

Fresh Pond Reservation Sustainable Landscape Management Plan

Section 1: Criteria for Plant Selection & Ecosystem Management

Approved Unanimously by Fresh Pond Reservation Master Plan Advisory Board September 19, 2019

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1.0 Guiding Principles

The 2000 *Fresh Pond Reservation Master Plan* (FPRMP) references a recommended plant species list that includes “desirable plants and trees suitable to different locations and different types of habitat in the Fresh Pond Reservation.” These lists, identified in the 1999 Fresh Pond Natural Resource Stewardship Plan, were recommended to be “revised and updated regularly by the Master Plan Advisory Board and by the Cambridge Water Department”. Stated in the FPRMP as a vegetation management priority is to “encourage a natural diversity of native plants in all areas of the Reservation, as appropriate for soil stability, health of ecosystems, and visual enjoyment of the landscape”.

Theories of planting design and ecosystem services have evolved enough in recent years that changes are necessary to keep the list current with widely-accepted sustainable principles. Human response to plants is biological, and ornamental characteristics like fruit, bloom and foliage color have long influenced plant selection and propagation. However, the understanding of plants comprising distinct and diverse natural communities above and below ground has evolved as invasive species have proliferated and native species have been displaced, disrupting ecosystem function and services.

This document identifies two significant updates to the FPR Recommended Plant Species List for restoration-driven plantings and a new explanation of the nature of native NE soil ecosystems and strategies for restoration and management. The first plant species update is the removal of species not naturally indigenous to the eastern Massachusetts Boston Basin Ecoregion. This includes those plants introduced to the ecoregion or “naturalized” at the hands of humans. The second plant update was to categorize individual species based on Massachusetts Natural Communities, as defined by the Natural Heritage and Endangered Species Program (NHESP) in 2005, where known. The updated Master Plant List additionally provides information on general habitat type, Wetland Indicator Status, and specific host pests of concern for many of the native species listed. A third, minor update, was to create a separate Landscape List, which includes a select list of resilient plants native to the eastern United States for ornamental use in high-visibility settings. These plants, while not ideally suited for ecological restoration purposes, are proven performers at FPR without posing the threat of naturalization or disruption of native plant communities.

The selection criteria for the updated FPR Restoration and Landscape Master Plan Lists still celebrate the aesthetic qualities of plants we cherish but are also guided by scientific data that demonstrate the importance of plant communities within a specific ecoregion. By placing plants within appropriate natural communities above and below ground, plants will flourish, improve ecosystem value and

diversity, and represent to the next generation of Cantabrigians a dynamic and robust version of New England character

1.1 Planting Goals:

1. Manage Fresh Pond Reservation to create and/or restore native plant communities to provide life cycle habitat and food source to native fauna, increase biodiversity, and protect and improve water quality.
2. Periodically assess the vigor of plant communities and the wildlife they support by documenting plant growth, plant reproduction, wildlife counts, etc. Assess and if needed restore native soil ecology to support native] plant communities. Use adaptive management strategies to analyze, edit and update the plant list based on these findings. Resilience to changing climate patterns and introduced pests shall also inform future updates to the master plant list.
3. Identify and interpret the use of both natural plant communities and ornamental specimens for the enjoyment and education of visitors.

1.2 Plant List Selection Criteria:

1. List, propagate and install plants native to the Boston Basin Ecoregion, an area defined by Bio Map 2 Technical Report, Massachusetts Department of Fish & Game and The Nature Conservancy, 2011. Verify the native status of plants with the most current edition of The Vascular Plants of Massachusetts: A County Checklist. Make plant lists searchable by MA native communities and habitats on the Reservation.
2. Select straight species whenever possible; to maximize habitat value, do not specify or allow substitutions of cultivars (nativars), selections, or hybrids. Exceptions include plants subject to pest infestation like *Ulmus americana*, as well as those plants on the Landscape Plant List.
3. List and install plants that do not require routine chemical treatments to protect water, soil, air quality and Reservation users.
4. Encourage the commercial nursery production and distribution of plants native to the Boston Basin ecoregion. Procure local genetic stock when possible.
5. For restoration of natural communities, avoid any use of native plants listed as Species of Special Concern by the NHESP (except when propagated from acceptable endemic populations
6. Develop a separate “Landscape List” of resilient ornamentals native to the Eastern United States for use as specimen plantings at high visibility entries and facilities. The Landscape List will reflect the historic use of plants on the Reservation as well as include plants that thrive in urban conditions. These specimen plants will not be installed or allowed to propagate in restoration areas.

