leek (*Allium tricoccum*), Goldie's fern (*Dryopteris goldiana*), and zigzag goldenrod (*Solidago flexicaulis*). A semi-evergreen fairly distinct sedge, plantain-leaf sedge (*Carex plantaginea*), is a good indicator of the community that is visible throughout the year.

Differentiating Occurrences: 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 (*Fagus grandifolia*), and oaks (*Quercus* spp.). The understory has dense spring ephemerals and lacks abundant evergreen wood fern (*Dryopteris intermedia*) and wild sarsaparilla (*Aralia nudicaulis*), both usually found in Northern Hardwood - Hemlock - White Pine Forest. Dense populations of late blue cohosh (*Caulophyllum thalictroides*), Virginia waterleaf (*Hydrophyllum virginianum*), or wild leek (*Allium tricoccum*) usually indicate Rich, Mesic Forests. The Northern Hardwood - Hemlock - White Pine Forest canopy includes eastern hemlock (*Tsuga canadensis*), white pine (*Pinus strobus*), American beech, and red oak (*Quercus rubra*). Rich Northern Hardwood - Hemlock - White Pine Forest may have scattered spring ephemerals, but also early yellow violet (*Viola rotundifolia*) and broad-leaved spring beauty (*Claytonia caroliniana*) 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 (*Betula lenta*). Spring ephemerals are not abundant. Geography is basic to differentiating Sugar Maple - Oak - Hickory Forest from Rich, Mesic Forest: most occurrences of Rich, Mesic Forests in Massachusetts are west of the Connecticut River Valley. The presence of multiple species of hickories (*Carya* spp.) and oaks (*Quercus* spp.) in Sugar Maple - Oak - Hickory Forest is a main difference between these two types. Broad-leaved woodland-sedge (*Carex platyphylla*) is close to being an indicator of Sugar Maple - Oak - Hickory Forest. Rich, Mesic Forest has plantain-leaf sedge (*Carex plantaginea*) 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 Rich, Mesic Forest lacks.

Associated Fauna: All of the upland forest types provide valuable structural attributes such as tree cavity den sites (used by a variety of bird and mammal species) and large woody material (used by various amphibian, reptile, and invertebrate species). Very few animal species are strongly associated with Rich, Mesic Forests to the exclusion of other community types. Birds of forests that breed in Rich, Mesic Forests include Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Black-and-white Warbler (*Mniotilta varia*), Ovenbird (*Seiurus aurocapillus*), Louisiana Waterthrush

(*Parkesia motacilla*), Scarlet Tanager (*Piranga rubra*), and Barred Owls (*Strix varia*). Species that breed in vernal pools, such as mole salamanders (*Ambystoma* spp.), are often found in Rich, Mesic Forest. They use the surrounding Rich, Mesic Forest for foraging and hibernation. Most of the small mammals of forests occur in Rich, Mesic Forests, although some are limited to their geographical distribution. Southern flying squirrels (*Glaucomys volans*), grey squirrels (*Sciurus carolinensis*), woodland jumping mouse (*Napaeozapus insignis*), masked shrew (*Sorex cinereus*), and red-backed vole (*Clethrionomys gapperi*) are among the widespread species whose habitat includes Rich, Mesic Forests. Large mammals include Rich, Mesic Forests as parts of their habitat, but are usually more dependent on size of undisturbed forest than on the precise forest type.

Public Access: Day Mountain WMA, Dalton; Maple Hill WMA, West Stockbridge; The Hopper, Mt. Greylock State Reservation, Williamstown; Knightville Dam and Reservation (US Army Corps of Engineers), Huntington; Hiram H. Fox WMAs, Huntington; Appalachian Trail, Tyringham.

Threats: Invasive exotics do very well in the nutrient-rich, mesic conditions associated with these forests. Fragmentation and isolation can be problems for the species of the community.

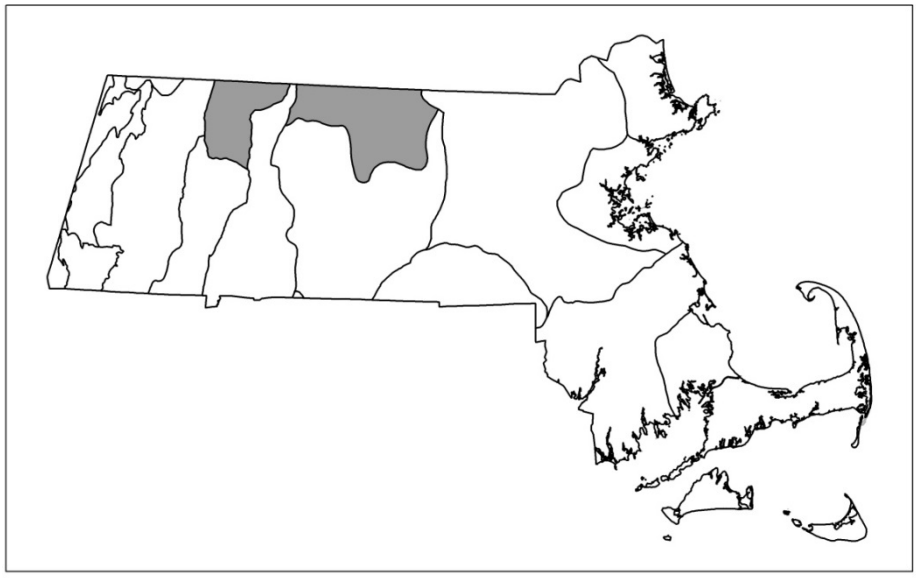
Management Needs: Control of exotics in exemplary sites.

USNVC/NatureServe: A3301 *Acer saccharum - Fagus grandifolia - Tilia americana* Forest Alliance - *Acer saccharum - Tilia americana/Acer pensylvanicum/Caulophyllum thalictroides* Forest [CEGL006637]; A3240 *Acer saccharum – Tilia americana - Fraxinus americana* Forest Alliance *Acer saccharum - Fraxinus americana/Acer spicatum/Caulophyllum thalictroides* Forest [CEGL006636]; A4126 *Acer saccharum - Tilia americana - Quercus rubra* Rocky Forest Alliance - *Acer saccharum- Fraxinus americana- Juglans cinerea/Staphylea trifolia* Forest [CEGL006577].

Ridgetop Heathland

Community Code: CT2B2B2000

State Rank: S2



Concept: A natural or semi-natural low shrub community on bedrock that often needs management to remain open in the absence of fire. The tree canopy is absent or poorly developed. Includes but is not restricted to abandoned lowbush blueberry farms.

Environmental Setting: Ridgetop Heathlands are shrublands of hills, ridgetops, and rock outcrops, sometimes instead of Acidic or Circumneutral Rocky Summits / Rock Outcrops or just below them. The exposed ridgetop environment is harsh, with intense sunlight, extreme daily and seasonal temperature variations, and bedrock at or close to the surface, resulting in nutrient-poor, droughty soils. They have a nearly continuous layer of low-growing shrubs. Some occurrences are derived from abandoned blueberry farms or grazed sites. If less than about 5000 sq. ft., an occurrence would be considered to be part of the surrounding rocky summit/rock outcrop, Ridgetop Pitch Pine - Scrub Oak Community, or Open Oak Forest/Woodland community. Without regular disturbance or management (fire or regular removal of trees), the community usually succeeds to woodland or forest, leaving mosaics of patchy occurrences along rocky ridges.

Vegetation Description: Overall, diversity is low, with heath shrubs forming an extensive, dense, low shrub layer dominated by low sweet blueberry (*Vaccinium angustifolium*) with early sweet blueberry (*Vaccinium pallidum*), black huckleberry (*Gaylussacia baccata*), bearberry (*Arctostaphylos uva-ursi*), and/or sheep-laurel (*Kalmia angustifolia*). Patches of taller shrubs may include black chokeberry (*Aronia melanocarpa*), mountain-laurel (*Kalmia latifolia*) and tree saplings from the surrounding forest, particularly white pine (*Pinus strobus*), gray or white birch (*Betula populifolia* or *B. papyrifera*), or red

maple (*Acer rubrum*). Little bluestem (*Schizachyrium scoparium*), poverty grass (*Danthonia spicata*) and hairgrass (*Deschampsia flexuosa*) typically occur in the sparse herbaceous layer. Three-toothed cinquefoil (*Sibbaldiopsis tridentata*) may be a characteristic species of northern occurrences.

Differentiating Occurrences: Ridgetop Heathlands occur on bedrock, often as semi-natural expansions of edges of rocky summit/rock outcrop communities. Identifying community types on rock outcrops is complicated by interdigitation of types and overlap of constituent species. If a community occupies a cumulative area of >5000 sq. ft. 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. Ridgetop Heathlands have large areas dominated by a fairly continuous cover (>50%) of low shrubs (often lowbush blueberry) and little exposed bedrock. Mosses, lichens, and grasses are present but not dominant. Rocky summit/rock outcrop communities are dominated by bare or lichen-covered rock. Ridgetop Pitch Pine - Scrub Oak Communities have scattered stunted pitch pine and dense scrub oak, and usually little bare rock. Shrub oaks and pitch pines need to be abundant, with tree oaks lacking, for the community to be pitch pine - scrub oak. Sandplain Heathlands - Inland Variant occur on sand or gravel soils, not on bedrock.

Associated Fauna: Ridgetops tend to be only a part of the habitat of most vertebrate animals. Lepidopteran fauna include heathland species such as the slender clearwing sphinx moth (*Hemaris gracilis*), pink sallow moth (*Psectraglaea carnosa*), and blueberry sallow moth (*Sympistis dentata*). Ravens (*Corvus corax*) are all around high elevations, especially near cliffs where they often nest.

Public Access: Leyden WMA, Leyden.

Threats: Succession, trampling along peaks and ridges near trails.

