

Dole Brook Buffer Planting Plan

Riverside Municipal Golf Course

Portland, Maine



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DOLE BROOK BUFFER PLANTING PLAN

1. PURPOSE

The purpose of this document is to provide guidance for the Dole Brook buffer enhancement project located at the 17th hole of the Riverside Municipal Golf Course in Portland, Maine. The planting plan will discuss planting rationale (species selection, size and spacing), as well as planting methods, and a summary of maintenance requirements to ensure both short and long-term viability of the plantings. A detailed operations and maintenance guidance document will be provided to the golf course superintendant upon completion of buffer implementation as a separate project deliverable.

2. BACKGROUND

Dole Brook, a small tributary of the Presumpscot River, flows approximately 1.6 miles through the City of Portland, Maine. The Dole Brook watershed area includes 896 acres (1.4 sq mi), which includes a portion of the Riverside Municipal Golf Course. Dole Brook is a class B freshwater stream listed on the Clean Water Act's 303(d) list of impaired waters. The stream does not meet water quality standards for aquatic life use (benthic-macroinvertebrates). This impairment can be associated with erosion, streambank and habitat degradation, and polluted urban runoff.



Figure 1: View of the project area at Dole Brook on the 17th fairway at Riverside Municipal Golf Course.

The stream's headwaters are located in a wooded area just west of Washington Avenue. The stream flows north through a commercial development along Riverside Industrial Parkway, and passes under the Maine Turnpike south of Exit 52, and then flows into several wetlands prior to crossing under Riverside Street and entering the golf course. Dole Brook flows for an estimated 2,500 feet, or just under a half mile,

within the golf course, and with the exception of approximately 1,000 feet of poorly buffered stream (Figure 1), the stream contains an intact wooded buffer. This portion of Dole Brook flows through the 17th fairway on the north end of the course before entering the Presumpscot River. In 2006, FB Environmental (FBE) was hired to implement a riparian buffer planting project at the golf course. Buffer plantings were performed at the 17th hole, and small areas of no-mow zones were defined (FBE, 2006). A follow-up site visit in July of 2007 confirmed that plantings survived the winter and spring flooding with the exception of shrubs planted to the south of the cart path crossing (FBE, 2007).

On April 8th, 2013, FBE conducted a site visit at the 17th hole to document native vegetation, stream bank erosion issues, and the extent of proposed buffer widths along the poorly buffered section of Dole Brook. The project team used temporary flagging to demarcate the 25-foot riparian corridor area which will include a combination of native plantings and a no-mow zone.

A narrow vegetated buffer exists in isolated sections along the 1,000-foot segment, mainly on the north side of Dole Brook. Of particular concern is the cart path, which is causing significant bank erosion and sedimentation in three locations along the brook. For planning purposes, this segment of Dole Brook was split into four individual zones, as each zone presents unique challenges that, in turn, require unique solutions in order to help stabilize the stream bank at the 17th fairway, and ultimately improve water quality of the stream. The buffer enhancement, and in some areas establishment of a buffer, will not only reduce sediment inputs to the stream, but also provide critical habitat and shade for wildlife and aquatic species, filter nutrients from adjacent turf areas, and prevent further collapse of the stream banks.

Figure 2 (below) displays the four zones used for the Dole Brook planting plan. Starting at the most upstream reach, Zone 1 includes the portion of Dole Brook between the natural wooded buffer and the cart path crossing. Zone 2 includes the areas between the cart path crossing and the first footbridge. The area between the first and second footbridges will be called Zone 3, and the most downstream section between the second footbridge and the stone bridge will be referred to as Zone 4. Species selection and placement of vegetation within each zone was based on several considerations such as existing native vegetation, stream bank stability, spacing requirements, in-play vs. out-of-play areas, frequency of flooding, and golf course superintendant and expert recommendations.