D. Bitsko, Chester/Hatch Associates; D. Kaplan Cambridge Water Dept. Watershed Manager; Fresh Pond Reservation Master Plan Advisory Board Planting Committee

1.3 Native Soil Ecosystem Restoration and Management Concepts & Standards:

Native NE soils are more acidic, fungal dominant and contain higher carbon (C) to nitrogen (N) ratios than cultivated soils. To successfully restore and preserve our native plant communities their soil

biology as well as soil physical type and hydrology must also be compatible. These plant communities rely on above and belowground feedbacks systems where plants' roots exude sugars and other compounds to attract beneficial microorganisms which in turn respond with needed plant nutrients (including N [nitrogen], P [phosphorus], Ca [Calcium], Fe [iron]), root growth-promoting hormones, moisture retention and disease suppressing chemicals. Over fertilization and other incompatible soil amendments can promote the growth of invasive soil organisms that disrupt these complex systems and reduce their capacity to retain carbon.

Mycorrhizal fungi are crucial components of healthy native ecosystems. Their mycelia strands attach to plant roots extending their reach horizontally and vertically. They stabilize soils, transforming recalcitrant soil matter into plant usable chemicals and transport them along with water to roots. A single plant's root system may associate with multiple species of mycorrhizal fungi, some generalists, some highly specialized. Introduced mycorrhizal spores not native to a restored plant community may encourage the growth of invasive plants.

Three types of mycorrhizal associations support our native plant communities

Arbuscular mycorrhizal (AM) species dominate native meadow and wetlands plants. Non-native AM species promote non-native plants. *Ectomycorrhizal fungi* (ECM) enable all our native conifers and many of our native deciduous trees to thrive in soils low in mineral nitrogen and calcium. ECM mycelial networks may connect multiple trees of the same or related species processing and distributing resources from areas of abundance (of nutrients, moisture and sun) to areas of deficit. Alder, Arborvitae, Aspen, Basswood, Beech, Birch, Chestnut, Hemlock, Hickory, Larch, Oak, Pine, Poplar, and Spruce are ectomycorrhizal. Introduction of AM species into an ectomycorrhizal forest encourages the growth of invasive plants whose exudates may in turn impair the growth of the native trees and understory. *Ericoid mycorrhizal fungi* (ErM) support important native, acid loving shrubs, including Azalea, Blueberry & Cranberry. Mountain laurel associates with both ErM and ECM species.

Cautions: Adding bacteria-dominated compost—especially compost containing invasive worm cocoons—will damage tree stands and forests (including AM and ECM trees). Worms (not native to NE) and excess bacteria consume the mycelia and leaf mold protecting the soil surface, increase soil nitrogen and calcium levels and raise pH. Trees planted in soils high in mineral N and P will reduce their root exudates that support mycorrhizal fungi other beneficial organisms thus, increasing the trees' susceptibility to above and below ground diseases and desiccation. As the ratio of bacteria to fungi increases the soil's capacity to retain carbon decreases.

Transitional Plant Zones and Soil Management

To protect native plant communities, soil amendments to support non-native plants and grasses should *not be* applied along the native plant root zones. Great care should be taken especially with ectomycorrhizal tree soils. *No* incompatible soil amendments should be applied beneath the area of a tree's expected canopy at maturity. Leaf mold and/or leaf mulch applied to these areas may supply the best native soil and tree protection. Leaf litter should be left in place except over lawn areas.

Further Research

As additional studies of mycorrhizal, bacterial and invertebrate soil species key to the health of our native landscapes are refined, plant-specific soil ecosystem standards and suggested product lists can be adapted.

J. Snow; editorial review by C. Young, S. Emperador Schrauwen; Fresh Pond Master Plan Advisory Board and D. Bitsko, Chester/Hatch Associates.