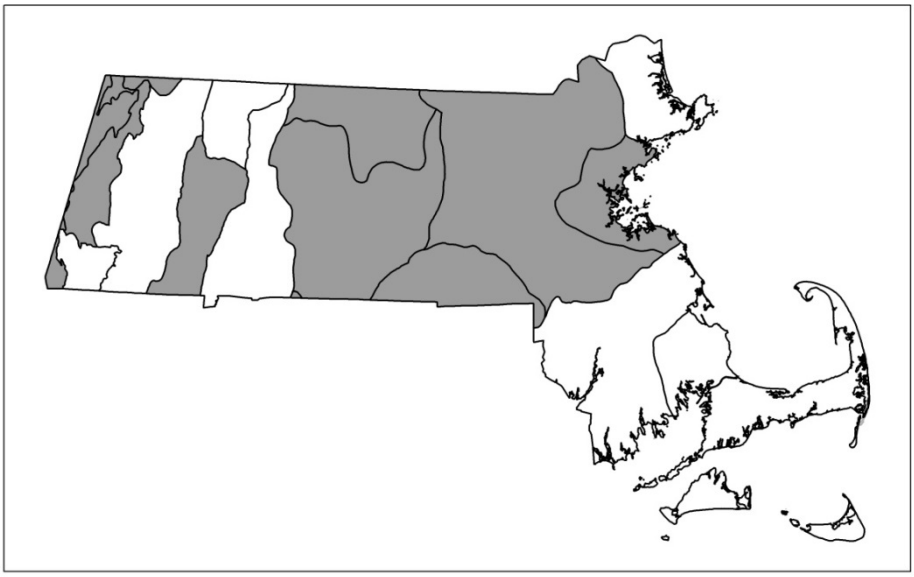
Management Needs: This community succeeds to forest if not burned or the trees removed on a 5- to 15-year cycle.

USNVC/NatureServe: Central Appalachian Pine-Oak Rocky Woodland System (Ridgetop Blueberry Heathland}. (System 201.571) and Northern Appalachian-Acadian Rocky Heath Outcrop (CES201.571): *Vaccinium angustifolium-Sorbus americana*/*Sibbaldiopsis tridentata* Dwarf-Shrubland (CEGL005094) and *Vaccinium* (*angustifolium*, *myrtilloides*, *pallidum*) Central Appalachian Dwarf-shrubland (CEGL003958) (Central Appalachian System only).

Ridgetop Pitch Pine – Scrub Oak Community

Community Code: CT2A1A1000

State Rank: S2



Concept: Ridgetop Pitch Pine - Scrub Oak community occurs on acidic bedrock, often in a mosaic with rocky summit/rock outcrop communities including Ridgetop Heathlands.

Environmental Setting: Ridgetop Pitch Pine - Scrub Oak Communities occur on exposed acidic bedrock, often in a mosaic with rocky summit/rock outcrop communities on ridgetops and steep upper mountain slopes with an open to closed canopy of pitch pine (*Pinus rigida*). The community is maintained by severe growing conditions; the characteristic species are tolerant of extremely xeric conditions. The most typical examples have a south to southwest aspect and receive high solar insolation. They are found on level crests as well as steep slopes. Soil accumulation is slow and soil depths are generally shallow, often with considerable exposed bedrock. Although some occurrences appear to be fire-dependent, other sites have little indication of past fire. In some places where fire has been infrequent, succession to White Pine - Oak Forest may be evident.

Vegetation Description: The canopy characteristically contains somewhat dwarfed pitch pines (*Pinus rigida*, avg. 5 m tall), with occasional red or other oaks (*Quercus rubra*, *Q. velutina*, *Q. montana*, or *Q. coccinea*), gray birch (*Betula populifolia*), black cherry (*Prunus serotina*), and red maple (*Acer rubrum*). White pine (*Pinus strobus*) may dominate the canopy in areas that have not experienced regular fire or other disturbance. In the shrub layer, scrub oak (*Quercus ilicifolia*) is the most characteristic species of the community, typically with patches of lower growing black huckleberry (*Gaylussacia baccata*) and lowbush blueberries (*Vaccinium angustifolium* and/or *V. pallidum*). Other shrubs in lower abundance may include dwarf chinquapin-oak

(*Quercus prinoides*), mountain laurel (*Kalmia latifolia*), wild raisin (*Viburnum cassinoides*), red chokeberry (*Aronia arbutifolia*), and serviceberries (*Amelanchier spp.*). The herbaceous layer is extremely sparse and tends to occur in rock crevices and at tree bases. Herbaceous layer plants include Canada mayflower (*Maianthemum canadense*), starflower (*Lysimachia borealis*), hairgrass (*Deschampsia flexuosa*), goldenrods (*Solidago* spp.), wintergreen (*Gaultheria procumbens*) and sedges (*Carex* spp.). Invasive exotic species are usually absent. The understory may be interspersed with areas of lichen-covered or exposed bedrock.

Differentiating Occurrences: Ridgetop Pitch Pine - Scrub Oak Communities have scattered stunted pitch pine and dense scrub oak. Usually, they have little bare rock. They are on bedrock ridgetops. 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 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. Identifying community types on rock outcrops is complicated by interdigitation of types and overlap of constituent species.

Associated Fauna: Ridgetops tend to be only a part of the habitat of most vertebrate animals, which are usually those of the surrounding forests and rocky outcrops. Larger mammals seem to prefer woodlands where they can move more easily, but birds find shelter in the dense shrubs during nesting and migration. Pitch Pine - Scrub Oak Communities have a rich lepidopteran fauna. Some of the rare moths of the larger Pitch Pine - Scrub Oak Communities on sands have been found in the ridgetop community.

Public Access: Appalachian Trail, Clarksburg; Appalachian and Taconic Trails, Mt. Washington; Monument Mtn. (The Trustees of Reservations)), Great Barrington; Tekoa Mtn. WMA, Russell; Middlesex Fells Reservation, Medford area; Blue Hills State Reservation, Milton area.

Threats: Forest succession, fire suppression, trampling, litter. The occurrences are threatened by exclusion of fire. Although many occurrences are on conservation lands, few are managed to maintain the specific natural community type. It would best be maintained by careful reintroduction of fire through prescribed burning or other fire management plans. Trails tend to run on ridge tops and, when the open areas supporting these communities are encountered, they invite human use, which can easily degrade the vegetation, destroy the lichen and moss cover on the rocks, and lead to soil loss. Balancing protection with use is possible with careful planning, such as adroit trail placement, education of users, and probably some triage of sites.

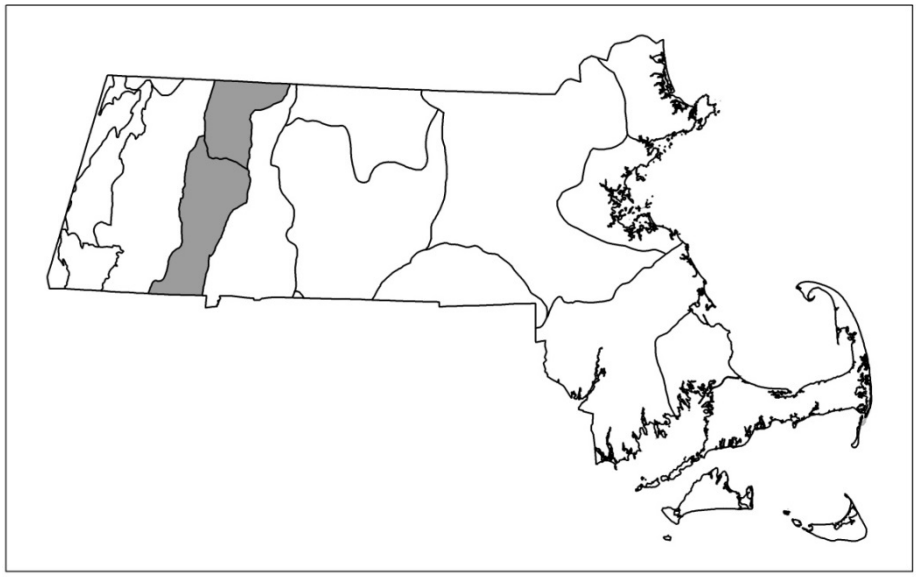
Management Needs: Prescribed fire to keep fuel loads down, limit succession, and allow regeneration of pitch pine and heaths. As open summits provide great views, trails and education are needed to minimize human impacts such as trampling and littering.

USNVC/NatureServe: *Pinus rigida* Woodland Alliance -- *Pinus rigida*/*Quercus ilicifolia*/*Aronia melanocarpa* Woodland [CEGL006323] --and, in part, *Pinus rigida*/*Aronia melanocarpa* Woodland [CEGL006116].

Riverside Rock Outcrop Community

Community Code: CT2A3A0000

State Rank: S3



Concept: Sparse, mostly herbaceous, vegetation limited to crevices where soil accumulates. Only outcrops influenced by river processes are considered to be riverside outcrops.

Environmental Setting: Only rock outcrops influenced by river processes are considered to be Riverside Rock Outcrop Communities, which nonetheless support terrestrial communities with non-wetland vegetation. The community occurs on flood- and ice-scoured bedrock stream banks and adjacent exposed ledges that are at or below the high water mark. The habitat is subject to flooding during much of the year. The outcrops may be low or steep on the river's edge or extending into the river channel. Mineral soil accumulates in crevices in the rocks. River spray and proximity to water may alleviate some of the harsh conditions usually encountered by plants growing in shallow soil in open areas.

Vegetation Description: Riverside Rock Outcrop Communities include low and scattered herbaceous plants; with few woody plants due to annual ice scouring. Generally there is a mix of only a few species per site: included might be harebell (*Campanula rotundifolia*), big bluestem grass (*Andropogon gerardii*), hemp dogbane (*Apocynum cannabinum*), goldenrods (*Solidago* spp.), and various asters (*Symphyotrichum* spp.) including New York aster (*Symphyotrichum novi-belgii*). Very occasional woody shrubs might be smooth rose (*Rosa blanda*) or running serviceberry (*Amelanchier stolonifera*). Non-native species that commonly occur are Canada bluegrass (*Poa compressa*) and purple loosestrife (*Lythrum salicaria*).

Differentiating Occurrences: Riverside Rock Outcrop Communities are open terrestrial communities often associated with Riverside Seep Communities, High-energy Riverside Meadows,

and/or High-energy Riverbank Communities, all of which are wetter and support wetland vegetation. Riverside Rock Outcrop Communities are on bedrock and have the sparsest vegetation. High-energy Riverbank Communities occur on cobble and sand substrates and usually also have sparse, open, low vegetation, but with some bare cobble and sand. High-energy Rivershore Meadows and Riverside Seep Communities are wet and have fairly dense vegetation with some organic as well as mineral soil development. All occur along the shores of fast-flowing, high-energy rivers, and differences may not always be distinct.