Figure 2: Zones 1-4 at the Dole Brook Planting Enhancement Site

3. EXISTING NATIVE VEGETATION

While some native vegetation was documented along the banks of the stream within the project area, there are large portions of the brook that lack any vegetation other than grass. This is because the area has been managed as a golf course, and cut short to the edge of the stream in many locations. FBE documented existing vegetation throughout the project area, as well as within the natural riparian corridors to the south and north of the site. In many cases, plant species within the naturalized areas were recommended for the planting plan within each zone. The species selected for the 2006 planting plan (FBE, 2006) were also taken into consideration. The 2006 plant list included:

Vaccinium corymbosum (high bush blueberry)
Swida sericia (red osier dogwood)
Spiraea alba (meadowsweet)
Spiraea tomentosa (steepleshub)
Alnus incana (speckled alder)

Viburnum dentatum (arrowwood viburnum)
Ilex verticillata (common winterberry)
Prunus virginiana (chokeberry)
Viburnum trilobum (cranberry bush)

In addition to the species listed above, coniferous trees were planted in 2006 at the request of the golf course superintendent. This list includes *Pinus strobus* (eastern white pine), *Abies balsamea* (balsam fir), *Pinus resinosa* (red pine), and *Tsuga canadensis* (eastern hemlock). Existing vegetation observed in each of the four zones within the project area along Dole Brook during the April 8, 2013 site visit is described below.

Zone 1

The upstream section of Dole Brook is adjacent to a natural wooded corridor to the south. Other than grass, no vegetation was observed in this reach, as mowing occurs right to the edge of the brook. Species found within the wooded area to the south include:

Salix discolor (pussy willow)
Solidago sp. (golden rod)
Fraxinus pennsylvanica (green ash)
Spiraea alba (meadowseet)
Onoclea sensibilis (sensitive fern)
Alnus incana (speckled alder)



Existing vegetation in Zone 2 - looking northeast from the cart path crossing.



Zone 1 – Looking south west from the cart path crossing.

Species selected for Zone 1 build upon the adjacent natural wooded buffer. However new species that are hardy and flood resistant were also chosen for this zone.

Zone 2

This zone contains the most vegetation, largely due to the 2006 buffer planting which included several trees and small shrubs. Common species in this zone include:

- Pinus strobus* (eastern white pine)
- Pinus resinosa* (red pine)
- Abies balsamea* (balsam fir)
- Viburnum dentatum* (arrowwood viburnum)
- Swida sericia* (red osier dogwood)
- Alnus incana* (speckled alder)

Proposed plantings for this zone consist of species that have adapted successfully in the past. Additionally, flowering shrubs and perennials will be planted around the footbridge.

Zone 3

The most severe stream bank erosion occurs within this zone. Few species were observed here. However, some species present include:

- Swida sericia* (red osier dogwood)
- Acer rubrum* (red maple)

A variety of species will be chosen for this zone. Willow staking will also be conducted in areas with the most severe bank erosion and slumping.

Zone 4

Zone 4 is the smallest zone within this reach of Dole Brook recent cutting along the brook was observed during the site visit and little to no vegetative buffer exists here. Existing vegetation is herbaceous.



Zone 2 – Looking south east.



Zone 3 – Looking north from footbridge.



Zone 4 - Looking south from the stone bridge.

4. VEGETATION SELECTION AND SPACING

Utilizing the FBE 2006 plant list, list of documented native vegetation, and expert recommendations, the section of the planting plan will describe species selection, plant spacing and rationale for each zone.

Plant spacing is based on past experience with similar buffer enhancement projects, and personal communication with Pierson's Nursery (Pierson, 2012). Shrubs and small trees will have an average spacing of 8-10 feet. Small shrubs, groundcovers, and herbaceous species will have an average spacing of 1-4 feet.

Recommended plant size is for mid-range to larger plants, and more established plants, as larger plants will be more capable of withstanding occasional grazing by wildlife, and require less maintenance during the early stages of growth. This in turn, will be a more cost effective approach to the buffer planting plan. Larger plants will also be more competitive with other grasses and forbs growing within the natural buffer. Smaller/herbaceous plants will require weeding and regular inspection, or otherwise may be out-competed by fast-growing grasses and existing species along Dole Brook.