2.0 Using the Updated Restoration and Landscape Master Plant Lists:

The planting goals and plant selection and sourcing criteria outlined above resulted in two plant lists with discrete yet overlapping functions. The Restoration Plant List is a flexible tool allowing for targeted selection of plants within specific habitats and natural communities as an aid to future ecological restoration work at FPR. The Landscape Plant List functions as a supplement to the Restoration Plant List, offering acceptable east-coast native plants for use in high-visibility ornamental plant beds. All plants on the Restoration Plant List may be considered for use in ornamental beds (though each plant's resiliency and ready commercial availability should be duly considered), but plants unique to the Landscape Plant List are not appropriate for use in restoration projects.

2.1 Restoration Plant List Categories:

The Restoration Plant List Table includes five columns identifying: Scientific and Common Plant Names; Native Plant Status; Habitat Type; NHESP Natural Communities; Wetland Indicator Status; and Special Conditions (see Attachment A – Restoration Plant List Table). Individual species have been categorized as follows:

- Deciduous, Evergreen and Understory Trees;
- Deciduous and Evergreen Shrubs;
- Groundcovers and Vines;
- Ferns and Mosses;
- Graminoids; and
- Forbs

The following paragraphs further define these plant categories in greater detail.

Native Plant Status

Plants native to Massachusetts can be broadly defined as “indigenous taxa considered to include Massachusetts as part of their natural range within historical times” (The Vascular Plants of Massachusetts: A County Checklist, First Revision, 2010), usually relegated to those species present prior to European settlement (estimated 1500).

More specifically, the updated master plant list identifies those plants native to both the Boston Basin Ecoregion and Middlesex County. An ecoregion is defined as “a geographic area with similar topography, geology, and predominant vegetation, representing an area of relatively homogeneous ecological settings”. Fresh Pond Reservation (Cambridge) lies within the Boston Basin Ecoregion, an area defined by a rim of low hills and outlying hilly suburban towns. The basin itself has low rolling topography and numerous urban reservoirs, lakes, and ponds (Bio Map 2 Technical Report, Massachusetts Department of Fish & Game and The Nature Conservancy, 2011). Protecting and supporting diverse ecosystems within its larger ecoregion helps to promote long-term biodiversity, providing a healthier stage for species to respond to multiple stressors associated with climate change.

Habitat Type

The designation “Habitat Type,” as defined [elsewhere] in the Sustainable Landscape Management Plan, broadly indicates the conditions (i.e. soil moisture content and the character of the dominant vegetation) in which a plant would survive and thrive. These habitat types are purposely inclusive and

generic, as many of the plants on the list (most especially among the graminoids and forbs) may be found within multiple habitat types. At Fresh Pond Reservation, the following seven habitat types have been identified as existing or possible, based on existing soils, hydrology, geology, aspect, slope, and climate.

Wetland Habitats

1. Pond:

The pond plant community occupies the fluctuating limit between the deep water habitat of the pond, where water is the principal medium in which dominant plant and animal species function, and upland areas where inundation beneath standing water is periodic or nonexistent. These plants thrive in conditions of more or less permanent standing water, from approximately six inches to the lowest depths of the pond.

For the purposes of this master plant list, we have divided pond vegetation into Open Water and Emergent categories, further broken down as follows:

Open Water: Water depths 3'-7'

- Floating: vegetation, either freely floating or rooted in the pond substrate, whose leaves rest at the water's surface (e.g. *Nymphaea odorata*)
- Submerged: vegetation whose leaves typically stay beneath the surface of the water (e.g. *Ruppia maritima*)

Herbaceous Emergent Vegetation: Including all non-woody vegetation, including forbs, grasses, rushes, and sedges. Vegetation in these categories is emergent (i.e. rooted underwater but emerging into air)

- Deep marsh: water depths 18"-3'
- Shallow marsh: water depths 6"-18"
- High marsh: water depths 0-6"

Within Fresh Pond Reservation, three out of four ponds (Fresh Pond, Little Fresh, and Black's Nook) have controlled water elevations resulting in limited seasonal fluctuations. North Pond is the only pond whose elevations are controlled naturally (without a controlled outlet structure).

2. Wet Meadow:

Plants of the wet meadow community inhabit open areas where the soil is kept consistently saturated by a high water-table. Though they may be seasonally inundated, the wet meadow is typified by a lack of standing water throughout most of the year and is dominated by grasses, rushes, sedges, and other herbaceous perennial and annual species.