Associated Fauna: These small, exposed communities have few, if any, animals that are restricted to them, but rather are parts of the habitat of wide-ranging riverine and upland animals, including shoreline foragers such as river otter (*Lontra canadensis*), mink (*Mustela vison*), and raccoons (*Procyon lotor*). Turtles are not attracted to rocks, preferring to bask on logs. Occasional bull frogs (*Rana catesbeiana*) or northern water snakes (*Nerodia sipedon*) would be expected. Common species of dragonflies and tiger beetles hunt over the rock areas.

Public Access: Visitation to Riverside Rock Outcrops is discouraged because of damage caused by trampling of plants.

Threats: Trampling by river users and competition from exotic species.

Management Needs: Removal of exotics from best sites.

USNVC/NatureServe: Related to: Great Lakes Alkaline Rocky Shore Sparse Vegetation [CEGL002506] and *Andropogon gerardii - Campanula rotundifolia - Solidago simplex* Herbaceous Vegetation [CEGL006284].

Sandplain Grassland

Community Code: CT2B2A0000

State Rank: S1

Concept: An open, near-coastal community visually dominated by native grasses, although forbs and shrubs are important components of the community.

Environmental Setting: 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. Occurrences receive onshore winds and salt spray from storms, which delay succession to shrubland, woodland, and forest. Prior to European settlement, they likely occurred as openings close to the coast where salt spray suppressed the growth of woody plants, and in openings created by windstorms, fires, and localized agricultural activities. The community also occurs in openings within Pitch Pine - Scrub Oak Communities, often in depressions (frost pockets) where frost can occur throughout the growing season inhibiting woody growth. Most current occurrences are on land that was previously farmed or disturbed.

Vegetation Description: Sandplain Grasslands are dominated by graminoids, usually little bluestem grass (*Schizachyrium scoparium*), Pennsylvania sedge (*Carex pensylvanica*), and poverty grass (*Danthonia spicata*), with bearberry (*Arctostaphylos uva-ursi*), scrub oak (*Quercus ilicifolia*), stiff aster (*Ionactis linariifolia*), bayberry (*Morella pensylvanica*), lowbush blueberry (*Vaccinium angustifolium*), black huckleberry (*Gaylussacia baccata*), and a variety of goldenrods (*Solidago* and *Euthamia* spp.). The shrubs often form clonal patches. Goat's-rue (*Tephrosia virginiana*), yellow wild indigo (*Baptisia tinctoria*), butterflyweed (*Asclepias tuberosa*), colic-root (*Aletris farinosa*), and bird's-foot violet (*Viola pedata*) are good indicators of the community, although they occur in other dry habitats as well. Uncommon plants include sandplain gerardia (*Agalinis acuta*), purple needlegrass (*Aristida purpurascens*), commons'

and harsh panic-grass (*Dicanthelium ovale* ssp. *pseudopubescens* and *D. scabriusculum*), sandplain and stiff yellow (or rigid) flax (*Linum intercursum* and *L. medium* var. *texanum*), and Bayard's adder's mouth (*Malaxis bayardii*).

Differentiating Occurrences: Sandplain Grasslands are part of a structural and successional continuum with other coastal communities. When communities are not distinct, the best fit should be named. Sandplain Heathlands and Sandplain Grasslands share about 70% of their dominant species; the proportions of the species and the community structure separate the types. Sandplain Heathlands look shrubbier with a taller shrub layer comprised of scrub oak, black huckleberry, and/or lowbush blueberry. Overall, they have fewer plant species. Both Sandplain Grasslands and Maritime Dune Communities have grasses, forbs, and low shrubs, with patches of bare soil. Dune communities are on dunes and are often dominated by beach grass and beach heather that occur less abundantly in grasslands, where if they occur they are with other plants. Sandplain Grasslands - Inland Variant often have a greater abundance of non-native and weedy species. Sandplain Grasslands - Inland Variant are located inland, away from maritime influences. They have fewer coastal species such as sandplain flax (*Linum intercursum*), golden heather (*Hudsonia ericoides*), and sandplain blue-eyed grass (*Sisyrinchium fuscatum*). Cultural Grasslands are by dominated by non-native grasses maintained for pasture or hayfields.

Associated Fauna: Animals of Sandplain Grasslands are adapted to open areas. Seven species of birds of conservation interest in Massachusetts are highly dependent on grassland habitat for nesting, overwintering, or resting during migration, including Grasshopper Sparrow (*Ammodramus savannarum*) which is particularly adapted to areas with open ground between grass tussocks. Five other birds that are uncommon and declining in the state are also associated with grassland habitats, including the Eastern Meadowlark (*Sturnella magna*) which uses habitat with continuous short grass. Grasslands provide hunting territory for hawks, such as Northern Harrier (*Circus cyaneus*)) and Short-eared Owls (*Asio flammeus*). In Massachusetts, the American burying beetle (*Nicrophorus americanus*) is restricted to Nantucket, where a reintroduced population currently exists at apparently healthy population levels. The purple tiger beetle (*Cicindela purpurea*) is also faring best on the offshore islands, with a few remaining mainland populations. Both of these species are strongly associated with grassland and savanna habitats. There are multiple species of moths and butterflies with habitat primarily restricted to sandplain grasslands, nine of which are of conservation concern.

Public Access: Katama Plains Nature Preserve, Edgartown; Chilmark Cemetery, Chilmark; Head of the Plains and Middle Moors (Nantucket Conservation Foundation), Nantucket; Francis Crane WMA, Falmouth.

Threats: Exotics, such as Scotch Broom (*Cytisus scoparius*), Japanese knotweed (*Fallopia japonica*), cypress spurge (*Euphorbia cyparissias*), and especially cool-season grasses that form mats. Common non-native species include sheep fescue (*Festuca ovina*), sweet vernalgrass (*Anthoxanthum odoratum*), velvet-grass (*Holcus lanatus*), bluegrass (*Poa pratensis*), timothy (*Phleum pratense*), spotted cat's ear

(*Hypochaeris radicata*), narrow-leaved plantain (*Plantago lanceolata*), sheep-sorrel (*Rumex acetosella*), and others.

Management Needs: Fire management plans should be produced and implemented to introduce prescribed fire to the best examples. Reduce exotics where possible.

USNVC/NatureServe: NatureServe, NVC System: Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895) *Morella pensylvanica*/*Schizachyrium littorale- Danthonia spicata* Shrub Herbaceous Vegetation (CEGL006067, G2). Association also as small patches in System: Northern Atlantic Coastal Plain Pitch Pine Barrens (CES203.269). Also: A3934 *Poa compressa - Solidago nemoralis - Centaurea biebersteinii* Ruderal Dry Meadow and Shrubland Alliance - CEGL006616 *Panicum virgatum* - (*Andropogon virginicus*) Ruderal Herbaceous Vegetation.

Sandplain Grassland – Inland Variant

Community Code: CT2B2A2000

State Rank: S2

Map: No Sandplain Grasslands – Inland Variant are documented in the NHESP database.

Concept: An often semi-natural open community, visually dominated by native grasses on sandplains or gravel in interior parts of the state, that usually needs management to remain treeless in the absence of fire. The community occurs in the surroundings of inland airports, and on military lands and wildlife management areas on sandplains.

Environmental Setting: Sandplain Grasslands - Inland Variants are open (essentially treeless), often semi-natural communities, visually dominated by native grasses and herbaceous species with sparse shrubs and patches of bare soil and lichens. They occur inland outside the influence of coastal storms and salt spray, primarily on sandplains or gravel (droughty, low-nutrient soils) and usually need management to remain open in the absence of fire or other disturbance. Otherwise, these grasslands generally succeed to forest. Surroundings often include Pitch Pine - Scrub Oak Communities. Many sites have been severely disturbed in the past which has slowed succession to woody species, but which has also allowed establishment of non-native species. The community occurs at small inland airports, along powerline rights of way, and on military lands and wildlife management areas on sandplains, all areas that are managed to exclude tall woody plants. Many current inland grasslands are the result of extensive clearing for agriculture that occurred with European settlement, some as expansions of original smaller occurrences and others created on poor sandy soils cleared of trees for grazing and crops.

Vegetation Description: Sandplain Grasslands - Inland Variant are dominated by graminoids, usually little bluestem (*Schizachyrium scoparium*), Pennsylvania sedge (*Carex pensylvanica*), and poverty grass (*Danthonia spicata*), often with many non-native species, especially many non-native grasses. These communities generally include a mix of herbaceous species such as goldenrods (*Solidago* and *Euthamia* spp.), milkweeds (*Asclepias spp.*) including butterflyweed (*A. tuberosa*), and occasionally New England blazing star (*Liatris scariosa* var. *novae-angliae*). There may be fewer shrubs than occur in coastal grasslands, although sweet fern (*Comptonia peregrina*) can form large patches, particularly in inland areas, and dewberries (*Rubus flagellaris* and *R. hispidus*) may be abundant in either. White pine is often the first tree to invade inland grasslands, with clonal species such as aspen (*Populus tremuloides*) and sumac (*Rhus* spp.) expanding from the edges.

Differentiating Occurrences: Sandplain Grasslands - Inland Variant are located inland away from maritime influences, out of even the storm salt spray zone, and, although on sandy soils, require regular management to stay open. The Inland Variant has fewer coastal species than the main, coastal Sandplain Grassland community: the Inland Variant lacks sandplain flax (*Linum intercursum*), golden heather (*Hudsonia ericoides*), and sandplain blue-eyed grass (*Sisyrinchium fuscatum*). The Inland Variant often has an

abundance of non-native and weedy species. Sandplain Heathlands - Inland Variant grade into Sandplain Grasslands - Inland Variant. Sandplain Heathlands - Inland Variant are and look shrubbier than grasslands, which look grassy. The visual appearance of being dominated by lowbush blueberry, scrub oak, or black huckleberry is a key difference from grasslands. Small patches of Sandplain Grasslands - Inland Variant in a mosaic with other communities are difficult to map and may be considered to be part of the variation of the prevailing community. Cultural Grasslands as a classification unit are intended to be grasslands that are cultivated or the results of cultivation with non-native, agricultural grasses (pastures and hayfields were the models).When communities are not distinct, the best fit should be named.