Zone 1

Due to limited existing vegetation within this area, the goal in Zone 1 is to build upon species present in the naturally wooded riparian corridor to the south. In addition, high bush blueberry (*Vaccinium corymbosum*) is recommended here for aesthetics and wildlife considerations. Edible berries and flowers will be attractive to golfers playing the 17th hole, as well as birds and other wildlife. However, since blueberries prefer slightly acidic soils, soil amendments will be considered in this location to ensure plant success. Through personal communication with the golf course superintendent, Gene Pierotti, we found that plant height is not of concern in this zone as it is mostly out-of-play for golfers. To build up the natural buffer, various willow species, meadowsweet, steplebush, dogwood and alders will be used.

Meadowsweet and steplebush are wetland plants that can adapt to a variety of wet habitats including stream banks. They have large white or pink pyramidal-shaped flowering pinnacles that bloom mid-summer through early fall. These flowers attract bees, butterflies and birds. Red osier dogwood also has attractive flowers in the spring and summer that turn into berries that last well into winter. Alders are ideal for areas of frequent flooding along with willows which also have great rooting depth (NRCS, 2013). Black willow, in particular, can get quite tall when mature. These are recommended in this zone because height is not of concern here.

The proposed addition of high bush blueberry and rhodora along the southern banks was selected due to flood tolerance and species association. Both these species are flood tolerant which is necessary since this zone experiences seasonal flooding; especially near the cart path crossing culvert.

Adjacent to the stream crossing is an area of severe erosion potentially caused by misalignment of the culvert. Willow staking is suggested in this area (approximately 5' x 5') in addition to vegetative plantings to further stabilize the bank and limit exposed soils.

Plant List for Zone 1

<i>Salix Discolor</i> (pussy willow)	<i>Alnus incana</i> (speckled alder)
<i>Salix petiolaris</i> (meadow willow)	<i>Vaccinium Corymbosum</i> (high bush blueberry)
<i>Salix nigra</i> (black willow)	<i>Rhododendron canadense</i> (rhodora)
<i>Spiraea alba</i> (meadowsweet)	<i>Swida sericia</i> (red osier dogwood)
<i>Spiraea tomentosa</i> (steeplebush)	

Zone 2

The goal in Zone 2 is to add to the existing buffer with similar vegetation. Flooding is not as frequent in this zone, with the exception of the portion nearest to the cart path crossing. Existing vegetation consists of hardy shrubs and larger conifers. Planting additional red osier dogwood is recommended here. Steeplebush, found commonly in Zone 4 will also be planted to add to the aesthetics of this area; particularly near the footbridge where golfers cross Dole Brook to retrieve lost golf balls. Steeplebush, as mentioned earlier, has large pink flower clusters that bloom mid-summer through fall and attract bees, butterflies and other wild life. Perennial plantings at the opening of the footbridge path will also be attractive to golfers and wildlife while bringing color to this portion of Dole Brook.

Though arrowwood viburnum is growing in the northern portion of this zone, FBE recommends using alternative species due to the potential threat of the viburnum leaf beetle. Both the larvae and adult beetles feed upon leaves of various viburnum species causing dieback, and ultimately killing the plant. Infestations have been more common in the northeast, and the beetles can destroy a plant in as little as 3 days. To prevent complete loss of buffer plantings, gray dogwood (*Cornus racemosa*) and downy serviceberry (*Amelanchier arborea*) is recommended (Garland, 2013).

Four larger black willows are also recommended on the northern bank at the sharp bend in this zone. Since larger shrubs and trees are currently growing here, height is not of major concern. Large willows will add to the existing buffer, help stabilize the banks, and provide shading to the aquatic life within Dole Brook.