Healthy Wet Meadow habitat occurs at Lusitania Meadow (restored in 2003) and adjacent to the new community gardens along Fresh Pond Parkway (restored in 2017) within the bioretention basin.

3. Scrub-Shrub Wetland:

The scrub-shrub wetland community, like the wet meadow community, occurs in areas of year-round high water tables and seasonal inundation. As its name suggests, the dominant plant type (covering at least 30% of the area) in the scrub-shrub wetland is woody vegetation less than 20' in height. This vegetation may include true shrub species as well as young or stunted tree species not yet 20' in height. These communities may be successional, marking the transition from a wet meadow to a

forested wetland, or they may be stable communities in which normally taller tree species are kept short by difficult environmental conditions. Wet meadow (non-woody) species can also be found in this community.

A few scrub-shrub wetland communities were identified in the Natural Resources Inventory (1998), but many of these have become degraded or lost due to the dominance of bittersweet (*Celastrus orbiculatus*) and other invasive species. A good example of a degraded scrub-shrub wetland is adjacent to Stream B in the Old Field/Birch Grove area. A current example of a healthy scrub-shrub habitat can be found in a restoration buffer (planted in 2012) between the FPGC Fairway 5 and Black's Nook Pond.

4. Vernal Pool:

Vernal pools are ephemeral habitats which appear seasonally within the matrix of a more stable (often upland) habitat, such as a dry grassland or a woodland. Forming anywhere the topography and soil composition allow for winter and spring precipitation to accumulate several inches of standing water, vernal pools dry out completely by summer or early fall. This precise and dramatic lifespan provides a protected aquatic breeding environment for terrestrial amphibious species without threat of predation from fish.

There are no certified vernal ponds within the Reservation. There are, however, two small areas created at Black's Nook to replicate the hydrology and vegetation associated with vernal pool habitats.

5. Forested Wetland:

Trees (woody vegetation greater than 20' in height) are the dominant vegetation species within the forested wetland, covering at least 30% of the area. Typically composed of a canopy overstory, a shrub understory, and an herbaceous groundcover level, forested wetlands are exposed to the same conditions of perpetually moist soils and periodic inundation as wet meadows and scrub-shrub wetlands. An example of a large forested wetland is the Lusitania Woodlands in the northeast quadrant of FPR.

Terrestrial (Upland) Habitats

1. Dry Grassland:

The dry grassland community is typified by open expanses of herbaceous graminoid and forb species. As the name implies, these communities are not subject to constant moisture or periodic inundation, surviving instead in areas of droughty soils. Grasslands are often semi-natural and typically require disturbance (e.g. grazing, fire, or mowing) to prevent succession into shrubland or forest communities. The west side of Little Fresh Pond abutting FPGC was restored in 2006 as a dry grassland community.

2. Woodland:

Plant communities of the upland woodland are dominated by tree species (woody vegetation greater than 20' in height) and are composed of upper canopy, understory, and groundcover layers. Like the dry grassland (which will succeed to woodland in the absence of a disturbance regime), the upland woodland thrives in areas of seasonally dry soils and no standing water. The Pine Grove and Glacken Slope areas are examples of woodland communities at FPR.

NHESP Natural Communities

NHESP Natural Communities represent a much more specific designation: as defined by the NHESP, “natural communities are assemblages of species that recur together in particular environmental conditions.” Thus, while a Habitat Type describes a set of conditions, a Natural Community represents a set of species living within those conditions. The principal source of information on the composition of these communities is the set of Natural Community fact sheets published by the NHESP. These provide an overview of the characteristics and composition of each community, as well as a list of the dominant and characteristic species typically present. They do not provide exhaustive lists of every plant found within each community. In our preparation of the updated plant list, we have therefore only labeled plants with communities to which they were specifically assigned. It is emphatically not the purpose of this designation to indicate every plant member of the community or a community for every plant member, but rather to provide a starting point, in concert with the SLMP and FPRMP, for any restoration projects which might be undertaken.