Associated Fauna: Location in the state and size of the grassland strongly affect the species that use grasslands. Many species of birds that use grasslands are more common in the midwestern prairies and agricultural fields. Airports currently support Massachusetts' largest populations of Upland Sandpipers (*Bartramia longicauda*), Grasshopper Sparrows (*Ammodramus savannarum*), and Savannah Sparrows (*Passerculus sandwichensis*). Other grassland birds include Killdeer (*Charadrius vociferus*), Eastern Meadowlarks (*Sturnella magna*), and Horned Larks (*Eremophila alpestris*). Meadow voles (*Microtus pennsylvanicus*), meadow jumping mice (*Zapus hudsonius*), and northern short-tailed shrews (*Blarina brevicauda*) would be expected in most grasslands. They would be hunted by garter snakes (*Thamnophis sirtalis*), long-tailed weasels (*Mustela frenata*), and American Kestrels (*Falco sparverius*), as well as wintering Northern Harriers (*Circus cyaneus*), Snowy Owls (*Nyctea scandiaca*), and Short-eared Owls (*Asio flammeus*). Lepidopteran fauna includes some species of sandplain grasslands, such as sandplain euchlaena, a geometrid moth (*Euchlaena madusaria*, Special Concern).

Public Access: Southwick WMA, Southwick; Montague Plains WMA, Montague.

Threats: Succession; development; ATV disturbance.

Management Needs: Mowing and grazing, in addition to fire, are required to maintain these communities. Fire management plans should be produced and followed to introduce prescribed fire to the best examples. Reduce exotics where possible.

USNVC/NatureServe: A3934 *Poa compressa* - *Solidago nemoralis* - *Centaurea biebersteinii* Ruderal Dry Meadow and Shrubland Alliance - CEGL006333 *Schizachyrium scoparium* - (*Andropogon virginicus*) - *Solidago* spp. Ruderal Herbaceous Vegetation.

Sandplain Heathland

Community Code: CT2B2B0000

State Rank: S1

Concept: An open, shrub-dominated, coastal community often in the zone receiving salt spray from storms, sharing many species with Sandplain Grasslands. Some heathlands have sparse clumps of plants with bare soil or lichen cover between the vascular plants.

Environmental Setting: Sandplain Heathlands are disturbance-dependent communities occurring on sandy/gravelly outwash plains and moraines near the coast. Plant cover in these nearly treeless shrublands ranges from nearly continuous to sparse with bare soil or lichen between clumps of plants. The rugged environment has extreme daily and seasonal temperature variations, nutrient-poor droughty soil, intense sunlight, and salt-laden winds. Although coastal heathlands are natural communities, until the late 19th century human activities increased their size and distribution with land clearing, grazing, and fires. Pre-European settlement occurrences were likely small patches in successional mosaics on drought-prone soils near the coast, where they were maintained by burning near Native American villages or by salt spray from coastal winds. Other occurrences may be maintained in frost pockets on outwash sandplains where unpredictable late season frosts inhibit growth of many species, including most trees.

Vegetation Description: Many of the dominant species in Sandplain Heathlands are low-growing woody shrubs, which if dominant are considered to be indicators of the community: black huckleberry (*Gaylussacia baccata*), bearberry (*Arctostaphylos uva-ursi*), and broom crowberry (*Corema conradii*). Other typical shrubs include lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*), bayberry (*Morella pensylvanica*), and scrub oak (*Quercus ilicifolia*). Less dominant but usual species include golden

heather (*Hudsonia ericoides*), chokeberry (*Aronia arbutifolia*), dwarf chinquapin oak (*Q. prinoides*), sweetfern (*Comptonia peregrina*), dewberry (*Rubus flagellaris*), little bluestem (*Schizachyrium scoparium* var. *scoparium*), and Pennsylvania sedge (*Carex pensylvanica*). The tall shrubland association particularly includes non-ericaceous shrubs such as beaked hazelnut (*Corylus cornuta*) and beach plum (*Prunus maritima* var. *maritima*). Many plants that are uncommon in Massachusetts occur in the Sandplain Heathlands, including sandplain flax (*Linum intercursum*), sandplain blue-eyed grass (*Sisyrinchium fuscatum*), eastern silvery aster (*Symphyotrichum concolor*), purple cudweed (*Gamochaeta purpurea*), butterfly weed (*Asclepias tuberosa*), and broom crowberry (*Corema conradii*).

Differentiating Occurrences: When bearberry and black huckleberry are dominant, they are considered to be indicators of Sandplain Heathlands. Sandplain Heathlands are in a continuum with openings in Pitch Pine - Scrub Oak Communities, Scrub Oak Shrublands, and maritime shrublands, woodlands, and forests. Their structure and species composition overlap with Maritime Dune Communities and Sandplain Grasslands. In mapping, as in defining, the edges are not always clear. 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 and appear taller and have fewer vascular plant species than do grasslands. The communities are not distinct at some sites; in that case, the dominant one is named. Sandplain Heathlands are structurally similar to Maritime Dune Communities 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, which occur less abundantly with more other species in Sandplain Heathlands. These communities may overlap along dune edges necessitating arbitrary assignment based on land form or the prevailing community type. Sandplain Heathlands and Maritime Shrubland Communities are shrublands; the Maritime Shrubland community is much denser, taller and more diverse. Maritime Juniper Woodland/Shrubland and Maritime Pitch Pine Woodland on Dunes are dominated by trees, although they 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.

Associated Fauna: Only a few bird species nest in Sandplain Heathlands, including Horned Lark (*Eremophila alpestris*), Savannah Sparrow (*Passerculus sandwichensis*), and Vesper Sparrow (*Pooecetes gramineus*). Short-eared Owls (*Asio flammeus*) are rare breeders in Massachusetts; one of their main food sources is the voles that live in heathlands. Birds of prey (or raptors) that may be seen hunting over the heathlands include Red-tailed Hawk (*Buteo jamaicensis*), American Kestrel (*Falco sparverius*), Merlin (*F. columbarius*), Peregrine Falcon (*F. peregrinus*), and Northern Harrier (*Circus cyaneus*). Other animals that can be found in heathlands include red-bellied snakes (*Storeria occipitomaculata*), meadow voles (*Microtus pennsylvanicus*), short-tailed shrews (*Blarina brevicauda*), and such common insects as monarchs

(*Danaus plexippus*) and pearl crescents (*Phyciodes tharos*). Several state-protected species of insects are also found in Sandplain Heathlands, including the chain-dotted geometer (*Cingilia catenaria*), the coastal heathland cutworm (*Abagrotis nefascia*), the barrens buckmoth (*Hemileuca maia*) and the purple tiger beetle (*Cicindela purpurea*). Before its extirpation from Massachusetts, the regal fritillary butterfly (*Speyeria idalia*) inhabited Sandplain Heathlands.

Public Access: Wasque Reservation (The Trustees of Reservations), Martha's Vineyard; Middle Moors (Nantucket Conservation Foundation), Nantucket; frost pockets in Myles Standish State Forest and Sly Ponds WMA, Plymouth.

Threats: The heathland community is considered to be vulnerable throughout its range. It has been estimated that about ninety per cent of coastal heathland in the northeastern United States has been lost since the middle of the nineteenth century, but other heathlands have been created by grazing and clearing. Reasons for this loss include suppression of fires, cessation of grazing by livestock in the affected areas, development of land, coastal erosion, and succession by trees and non-heathland shrubs. Excessive foot traffic and the use of off-road vehicles also threaten heathlands. Damage can be done by just one vehicle passing over the habitat; fifty passes of a vehicle will devegetate the surface. Prescribed burning and controlled grazing are being used to maintain remaining heathlands. Some exotic species such as black pine (*Pinus thunbergiana*) and Scotch broom (*Cytisus scoparius*) are issues. Fragmentation and development. Domestic pets and feral predators are problems for ground-nesting bird species, such as Short-eared Owl (*Asio flammeus*).

Management Needs: Selective tree removal, fire, and grazing are often required. Fire management plans should be produced and implemented to reintroduce fire. Remove exotics where a problem. Control foot and vehicular traffic.

USNVC/NatureServe: NVC System: Northern Atlantic Coastal Plain Heathland and Grassland (CES203.895) especially *Gaylussacia baccata - Vaccinium angustifolium - Arctostaphylos uva-ursi/Schizachyrium littorale* Dwarf-shrubland (CEGL006066, G3).

Sandplain Heathland – Inland Variant

Community Code: CT2B2B3000

State Rank: S2

Concept: Often semi-natural, usually successional, low shrub community on sandplains or gravel in interior parts of the state, which needs management to remain open in the absence of fire. Includes erosional gravel/sandy cliff face next to rivers or river floodplains. The tree canopy is absent or poorly developed.

Environmental Setting: Sandplain Heathlands - Inland Variant occur away from the coast, often on kames, glacial lake beaches, and other sand or gravel sediment deposits, including dry riverside bluffs (20- to 50-foot-high erosional gravel cliffs next to rivers). The rugged environment has intense sunlight, extreme daily and seasonal temperature variations, and nutrient-poor droughty soils. Like coastal Sandplain Heathlands, the Inland Variants are open, nearly treeless shrublands often dominated by low-growing members of the heath or blueberry family (Ericaceae). Plant cover ranges from nearly continuous to sparse with bare soil or lichen between clumps of plants. Some occurrences are variably sized openings in Pitch Pine – Scrub Oak Communities, often in depressions (frost pockets) on sandplains where unpredictable late season frosts inhibit growth of many species, including most trees. Other pre-European settlement occurrences were likely small patches in successional mosaics on drought-prone soils maintained by disturbances, including fires that enhanced blueberry production and kept the forest open around Native American villages. Current occurrences were likely enlarged or created by past land use (land clearing and farming) on low-nutrient soils. Fire has been important in at least some situations, especially on drier south- and southwest-facing slopes. Without disturbance or management, succession to open woodland, often pine or pine-oak, occurs.