Plant List for Zone 2

<i>Swida sericia</i> (red osier dogwood)	<i>Salix nigra</i> (black willow)
<i>Cornus racemosa</i> (gray dogwood)	<i>Spiraea tomentosa</i> (steeplebush)
<i>Amelanchier arborea</i> (downy serviceberry)	

Zone 3

The goal in Zone 3 is to establish a buffer of hardy, deep rooting species, and to conduct live willow staking in the areas of most severe stream bank erosion and slumping. Since very little buffer currently exists in this zone, a variety of species are to be considered to ensure buffer establishment.

Black Chokeberry is recommended along the southern bank of this zone in the location of the original cart path. This species tolerates wet clay soils and spreads easily as new shoots will sprout up adjacent to adult

plants (NRCS, 2013). The area of the cart path needs to be vegetated by a spreading shrub to ensure that golfers stay out of the buffer area. This area of Dole Brook is close to the fairway, and for aesthetic purposes, will also have a variety of hardy and flowering shrubs that are attractive to both golfers and wildlife.

Plant List for Zone 3

<i>Amelanchier arborea</i> (downy serviceberry)	<i>Swida sericia</i> (red osier dogwood)
<i>Salix nigra</i> (black willow)	<i>Spiraea tomentosa</i> (steepleshub)
<i>Salix petiolaris</i> (meadow willow)	<i>Alnus incana</i> (speckled alder)
<i>Ilex verticillata</i> (common winterberry)	<i>Aronia melanocarpa</i> (black chokeberry)

Zone 4

The old stone bridge at the most downstream point of the reach is a historic focal point within the golf course, and therefore, an important design consideration for the buffer enhancement. At the request of the golf course superintendant, low growing perennial species will be planted nearest to the bridge to ensure that the unique features of the bridge remain visible to the public. The selected vegetation will add to the beauty of the stream crossing, incorporating perennial ferns, flowering shrubs, and groundcovers that are attractive to wildlife and visually pleasing to the golfers playing the 17th hole. Hardier shrubs, such as winterberry, willow, summersweet and dogwood, will be planted farther upstream of the bridge to prevent further bank erosion, and prevent cart traffic through the newly established buffer zone.

The buffer in this stream segment is more gently sloping compared with the stream banks in the other three zones, allowing for a greater variety of vegetation planted closer to the brook. Also, as in other zones, perennial plantings are recommended around the footbridge paths for aesthetic purposes.

Plant List for Zone 4

<i>Ilex verticillata</i> (common winterberry)	<i>Salix petiolaris</i> (meadow willow)
<i>Swida sericia</i> (red osier dogwood)	<i>Salix bebbiana</i> (long-beaked willow)
<i>Spiraea tomentosa</i> (steepleshub)	<i>Salix sericia</i> (silky willow)
<i>Spiraea alba</i> (meadowsweet)	<i>Clethra alnifolia</i> (summersweet)
<i>Amelanchier arborea</i> (downy serviceberry)	<i>Athyrium filix-femina</i> (lady fern)
<i>Vaccinium angustifolium</i> (low bush blueberry)	<i>Comptonia peregrina</i> (sweet fern)
<i>Lobelia cardinalis</i> (cardinal flower)	

5. PLANTING METHODOLOGY

Methods for plan implementation are based on Portland Water District's facts sheets for Planting and Maintaining Buffers. Additionally, Maine DEP sedimentation and erosion control BMPs for vegetated buffers and permanent vegetation will be followed when applicable. Willow staking methods will be based on Portland Water District guidelines outlined in the live staking procedures fact sheet. This document discusses stake species and size, installation, spacing and maintenance of live stake areas.

Site Preparation

Prior to implementation, the 25-foot buffer area will be marked by FBE. This zone should be free of trash, debris, and roots to provide a workable environment for the buffer plantings.