The Massachusetts Natural Heritage and Endangered Species Program (NHESP) has classified the natural communities occurring across the Commonwealth in order to establish a datum for future restoration, preservation, and conservation efforts. The following definition of the NHESP Natural Communities was taken from the Mass NHESP website (<https://www.mass.gov/service-details/natural-communities-overview>).

“Natural communities are assemblages of species that recur together in particular environmental conditions. Named types of communities have:

- structure (such as being forested or not forested),
- characteristic species that usually occur in that type of community,
- and dominant species that control or influence the growth of other species (for example, hemlock trees shade the ground so thoroughly that they limit what other species will be present).

“Physical conditions influence the types of communities that can occur in particular areas:

- degree of wetness,
- abundance of nutrients,
- presence of salt,
- and many other physical factors control the species that occur and therefore the community type.

“Natural communities are not discrete units with neat boundaries; there is overlap among and between communities in their composition, structure, and physical characteristics. Large and mobile animals often include many community types in their habitats. Natural communities may be restricted or widespread in their distribution across the state.

Identifying Existing and Viable Future Communities at Fresh Pond Reservation

Massachusetts, though relatively small as a state, contains a remarkable diversity of natural communities that grow in response to a wide range of climatic and geological conditions. Though the NHESP recognizes 106 distinct (though, as noted above, not necessarily discrete) natural communities within the state, a large portion of these are not to be found in or anywhere near Cambridge.

The following is an explanation of the process of elimination by which appropriate target communities for restoration at Fresh Pond Reservation were discerned.

1. Eliminate all marine and estuarine communities

Fresh Pond is not tidal or oceanfront.

2. Eliminate all calcareous communities

These communities are restricted within the Commonwealth to the Marble Valleys of Berkshire County, where the limestone geology enriches water with calcium.

3. Eliminate all high-elevation/northern forest communities

Cambridge does not experience the sustained cold temperatures necessary for the survival of these communities.

4. Eliminate all rocky summit/cliff/boulder communities

The exposed, harsh conditions in which these communities thrive are not to be found at Fresh Pond.

5. Eliminate all floodplain/riverine communities

While parts of Fresh Pond Reservation are subject to periodic flooding, these are not analogous to riparian floodplain communities, which receive sediment deposits and are subject to dramatic floodwater disturbance.

6. Eliminate geographically irrelevant communities*

Certain vegetative communities are native to parts of the state (e.g. Western Massachusetts, the south coast, Cape Cod) with different environmental conditions than the Boston Basin; while these communities could potentially survive in Cambridge, there is little cause to impose them in an imperfect setting

*A note about geography: The NHESP fact sheets provide a key map in the upper right-hand corner showing DFW Ecoregions wherein the community in question has been noted by the NHESP. This information is meant, as far as we can tell, to tie into the section of the fact sheet dealing with instances of the community on public land which may be visited—it is not intended to describe the geographic range of possible manifestations of the community. Certain communities (e.g. Red Maple Swamp, Shrub Swamp, Wet Meadow) which are not indicated as “known” within the Boston Basin were included within this scheme if they were determined either to be likely present within the Basin or to be an appropriate target for a restoration community.

The NHESP classification divides natural community types into three major sections:

- Terrestrial
- Palustrine
- Estuarine

2.2 Terrestrial Communities at Fresh Pond Reservation:

Woodland

Black Oak – Scarlet Oak Woodland (BOSOW)

An oak woodland with a black and scarlet oak canopy over a blueberry shrub layer maintained by regular light fire. Many types of oak communities grade into one another in time and space and are difficult to differentiate both in a classification and on the ground. They all have tree oaks and most have a low shrub layer dominated by plants of the blueberry family. BOSOW often occurs on dry slopes. Most canopy trees are relatively short (<20m, (~60 ft)) and the cover is generally interrupted rather than continuous (~60% cover). The subcanopy is sparse, and the low shrub layer dense.

Dry, Rich Oak Forest/Woodland (DROF)

A somewhat open oak-dominated canopy with occasional sugar and red maples, American beech, hickories, and scattered eastern hemlock on southwest facing mid-slopes with well-drained often rocky soils that appear to be slightly acidic and of intermediate fertility. DROF is a deciduous, predominantly oak, forest with a rich understory of herbaceous plants, including legumes, and graminoids. DROF 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.