Vegetation Description: Sandplain Heathland - Inland Variant community is composed of low-growing plants, including several species that can reproduce clonally. Overall diversity is fairly low, with heath (blueberry family) shrubs forming an extensive, dense low shrub layer dominated by low sweet blueberry (*Vaccinium angustifolium*), early sweet blueberry (*Vaccinium pallidum*), and/or black huckleberry (*Gaylussacia baccata*), with sweet fern (*Comptonia peregrina*), bearberry (*Arctostaphylos uva-ursi*), scrub oak (*Quercus ilicifolia*), American hazelnut (*Corylus americana*), New Jersey tea (*Ceanothus americanus*) and/or sheep-laurel (*Kalmia angustifolia*). Scattered individuals or patches of taller shrubs may include tree saplings from the surrounding forest, particularly pitch or white pine (*Pinus rigida* or *P. strobus*), gray or white birch (*Betula populifolia* or *B. papyrifera*), trembling aspen (*Populus tremuloides*), or red maple (*Acer rubrum*). Trailing arbutus (*Epigaea repens*) and teaberry (*Gaultheria procumbens*) are usually present, the latter abundant only on untilled soils. Little bluestem grass (*Schizachyrium scoparium*), poverty grass (*Danthonia spicata*), and hairgrass (*Deschampsia flexuosa*) typically occur in the sparse herbaceous layer that may also include goat's rue (*Tephrosia virginiana*), stiff aster (*Ionactis linariifolia*), woodland sunflower (*Helianthus divaricatus*), and wild lupine (*Lupinus perennis*) between shrub patches. Neither pitch pine nor scrub oak is dominant, although often present.

Differentiating Occurrences: Sandplain Heathlands - Inland Variant grade into Sandplain Grasslands - Inland Variant. They are often small patch communities within the prevailing forest matrix. The visual appearance of being dominated by blueberries or other low shrubs is a key difference from grasslands. Sandplain Heathlands - Inland Variant are located inland at distances away from maritime influences. Sandplain Heathlands are near the coast within the salt spray zone of storms. Ridgetop Heathlands occur on bedrock, often as semi-natural expansions of edges of rocky summits or old blueberry farms. Pitch Pine - Scrub Oak Communities are dominated by scrub oak with abundant 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 variations in the Pitch Pine - Scrub Oak Community occurrence. Sandplain Heathlands - Inland Variant are and look shrubbier than Sandplain Grasslands - Inland Variant, which are dominated by grasses.

Associated Fauna: Savannah Sparrows (*Passerculus sandwichensis*) use sandplain heathlands, including inland variant occurrences. Meadow voles (*Microtus pennsylvanicus*), short-tailed shrews (*Blarina brevicauda*), and white-footed mice (*Peromyscus leucopus*) are often abundant near or under shrubs. White-footed mice are known to be one host of the deer tick (*Ixodes scapularis*) that carries Lyme and other diseases. Invertebrates of inland variant heathlands include butterflies such as hairstreaks and skippers. Uncommon species include slender clearwing sphinx moth (*Hemaris gracilis*), pink sallow moth (*Psectraglaea carnosa*), and blueberry sallow moth (*Sympistis dentata*).

Public Access: Montague Plains WMA, Montague; Barre Heathland, DCR Ware River Watershed Area, Barre; Clinton Bluff WMA, Clinton.

Threats: Succession, including from fire suppression. Fragmentation and development. Domestic pets and feral predators are problems for ground-nesting bird species.

Management Needs: Selective tree removal, fire, and grazing are often required. Fire management plans should be produced and implemented to reintroduce fire. Remove exotics where a problem. Control foot and vehicular traffic.

USNVC/NatureServe:

Scrub Oak Shrubland

Community Code: CT2B1F1000

State Rank: S2

Concept: A shrubland dominated by scrub oak, with essentially no pitch pine (stems are very scattered if present), although within Pitch Pine - Scrub Oak Communities.

Environmental Setting: Scrub Oak Shrublands are dense shrublands, dominated by shrub oaks forming almost impenetrable thickets ranging from 2-3 feet (about 1m) to greater than 6 feet (2m) in height. They occur on sandplains, usually in depressions where localized frosts keep out competing trees, and on ridge tops. Disturbances in both environments maintain mosaics in space and time of grassland and heathland openings, shrublands, Pitch Pine - Scrub Oak Communities, and oak/pine forest. Scrub Oak Shrublands are dry with few nutrients available, since neither sand nor shallow soils on bedrock hold water or nutrients. Besides frosts that damage competing tree species, fires that eliminate or significantly reduce trees establish and maintain Scrub Oak Shrublands. Because the component shrub species both foster and are adapted to fire, Scrub Oak Shrublands are considered to be fire-dependent communities; scrub oak and heath species resprout readily after fires. It is likely that in the past this community burned under a variety of conditions, including during droughts and possibly during the growing season as well as the dormant season, so that structural and compositional variation may have been greater than what we see today. In addition, scrub oak communities seldom occur on land that has been plowed; even a hundred years after agricultural abandonment, many vegetatively reproducing plants are missing from the vegetation on previously plowed lands.

Vegetation Description: Scrub Oak Shrublands are dominated by shrub oaks, scrub oak (also called bear oak) (*Quercus ilicifolia*) and dwarf chinquapin oak (*Quercus prinoides*), that together

have at least 40% cover. Sparse (<10% cover) tree species may include pitch pine (*Pinus rigida*), red or black oak (*Quercus rubra* or *velutina*), gray birch (*Betula populifolia*), and quaking aspen (*Populus tremuloides*). Other characteristic plants include black huckleberry (*Gaylussacia baccata*), lowbush blueberry (*Vaccinium angustifolium*), early sweet blueberry (*Vaccinium pallidum*), black chokeberry (*Aronia melanocarpa*), sheep laurel (*Kalmia angustifolia*), and sweet fern (*Comptonia peregrina*), along with Pennsylvania sedge (*Carex pensylvanica*), little bluestem (*Schizachyrium scoparium*), poverty grass (*Danthonia spicata*), cow wheat (*Melampyrum lineare*), bracken fern (*Pteridium aquilinum*), bearberry (*Arctostaphylos uva-ursi*), and areas of lichens (*Cladina* and *Cladonia* spp.).

Differentiating Occurrences: Scrub Oak Shrublands 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. May be in a matrix with Sandplain Heathlands. Scrub Oak Shrublands are dominated by dense shrub oaks and lack pitch pine, on sand and on bedrock. Pitch Pine - Scrub Oak Communities have up to about 25% cover by pitch pine trees, are on sand or gravel, tend to be large, and have most of the same species. Ridgetop Pitch Pine - Scrub Oak Communities have scattered stunted pitch pine and dense scrub oak, and usually have little bare rock. They are on bedrock ridgetops. 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. Rocky summit/rock outcrop communities are dominated by bare or lichen-covered rock. Identifying community types on rock outcrops is complicated by mixing of 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.

Associated Fauna: Scrub Oak Shrublands provide similar shrub habitat to the Pitch Pine - Scrub Oak Community often surrounding a shrubland. Species in Scrub Oak Shrublands include rare, as well as more common, moths and butterflies that are dependent on oaks and members of the blueberry family. Scrub Oak Shrublands in southeastern Massachusetts are being increasingly managed for New England cottontail (*Sylvilagus transitionalis*), which benefits other species that use the protection dense shrubs offer for nesting and resting, including Prairie Warbler (*Dendroica discolor*), which is declining throughout its range due to habitat loss. Common Yellowthroat (*Geothlypis trichas*), which nest in dense tangled vegetation, are very common in some scrub oak areas. Large mammals tend to avoid the dense shrub thickets.

Public Access: Middlesex Fells, Medford; Myles Standish State Forest, Plymouth; Lovell's Lane Conservation Area, Mashpee; Manuel F. Correllus State Forest, West Tisbury.

Threats: Development and fragmentation of the entire systems.

Management Needs: Experiments are needed to ascertain the fire dependence/sensitivity of the community and its dependent species.

USNVC/NatureServe: Nature Serve Systems: CES202.600 Central Appalachian Pine-Oak Rocky Woodland and CES203.269 Northern Atlantic Coastal Plain Pitch Pine Barrens. *Quercus ilicifolia* Shrubland Alliance -- *Quercus ilicifolia-Quercus prinoides* Shrubland [CEGL006111] and *Quercus ilicifolia - Prunus pumila* Shrubland [CEGL006121].

Spruce – Fir – Northern Hardwood Forest

Community Code: CT1D100000

State Rank: S4

Concept: A mixed forest with red spruce and northern hardwoods in cooler, usually northern, parts of the state

Environmental Setting: The Spruce - Fir - Northern Hardwoods Forest has a canopy of mixed spruce and northern hardwoods. It occurs in cool areas above ~450m (~1400 ft.), generally on rocky, nutrient-poor, dry to mesic, acidic soils. Often little light gets through the dense canopy and lower layers are sparse and patchy. Slow decomposition produces dense needle accumulation that further limits herbaceous growth. Tree reproduction is in gaps left by single tree fall.

Vegetation Description: The canopies of Spruce - Fir - Northern Hardwoods Forests have variable dominance of 25 to 75% conifers, and the inverse tree composition of northern hardwoods: red spruce (*Picea rubens*) and/or balsam fir (*Abies balsamea*) with eastern hemlock (*Tsuga canadensis*) may be dominant or co-dominant with sugar maple (*Acer saccharum*) and American beech (*Fagus grandifolia*). Eastern hemlock can be abundant or scattered. Heart-leaf paper birch (*Betula cordifolia*) and paper birch (*Betula papyrifera*) usually occur as scattered individuals. Characteristic shrubs include mountain maple (*Acer spicatum*), red-berried elder (*Sambucus racemosa*), northern mountain ash (*Sorbus americana*), hobblebush (*Viburnum lantanoides*), beaked hazel (*Corylus cornuta*), and American yew (*Taxus canadensis*). A low shrub layer has bunchberry (*Chamaepericlymenum canadense*), creeping snowberry (*Gaultheria hispidula*), and, occasionally, twinflower (*Linnaea borealis*). Herbs tend to be sparse, especially when conifers are abundant; plants include intermediate fern (*Dryopteris intermedia*), mountain wood fern (*Dryopteris campyloptera*),

bluebead lily (*Clintonia borealis*), painted trillium (*Trillium undulatum*), and wood sorrel (*Oxalis acetosella*).