Cart Path Removal and Seeding

Golfers access the 17th hole via a gravel cart path that follows along the southern banks of Dole Brook. Approximately 430 feet of this path lies within the 25 foot buffer zone. For future success of plantings, and reduction of erosion and sedimentation to Dole Brook, the cart path will be moved to the south side of the 17th hole and away from Dole Brook. The portions of the existing path that lie within the buffer zone will be removed and reseeded or converted to buffer planting areas. Figure 3 (right) shows the location of the existing cart path, and the approximate location of the proposed new cart path to the south of the fairway.

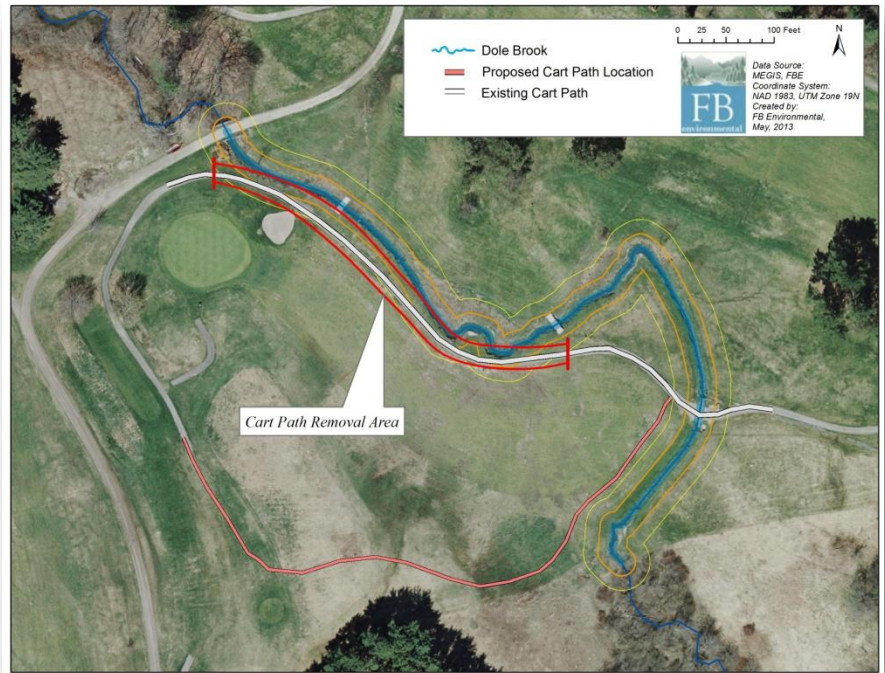


Figure 3: Existing and proposed cart path locations.

The process of removing the cart path will require the removal of existing compacted gravel to a depth of about 3 inches, the addition of loam, and the reseeded of loamed areas. The dimensions for both the amount of gravel to be removed and loam necessary for seeding is below:

$$(430 \text{ ft of cart path}) \times (0.25 \text{ ft depth of gravel removed}) \times (3 \text{ ft wide path}) = 322.5 \text{ ft}^3 \text{ of loam needed for seeding}$$

The removal of the existing cart path will require minimal soil disturbance as sub soils will not be raked or tilled. The loam needed for seeding success in these clay soils will be immediately seeded and covered as suggested in Maine’s Erosion and Sediment Control BMP for permanent vegetation. All erosion and sediment control BMPs are outlined below in the Erosion Control Plan.

Erosion Control Plan

Erosion controls will be used during the cart path removal, seeding of loamed areas, and during the buffer planting implementation. Minimal soil will be disturbed as point plantings will be dug using an auger, and immediately back filled and covered with erosion control mulch upon placement of vegetation.

Sediment barriers will be used along Dole Brook within the cart path removal areas. Though minimal soil disturbance, proper controls will be in place in case of rain or storm event. Erosion control filter socks will be utilized for this project. FBE feels this will be most effective in providing erosion control during cart path removal and planting implementation. Sediment barriers such as silt fences and hay bales could further erode areas around Dole Brook prone to slumping and be less effective along this sinuous stretch of the Brook.



Erosion control socks used to prevent sediment from moving on a slope in California.