Forest Seep (FS)

Upland forest with upland trees such as oaks, beech, or sugar maple over a small area of wetland soil and wetland herbaceous layer. FS are small wetland areas that retain the canopy of the surrounding upland forest; although they are wet they may not show up as wetlands on wetlands maps.

Hemlock Forest (HF)

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

Hickory – Hop Hornbeam Forest/Woodland (HHH)

Forests on slopes with shallow soils, with hickory species prominent in the mixed hardwood canopy, with a very sparse shrub layer that lacks blueberry family shrubs, and a nearly continuous cover of graminoids mixed. HHH have a park-like appearance with sparse shrub layer and a distinctive sedge understory. Hickories dominate the canopy with hop-hornbeam forming a subcanopy. Oaks (particularly red oak) may or may not be part of the canopy but occur in surrounding forests.

Mixed Oak Forest/Woodland (MOFW)

Deciduous oak forest/woodland with a closed to interrupted canopy formed by a variable mix of black, white, red, scarlet, and chestnut oak trees with black and white birches and red maple. MOFW is a broadly defined tree oak dominated community that grades into other more narrowly defined communities. They often occur in areas that burn regularly, with dry soils and exposed slopes. It is part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species. MOFW have more oak species than most other oak forests (black, scarlet, white, red, and chestnut oak), and birches; and lack abundant pines or hemlock, and lack hop-hornbeam and indicators of rich sites.

Northern Hardwoods – Hemlock – White Pine Forest (NHHWPF)

Tall forests with generally closed canopies of northern hardwoods mixed with hemlock and white pine. NHHWPF is a widespread forest type in northern areas or on north-facing slopes. The forest generally has sparse shrub and herbaceous layers. Although conifers are part of the forest, they may be scattered and locally in sufficiently low percentages for the forest to appear to be a deciduous forest type.

Oak – Hemlock – White Pine Forest (OHWPF)

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

Oak – Hickory Forest (OHF)

Oak forests dominated by one or several species of tree oaks with hickories prominent. A subcanopy includes hop hornbeam, flowering dogwood, and shadbush. OHF are in the middle to moist end of a continuum of forests that are dominated by oaks. They are more diverse in all the vegetation layers than many oak forests/woodlands in the continuum. The canopies of OHF are generally closed or almost closed (typically >67% cover). White and black oaks usually dominate the canopy, with red or chestnut oaks producing additional canopy cover. Hickories and scarlet oaks are consistently present but not dominant.

Open Oak Forest/Woodland (OOFW)

Oak woodland on gradual upper hill slopes below the summit, with short red (and black or hybrid) and white oak trees scattered over a huckleberry or other ericaceous low shrub layer or graminoid (grass and sedge) understory around small rock outcrops. OOFW are part of a continuum of dry, acidic communities that contain a variety of tree oak and pine species. Many types of oak communities grade into one another in time and space and are difficult to differentiate both in a classification and on the ground. They all have tree oaks and a low shrub layer dominated by blueberry family plants. They often occur between a rocky summit and the surrounding taller forest.

Pitch Pine – Oak Forest Woodland (PPOF)

Pitch pine and tree oaks dominate the canopy generally on dry, low nutrient, acidic soils. PPOF occur statewide, but form a matrix forest in SE Massachusetts. PPOF 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. Topography, soils, and local climate control the broader vegetation types. In PPOF, pitch pine produces at least 25% of the existing canopy with tree oaks also producing at least 25% of the mixed canopy.

Scrub Oak Shrubland (SOS)

Scrub oak dominated shrubland without pitch pine canopy. SOS are dominated by dense shrub oaks and lack pitch pine, on sand and on bedrock. They generally occur within Pitch Pine – Scrub Oak communities, particularly in frost bottoms and frost pockets, and on ridge tops near Ridgetop Pitch

Pine – Scrub Oak Communities. They may occur in a matrix with Sandplain Heathlands.

Successional Northern Hardwood Forest (SNHF)

The forest canopy is dominated by white birch, aspens, and red maple, with northern hardwood tree species including sugar maple, white ash, and yellow birch predominantly in the subcanopy. SNHF include young to more mature forests in the northern and western parts of Massachusetts, and on northern slopes and at elevation, that have had past major disturbances that continue to affect the diversity and structure of the forest. They are highly variable forests, usually in a successional sequence leading to NHHWPF. In the SNHF, the northern hardwoods generally occur predominantly in the subcanopy or shrub layer, not the canopy.