Differentiating Occurrences: In Spruce - Fir - Northern Hardwoods Forests, red spruce is a dominant or at least present with other conifers, including balsam fir and eastern hemlock, while white pine is uncommon. Heart-leaf paper birch is present as scattered individuals. In Massachusetts, High Elevation Spruce - Fir Forest/Woodland occurs only in the Greylock range at the very highest elevations in the state and is more exposed, resulting in shorter, sparser trees in more open woodland conditions than in Spruce - Fir - Northern Hardwoods Forests. There is also a lower proportion of northern hardwoods. Northern Hardwoods - Hemlock - White Pine Forests lack abundant spruce, fir, and heart-leaf paper birch. Blueberry is occasionally present in the understory of Spruce - Fir - Northern Hardwoods Forest, but absent or nearly so in Northern Hardwoods - Hemlock - White Pine Forests. Successional Northern Hardwood Forest is best distinguished by the abundance of white birch and/or aspens in the canopy and northern hardwood species generally occurring in the subcanopy or shrub layer, not the canopy. If spruce or fir is present, it is as scattered individuals, <25% cover. 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, heart-leaf paper birch, and other species of cool areas, including mountain and striped maples (*Acer spicatum*, *A. pensylvanicum*), mountain ash (*Sorbus americana* and *S. decora*), and skunk currant (*Ribes glandulosum*). They lack species of warmer areas such as oaks (*Quercus* spp.), black birch (*Betula lenta*), and mountain laurel (*Kalmia latifolia*).

Associated Fauna: Animals of this community tend to be northern species that are more typical of forests of Vermont and New Hampshire. Birds include Golden-crowned Kinglet (*Regulus satrapa*), Blue-headed Vireo (*Vireo solitarius*), Blackburnian Warbler (*Dendroica fusca*), Yellow-rumped Warbler (*D. dominica*), and Magnolia Warbler (*D. magnolia*). Mammals include fisher (*Martes pennanti*), red squirrel (*Tamiasciurus hudsonicus*), snowshoe hare (*Lepus americanus*), northern flying squirrels (*Glaucomys sabrinus*), and pygmy shrews (*Sorex hoyi*). Amphibians would include the ubiquitous redbacked salamanders (*Plethodon cinereus*), wood frogs (*Rana sylvatica*), and red efts (juvenile stage of red-spotted newts, *Notophthalmus v. viridescens*).

Public Access: Monroe State Forest, Monroe; Mt. Greylock, Adams; Watatic Mountain Sanctuary and Ashburnham State Forest; Ashburnham.

Threats: Climate change and white pine replacing spruce in old field situations; clearing for ski slopes.

Management Needs:

USNVC/NatureServe: CEGL006053

Successional Northern Hardwood Forest

Community Code: CT1C1B0000

State Rank: S5

Map: No Successional Northern Hardwood Forests are documented in the NHESP database.

Concept: A broadly defined time sequence of forest communities, from thick young sprouts with little diversity, to mature, diversifying forests with undergrowth of more shade-tolerant trees. The canopy is seldom completely closed and undergrowth may be dense or open.

Environmental Setting: In cooler areas of Massachusetts, generally in northern, western, and higher elevation areas, Successional Northern Hardwood Forests precede Northern Hardwood - Hemlock - White Pine Forests when land has been left to natural processes after large-scale land opening events. They include a broad time sequence of predominantly deciduous forests growing where major disturbances such as fires, tornados, severe hurricanes, logging, or clearing for farm fields occurred a few to many decades in the past. The canopy, dominated by shade-intolerant tree species, is seldom completely closed and the subcanopy is generally composed of more shade-tolerant tree species. The shrub layer may be dense with low-diversity tree saplings or sprouts, or with more diverse deciduous broad-leaved species in older stands. There is usually an herbaceous layer of perennial forbs. Sites are generally dry-mesic to mesic.

Vegetation Description: The vegetation of successional communities is highly variable: it changes over time and depends on surrounding seed sources and the type of disturbance that removed the original forest. Typically, the canopy of Successional Northern Hardwood Forests includes aspen (*Populus tremuloides* and *P. grandidentata*), white birch (*Betula papyrifera*), red maple (*Acer rubrum*), and/or black cherry (*Prunus serotina*), with gray birch (*B. populifolia*) on very well-drained soils. There may be low percentages of white pine (*Pinus strobus*) or red spruce (*Picea rubens*). Pin cherry (*Prunus pensylvanica*) is a very early colonizer after heavy logging or fire. As the forest matures, the understory is made up of young northern hardwoods such as sugar maple (*Acer saccharum*), red maple (*A. rubrum*), white ash (*Fraxinus americana*), yellow birch (*B. alleghaniensis*), American beech (*Fagus grandifolia*), and red oak (*Quercus rubra*). Shrubs and herbaceous species are variable, sometimes including shade-tolerant pre-disturbance species or residual early post-disturbance pioneer species.

Differentiating Occurrences: Successional Northern Hardwood Forests are highly variable forests, usually in a successional sequence leading to Northern Hardwood - Hemlock- White Pine Forests or one of its named variants. The successional forest is best distinguished by the abundance of white birch and / or aspens in the canopy. All types of northern hardwood forests, including Northern Hardwood - Hemlock- White Pine Forest, are dominated by sugar maple with other northern hardwoods such as white ash,

yellow birch, American beech, and red oak, with low cover of white pine and hemlock; in the Successional Northern Hardwood Forest, the northern hardwoods generally occur predominantly in the subcanopy or shrub layer, not the canopy.

Associated Fauna: The structure of a community is important to animals. Successional communities change in structure quite quickly, and the animals inhabiting them change as the vegetation grows. For 0 to 10 years, trees are dense but small, often with blackberry (*Rubus* spp.) below. Fugitive bird species such as Chestnut-sided Warblers (*Dendroica pensylvanica*) and Mourning Warbler (*Oporornis philadelphia*) are common in the first 5 years after a major disturbance, especially if there are dead snags left for singing perches. Ruffed Grouse (*Bonasa umbellus*) and American Woodcock (*Scolopax minor*) inhabit younger forest, as does the New England cottontail (*Sylvilagus transitionalis*) if there is a dense shrub layer. After 30 years, Successional Northern Hardwood Forests are used by many generalist animals as part of their habitats.

Public Access: Sandisfield State Forest, Sandisfield; Leadmine WMA, Sturbridge; Minute Man National Historical Park, Concord.

Threats: Invasive species in disturbed areas.

Management Needs:

USNVC/NatureServe: A3225 *Betula papyrifera - Populus tremuloides - Acer rubrum* Forest Alliance - *Betula papyrifera - Acer saccharum*/Mixed Hardwoods Forest [CEGL002464]; A3229 *Acer rubrum - Prunus serotina - Pinus strobus* Ruderal Forest Alliance - *Populus* (*tremuloides*, *grandidentata*) - *Betula* (*populifolia*, *papyrifera*) Ruderal Woodland [CEGL006303], *Quercus rubra - Acer rubrum - Betula* spp. - *Pinus strobus* Ruderal Forest [CEGL006506], and *Acer saccharum - Betula* spp. - *Fagus grandifolia* Successional Forest [CEGL006628].

Successional White Pine Forest

Community Code: CT1A1A0000

State Rank: S5

Map: No Successional White Pine Forests are documented in the NHESP database.

Concept: Oldfield white pine, several decades since establishment. Other species co-occur with the white pine, but seldom share dominance. The forest floor is often carpeted with needles, with only a sparse herbaceous layer.

Environmental Setting: Oldfield white pines form the canopy of Successional White Pine Forests, which occur on abandoned agricultural land, usually former pastures. The near monoculture of white pines in the canopy is a combined artifact of human land-use history, seed ecology, and shade tolerance, resulting in a minor component of the pre-colonial forest becoming the most abundant tree in Massachusetts in the post-agricultural conditions that became widespread during the late 1800s. This semi-natural forest with dominant white pines may be maintained by selective logging, without which pines tend to be replaced by hardwoods such as oaks and red maples. The forest floor is often carpeted with needles, with only a sparse herbaceous layer.

Vegetation Description: Successional White Pine Forests have a near monoculture of white pine (*Pinus strobus*) (>75% cover) in the canopy, with scattered associates that vary with geography and prior land use, including white oak (*Quercus alba*), red oak (*Quercus rubra*), red maple (*Acer rubrum*), and early successional trees such as birches (*Betula* spp.) and aspens (*Populus* spp.). The shrub layer is variable, from sparse to thick, and may include black elderberry (*Sambucus nigra* ssp. *canadensis*), black cherry (*Prunus serotina*), maple-leaved viburnum (*Viburnum acerifolium*), and non-native species such as glossy buckthorn (*Frangula alnus*), bush honeysuckles (*Lonicera morrowii* complex), and/or multiflora rose (*Rosa multiflora*). Blackberry (*Rubus* spp.) vines may form thickets, and poison ivy (*Toxicodendron radicans*) often covers the ground near openings or in formerly open disturbed areas. Lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*) form patches mixed with black huckleberry (*Gaylussacia baccata*) on sites with less disturbed soils. Bracken fern (*Pteridium aquilinum*) may be in the shrub layer. The herbaceous layer is variable; large patches of Canada mayflower (*Maianthemum canadense*) and starflower (*Lysimachia borealis*), with clubmosses (such as ground-pine (*Dendrolycopodium obscurum*), southern ground-cedar (*Diphasiastrum digitatum*), and staghorn clubmoss (*Lycopodium clavatum*)), are particularly common on formerly plowed soil. Partridgeberry (*Mitchella repens*), fringed polygala (*Polygala paucifolia*), and pink lady's-slipper (*Cypripedium acaule*) grow in many longer established sites.

Differentiating Occurrences: Successional White Pine Forests are best distinguished by the >75% canopy cover of white pine. They are often in a successional sequence leading to White Pine - Oak Forests, which have 25-75% cover of white pine and the inverse, 75-25% cover, of

oaks, making the oaks clearly sharing dominance with the pine. Successional White Pine Forests grade into Northern Hardwood - Hemlock - White Pine Forests in northern areas and into Oak - Hemlock - White Pine Forests to the south. In southern areas, white pine forests occur near Pitch Pine - Oak Forests 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 included as natural community types.