Sediment barriers will be installed prior to the cart path removal and removed only when all areas of disturbed soils are stabilized following buffer planting implementation. Areas of exposed soils will be covered with erosion control mulch and the cart path removal areas will be seeded. FBE will conduct site visits once a week to determine when erosion controls can be removed. Sediment barriers must be removed within 30 days of final site stabilization (NRPA, Chapter 305).

Planting Layout and Method

The planting layout is located in **Appendix A**. FBE will serve as the lead for plan implementation, working with volunteers and other technical staff to implement the planting plan in July 2013. A technical leader will be assigned to each planting zone to assist inexperienced volunteers. Prior to planting, the technical leader will flag the location of all plants within the zone, and place markers in each plant to ensure that the right plants are planted in the proper location.

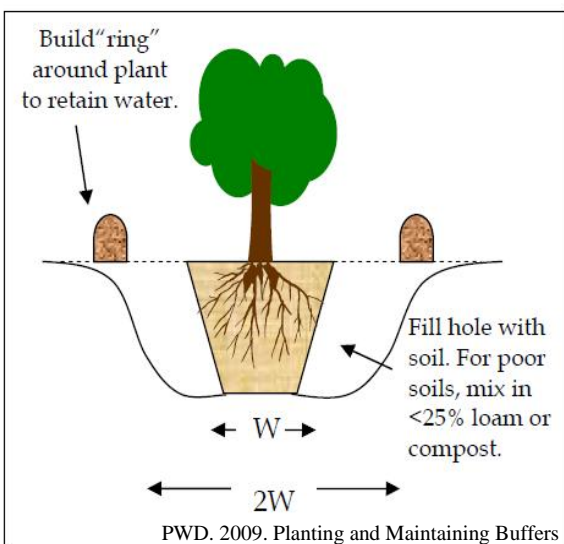


Figure 4: *Planting method for the Dole Brook buffer enhancement.*

Figure 3 (right) shows how each plant should be properly placed in the ground. Note that the top of the root ball should always be level or slightly above the ground. Planting too deep can potentially kill the plant. Once the plant is securely in the ground, 2 – 4 inches of erosion control mulch should be placed over areas of exposed soil (PWD, 2009).

Soil Amendments

Soil structure is a key factor in successful plant growth, and improving the soil structure around Dole Brook will help ensure success of buffer plantings. Though the clayey soils on the site may be difficult to cultivate, they are fairly fertile and are able hold nutrients essential for plant growth. To amend the heavy clay soil, organic matter will be added during the planting process. Adding organic matter to the soil around the plants will improve soil particle aggregation and drainage, and increase water and nutrient storage -- in turn reducing erosion and polluted runoff. Also, clay soils tend to have a high cation exchange capacity, stay saturated for longer periods of time, and require less frequent fertilization (UMaine Cooperative Extension – “*Soil and Plant Nutrition*”).

6. MAINTENANCE OF VEGETATION AND NO-MOW ZONES

Year 1

During the first year, particularly in the summer months, deep watering on a weekly basis will be critical to the success of the buffer enhancement. During the first growing season, be sure to look for invasive species within the buffer area. If invasive species are documented, they should be addressed immediately to prevent further spread. Areas around plantings may be weeded if necessary, but should not be raked or continually mulched.

Year 2

Continue to allow area to naturalize. After the first year, weekly watering is not necessary unless dry conditions bring below normal precipitation levels. Fertilization is also unnecessary if plants are growing normally. Inspect the buffer frequently for invasive species and areas of erosion or concentrated flow paths. If invasive species are documented, they should be addressed immediately to prevent further spread.

Year 3+

Continue to maintain the buffer by replacing any plants that did not survive, and inspect for invasive species and areas of concentrated flow. If invasive species are documented, they should be addressed immediately to prevent further spread. Areas of concentrated flow should be addressed by redirecting the runoff away from the brook, and bare soil areas should be revegetated.

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Appendix A

Dole Brook Planting Plan Layout