Successional White Pine Forest (SWPF)

Forests/woodlands with canopies dominated by white pine. State wide, although most typically in eastern, central, or southern Massachusetts or on south facing slopes in the west, north, or at elevation. SWPF are best distinguished by the >75% canopy cover of white pine. SWPF grade into NHHWPF in northern areas and the general matrix of OHWPF to the south.

Sugar Maple – Oak – Hickory Forest (SMOHF)

Deciduous forest dominated by a sugar maple and white ash with scattered basswoods and a mix of black, white, and other oaks with shagbark, pignut and/or mockernut hickories.

White Pine – Oak Forest (WPOF)

White pine and tree oaks dominate the canopy or white pines may form a super-canopy. A widespread successional community type. WPOF have >25% cover of white pine overall (not just local patches) and >25% oaks.

Grassland

Cultural Grassland (CG)

Grassland dominated by non-native grasses requiring sowing and maintenance, occur state-wide including coastal.

Sandplain Grassland – Inland Variant (SGIV)

Grassland dominated by native grasses, usually on sand or gravel substrates. SGIV is an often semi-natural open community visually dominated by native grasses on sandplains or gravel in interior parts of the state that usually need management to remain tree-less in the absence of fire. The largest areas of the community occur in the surroundings of inland airports, and on military lands and wildlife management areas on sandplains. The Inland Variant often has an abundance of non-native

and weedy species. Difficult to map. Small patches of SGIV in a mosaic with other communities may be considered to be part of the variation of the prevailing community. When communities are not distinct the best fit should be named.

2.3 Palustrine Communities at Fresh Pond Reservation:

Pond

Acidic Pondshore/Lakeshore (APL)

Vegetation associated with shores of acidic ponds and lakes that are not closed basins in sandy outwash. The APL community is broadly defined to cover most of the pondshores in the state that are not explicitly excluded such as calcareous pondshores and shores of ponds or lakes in isolated depressions on sand or gravel with regular low water cycles. Many occurrences are narrow (often <1m wide) and are submerged or saturated for a significant part of the year or continuously in wet years. In ponds or lakes that have little natural fluctuation in water levels, the shores are often shrub dominated. Shallow ponds with gradual slopes may have broader shores with emergents along the shore or, if there is regular disturbance such as water level changes or ice scour, the vegetation may be sparse.

Deep Emergent Marsh (DEM)

Wetlands dominated by tall graminoids on mucky mineral soils in deep water (<3 ft (~1 m) deep) surface water all year, including during the growing season. They occur along rivers and streams, lakes, artificial impoundments and other water bodies. DEM are tall graminoid wetlands often dominated by cat-tails, phragmites, and wool-grass growing in water from a half foot to 3 ft. deep. [Note: non-native, invasive subspecies of phragmites now dominate NE wetlands.]

Shallow Emergent Marsh (SEM)

Wetlands dominated by relatively short grasses, sedges, and rushes on mucky mineral soils that have shallow (averaging <6 in deep (15 cm)) surface water all year, including during the growing season. They often occur in broad, flat areas bordering slow rivers or along pond margins. SEM are graminoid/herbaceous wetlands that usually have shallow surface water all year. Cat-tails, phragmites, and wool-grass (the dominants of Deep Emergent Marshes) can occur but never dominate. The substrate is typically a layer of well-decomposed organic muck overlying mineral material.

Open Water (NHESP community not identified)*

Forested Wetland

Red Maple Swamp (RMS)

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

Shrub-Scrub Wetland

Highbush Blueberry Thicket (HBT)

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

Shrub Swamp (SS)

Tall (>6' (~2m)) shrub-dominated wetlands occurring on mineral or mucky mineral soils that are seasonally or temporarily flooded. SS have >25% cover of tall shrubs on mixed mineral and well decomposed organic soils. SS are a common and variable type of wetlands occurring on seasonally or temporarily flooded soils. They are often found in the transition zone between emergent marshes and swamp forests.