Associated Fauna: There are no species known to be restricted to the Successional White Pine Forests. The canopy monoculture and overall acidity from conifer needles restrict diversity. Blackburnian Warblers (*Dendroica fusca*) are probably the bird species most closely associated with dense white pine forests. Other birds of the community include Ovenbird (*Seiurus aurocapillus*), Yellow Warbler (*D. dominica*), Cooper's Hawk (*Accipiter cooperii*), and Northern Goshawk (*Accipiter gentilis*), as well as generalists such as the Black-capped Chickadee (*Poecile atricapillus*), and Red-breasted Nuthatch (*Sitta canadensis*).

Public Access: Townsend State Forest, Townsend; Douglas State Forest, Douglas; Oxbow National Wildlife Refuge, Harvard.

Threats: Non-native species such as glossy buckthorn (*Frangula alnus*), Morrow's honeysuckle (*Lonicera morrowii*), and privet (*Ligustrum obtusifolium*).

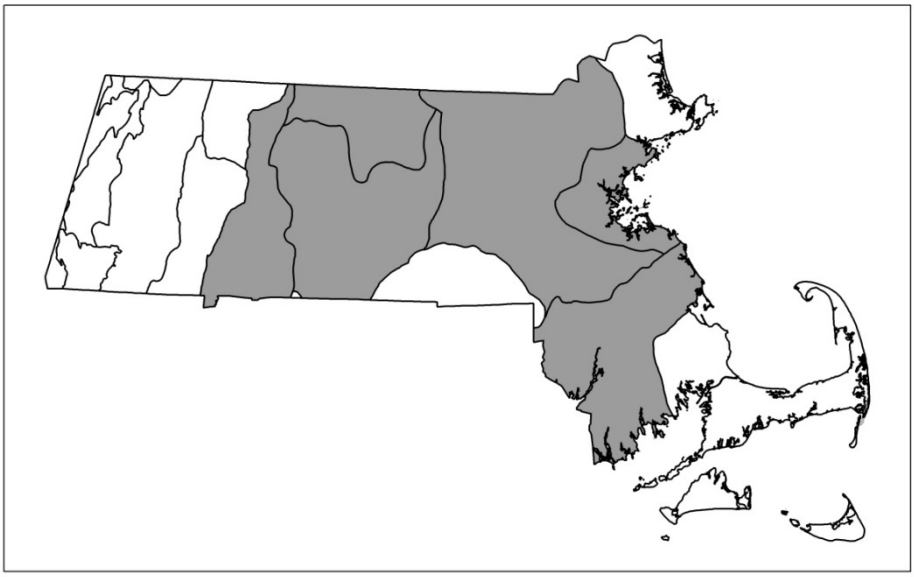
Management Needs: These are successional semi-natural forests: they are expected to change over time. No management is needed.

USNVC/NatureServe: A3227 *Juniperus virginiana - Pinus virginiana - Pinus echinata* Ruderal Forest Alliance - *Pinus strobus* Ruderal Forest (CEGL007944).

Sugar Maple – Oak – Hickory Forest

Community Code: CT1C2A1000

State Rank: S3



Concept: A species-rich forest that combines aspects of Rich, Mesic Forest of the northern hardwood forests with rich Oak - Hickory Forests of the central hardwood forests.

Environmental Setting: Community occurrences are in or east of the Connecticut River Valley in Massachusetts. They are associated with outcrops of circumneutral rock and the slopes below them, which have more nutrients than are available in the surrounding forest. Occurrences are usually small patches within matrix forests, with which many species are shared. Many but not all are on slopes with southeast to southwest aspect.

Vegetation Description: Like Rich, Mesic Forests, Sugar Maple - Oak - Hickory Forests are dominated by sugar maple (*Acer saccharum*) and red oak (*Quercus rubra*) with white ash (*Fraxinus americana*) and bitternut hickory (*Carya cordiformis*). Basswood (*Tilia americana*) occurs consistently as very scattered individuals. However, black, white, and/or chestnut oaks (*Q. velutina*. *Q. alba*, and *Q. montana*) and shagbark, pignut and/or mockernut hickories (*C. ovata*, *C. glabra*, and *C. tomentosa*) occur regularly in the canopy. Black birch (*Betula lenta*) is commonly present. The sparse subcanopy includes hop hornbeam (*Ostrya virginiana*), red maple (*A. rubrum*), and canopy species. Pagoda dogwood (*Swida alternifolia*) contributes to a usually sparse tall shrub layer. The shorter shrubs are dominated by maple-leaf viburnum (*Viburnum acerifolium*). The herbaceous layer varies from sparse to intermittent, with some spring ephemerals including bloodroot (*Sanguinaria canadensis*) and trout-lily (*Erythronium americanum*). There are fewer individuals and species of spring ephemerals than in true Rich, Mesic Forest, particularly in the easternmost occurrences. Later-flowering species may include wild geranium (*Geranium*

maculatum), herb Robert (*G. robertianum*), false Solomon's seal (*Maianthemum racemosum*), wild licorice (*Galium circaezans*), maidenhair fern (*Adiantum pedatum*), bottlebrush grass (*Elymus hystrix*), and large amounts of white wood aster (*Eurybia divaricata*). Broad-leaved, semi-evergreen sedges in the Laxiflorae are common, with broad-leaved woodland-sedge (*Carex platyphylla*) being close to an indicator of the community type. Witch hazel (*Hamamelis virginiana*), hepaticas (*Anemone acutiloba* and *A. americana*), and wild oats (*Uvularia sessilifolia*) usually occur in areas of transition to surrounding forest types.

Differentiating Occurrences: Geography is basic to differentiating Sugar Maple - Oak - Hickory Forest from Rich, Mesic Forest: most occurrences of Rich, Mesic Forest in Massachusetts are west of the Connecticut River Valley. 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 (*Carex platyphylla*) is close to being an indicator of Sugar Maple - Oak - Hickory Forest. Rich, Mesic Forest is characterized by very dense herbaceous growth of spring ephemerals. Sugar Maple - Oak - Hickory Forest shares some of the ephemeral species but with fewer individuals of fewer species. Sugar Maple - Oak - Hickory Forest has evergreen ferns, Christmas fern (*Polystichum acrostichoides*) and evergreen wood ferns (such as *Dryopteris marginalis*), that Rich, Mesic Forests lack. Oak - Hickory Forests and Dry, Rich Oak Forests lack abundant sugar maple, basswood, and white ash, and lack spring ephemerals and herbaceous species indicative of rich conditions, such as herb Robert and others listed as characteristic Sugar Maple - Oak - Hickory Forest species.

Associated Fauna: Very few animal species are strongly associated with Sugar Maple - Oak - Hickory forests to the exclusion of other community types. Birds that breed in forests include Wood Thrush (*Hylocichla mustelina*), Veery (*Catharus fuscescens*), Black-and-white Warbler (*Mniotilta varia*), Ovenbird (*Seiurus aurocapillus*), Louisiana Waterthrush (*S. motacilla*), Scarlet Tanager (*Piranga rubra*), and Barred Owl (*Strix varia*). Species that breed in vernal pools are often found in surrounding forests, for example, species of mole salamanders (*Ambystoma* spp.) and spotted turtles (*Clemmys guttata*). Most of the small mammals of forests occur in rich forests, although some are limited by their geographical distribution. Southern flying squirrels (*Glaucomys volans*), grey squirrels (*Sciurus carolinensis*), woodland jumping mice (*Napaeozapus insignis*), masked shrews (*Sorex cinereus*), and red-backed voles (*Clethrionomys gapperi*) are among the widespread species whose habitat includes rich forests. Large mammals include rich forests as parts of their habitat, but are usually more dependent on size of undisturbed forest than on the precise type.

Public Access: Middlesex Fells Reservation, Stoneham; Manchester Reservoir Conservation Land, Attleboro; Wachusett Mountain State Reservation, Princeton; Palmer WMA, Palmer; Wells State Park, Sturbridge.

Threats: Occurrences are susceptible to invasive exotic species. Original easternmost version of community description: the easternmost occurrences are in very developed

areas, although two are on conservation land. The other may be developed; there is an old subdivision plan and roads.

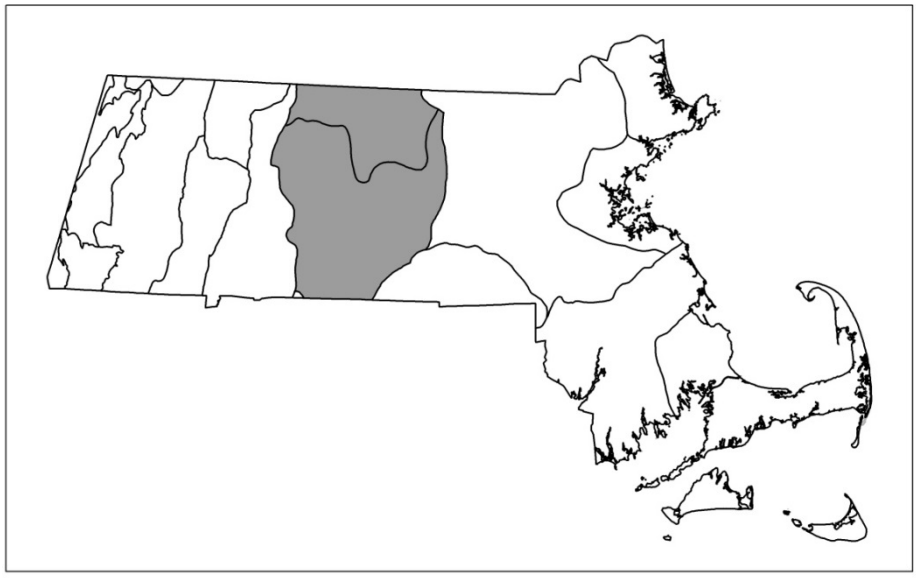
Management Needs: Removing invasive exotics as necessary and maintaining forested buffer around the occurrences would benefit the occurrences. Aside from removing invasive exotics, active management is not necessary.

USNVC/NatureServe: Related to: *Carya* (*glabra*, *ovata*) - *Fraxinus americana* - *Quercus* (*alba*, *rubra*) Forest Alliance - *Carya* (*glabra*, *ovata*) - *Fraxinus americana* - *Quercus* spp. Forest (CEGL006236). A3303 *Quercus rubra* - *Acer saccharum* - *Betula lenta* Forest Alliance - *Acer saccharum* - *Quercus rubra*/*Hepatica nobilis* var. *obtusa* Forest [CEGL006046]; A4126 *Acer saccharum* - *Tilia americana* - *Quercus rubra* Rocky Forest Alliance - *Acer saccharum* - *Fraxinus americana* - *Juglans cinerea*/*Staphylea trifolia*/*Adlumia fungosa* Forest [CEGL006577].

White Pine – Oak Forest

Community Code: CT1A100000

State Rank: S5



Concept: A forest of mixed dominance with oaks and white pine in the canopy.

Environmental Setting: White Pine - Oak Forest is a widespread successional community that occurs below 915m (3000 ft.) on slopes or flat to gently rolling moraines, till, or outwash plains. Sites are dry (but not very dry) to moist (mesic). The forest canopy is closed with mixed dominance of pines and deciduous trees in the canopy, often with a super-canopy of white pine. Indicators of past land use such as stone walls, old wood roads, and stumps may appear throughout.

Vegetation Description: White pine (25-75% cover, *Pinus strobus*) and oak species (25-75% cover, *Quercus rubra*, *Q. velutina*, *Q. alba*, *Q. coccinea*, and *Q. montana*) dominate the canopy layer in a variety of proportions. Pitch pine (*Pinus rigida*), red maple (*Acer rubrum*), white birch (*Betula papyrifera*), black birch (*B. lenta*), hickories (*Carya* spp.), American beech (*Fagus grandifolia*), and sassafras (*Sassafras albidum*) occur regularly but generally in low numbers. Chestnut (*Castanea dentata*) is frequently present as a shrubby tree. The shrub layer is variable in abundance and species. A prominent heath shrub layer, with lowbush blueberries (*Vaccinium angustifolium* and *V. pallidum*), black huckleberry (*Gaylussacia baccata*), mountain laurel (*Kalmia latifolia*), and/or sheep laurel (*K. angustifolia*), may be present. Other shrubs include maple-leaved viburnum (*Viburnum acerifolium*) and witch-hazel (*Hamamelis virginiana*). Typical species of the sparse herb layer include bracken fern (*Pteridium aquilinum*), wild sarsaparilla (*Aralia nudicaulis*), Canada mayflower (*Maianthemum canadense*), partridgeberry (*Mitchella repens*), pink lady's-slipper (*Cypripedium acaule*), cow-wheat (*Melampyrum lineare*), and whorled loosestrife (*Lysimachia quadrifolia*). Evergreen patches of club mosses such as ground-pine

(*Dendrolycopodium obscurum*), southern ground-cedar (*Diphasiastrum digitatum*), and staghorn clubmoss (*Lycopodium clavatum*) are particularly apparent in the winter.

Differentiating Occurrences: White Pine - Oak Forests have >25% cover of white pine overall (not just local patches). They are often in a successional sequence from Successional White Pine Forests: the key difference is the >25% of oaks in the White Pine - Oak Forest canopy. In southern or very dry areas, White Pine - Oak Forest may grade into Pitch Pine - Oak Forests which have >25% cover of pitch pine and <25% canopy of white pine. Related forest types in the oak continuum 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. In the northern areas, White Pine - Oak Forest may grade into Northern Hardwood - Hemlock- White Pine Forests that are dominated by sugar maple and white ash with <25% canopy cover of white pine. In these northern hardwoods forests, the only oak is red oak.

Associated Fauna: There are no species known to be restricted to the White Pine - Oak Forests; most animals in the forest are widespread generalists. Small mammals include white-footed mice (*Peromyscus leucopus*), gray squirrels (*Sciurus carolinensis*), short-tailed shrews (*Blarina brevicauda*), and chipmunks (*Tamias striatus*). Birds that nest in White Pine - Oak Forests include Eastern Wood-Pewee (*Contopus virens*), Red-eyed Vireo (*Vireo olivaceus*), Brown Creeper (*Certhia americana*), Hermit Thrush (*Catharus guttatus*), and Red-tailed Hawks (*Buteo lineatus*). If a community occurrence contains vernal pools, red-spotted newts (*Notophthalmus v. viridescens*) and spotted salamanders (*Ambystoma maculatum*) will live in the humus of the forest floor for most of their adult lives. All of the upland forest types provide valuable structural attributes, such as tree cavity den sites (which are utilized by a variety of bird and mammal species) and large woody material (which is utilized by various amphibian, reptile, and invertebrate species). Oak acorn production, an important source of wildlife food, is substantially greater in oak forest types than in northern forest types. Oaks and acorns play a fundamental role in the organization and dynamics of wildlife communities.

Public Access: Myles Standish State Forest, Plymouth; Freetown-Fall River State Forest, Freetown; Quabbin Reservation, Belchertown; Wachusett Meadow Wildlife Sanctuary (Massachusetts Audubon Sanctuary), Princeton.

Threats: Invasives can occur.

Management Needs: As a widespread successional forest occurring on previously disturbed land, generally sites do not need to be maintained. Some sites do have invasive species, such as barberry, that should be controlled if threatening more natural habitats or uncommon species.

USNVC/NatureServe: A2080 *Pinus strobus* - *Quercus prinus* Appalachian Forest Alliance - *Quercus* (*rubra*, *velutina*, *alba*) - *Betula lenta* - (*Pinus strobus*) Forest [CEGL006454]; A4209 *Quercus velutina* - *Quercus falcata* - *Pinus rigida* Coastal Plain Forest Alliance in part *Pinus strobus* - *Quercus alba*/*Ilex glabra* Forest [CEGL006382]; A4128 *Pinus strobus* - *Quercus alba* Allegheny Forest and Woodland Alliance - *Pinus strobus* - *Quercus* (*rubra*, *velutina*) - *Fagus grandifolia* Forest [CEGL006293].

Yellow Oak Dry Calcareous Forest

Community Code: CT1B2A0000

State Rank: S1

Concept: A dry, often open, oak - sugar maple forest with rich understory on shallow soil, often with areas of exposed marble or limestone bedrock.

Environmental Setting: The Yellow Oak Dry Calcareous Forest occurs on moderate to steep slopes and summits of low knolls or ridges underlain by calcium-rich limestone or dolostone. Exposed bedrock outcrops or boulders are common. The shallow soils tend to be well-drained and nutrient-rich, with a pH >6.5. The forest canopy is often somewhat open (>50% cover) and all layers have a large diversity of species. The community generally occurs as small (a few acres) patches on southwest- to southeast-facing slopes within other forest types.

Vegetation Description: Yellow oak (sometimes called chinquapin oak) (*Quercus muehlenbergii*) is the key characteristic and indicator species of Yellow Oak Dry Calcareous Forests, though rarely dominant in the canopy or subcanopy. The diverse, often somewhat open canopy is usually dominated by sugar maple (*Acer saccharum*), white oak (*Q. alba*), and black oak (*Q. velutina*), associated with red oak (*Q. rubra*), white ash (*Fraxinus americana*), shagbark hickory (*Carya ovata*), pignut hickory (*Carya glabra*), white pine (*Pinus strobus*), and hemlock (*Tsuga canadensis*). Yellow oak is often in the subcanopy, along with one or more of these canopy dominants and hop hornbeam (*Ostrya virginiana*). Tall shrubs include ironwood (*Carpinus caroliniana*), pagoda dogwood (*Swida alternifolia*), and bladdernut (*Staphylea trifolia*) with occasional prickly ash (*Zanthoxylum americanum*). The herbaceous layer tends to be rich in species. Dominant graminoids include Pennsylvania sedge (*Carex pensylvanica*), broadleaf sedge (*C. platyphylla*), thread-leaved sedge (*C. eburnea*), mountain ricegrass (*Piptatherum racemosum*), and bottlebrush-grass (*Elymus hystrix*).

Characteristic broad-leaved species include hog peanut (*Amphicarpaea bracteata*), early meadow-rue (*Thalictrum dioicum*), blunt-lobed hepatica (*Anemone americana*), lance-leaf bedstraw (*Galium lanceolatum*), broad-leaved ragwort (*Packera obovata*), and wild geranium (*Geranium maculatum*). In open, disturbed areas, red cedar (*Juniperus virginiana*) and aspen (*Populus tremuloides*) may be common, often with non-native species such as Norway maple (*Acer platanoides*), autumn olive (*Elaeagnus umbellata*), common buckthorn (*Rhamnus cathartica*), and Japanese barberry (*Berberis thunbergii*).

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

Associated Fauna: Mature upland forest types provide valuable structural attributes such as tree cavity den sites. The fauna tends to be that of generally dry forests, but with no species restricted to the Yellow Oak Dry Calcareous Forest. The patches would be parts of the habitats of wide-ranging animals.

Public Access: Appalachian Trail, Sheffield; Dohoney Property (Sheffield Land Trust), Sheffield.

Threats: High deer densities likely reduce seedling numbers below what will provide for adequate regeneration. Exotic species do well in disturbed forests: Norway maple (*Acer platanoides*), Oriental bittersweet (*Celastrus orbiculatus*), Japanese barberry (*Berberis thunbergii*), glossy buckthorn (*Frangula alnus*), shrub honeysuckles (*Lonicera morrowii*), and other invasive species can displace native species and change the structure of forests. Yellow Oak may be logged for firewood or taken as associated species are logged for timber.

Management Needs: Exotic control on best examples. Since yellow oak forests generally occur in small patches, a surrounding buffer of a larger matrix forest is likely necessary to limit the likelihood of invasive species. Oak forests generally depend on some form of disturbance, with periodic low-intensity, dormant-season fires as the normal maintenance regime. Shallow soils and steep slopes may contribute to periodic loss of canopy species, thereby opening the forest floor to greater light.

USNVC/NatureServe: A2047 *Quercus muehlenbergii - Acer saccharum - Tilia americana* Forest Alliance -- *Acer saccharum - Quercus muehlenbergii/Carex platyphylla* Forest [CEGL006162]; very likely, but not mapped to MA: *Tsuga canadensis - Acer*

saccharum - *Quercus muehlenbergii* Lower New England/Northern Piedmont Forest [CEGL006924]. N system: Central Appalachian Dry Oak-Pine Forest CES202.591.