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Weymouth Waterfront Walkway
Vegetation Management Plan
Draft: 17 November 2017

Town of Weymouth Coastal Bank Restoration Guidelines

From the Massachusetts Executive Office of Energy and Environmental Affairs' Coastal Zone Management website for Landscaping a Coastal Bank:

"Many of the coastal banks in Massachusetts are landforms deposited by the last glaciation. Some coastal banks are not glacial in origin, including bedrock banks or sediment banks that were deposited prior to the glaciers (though [these] may have subsequently been eroded, weathered, or displaced by glaciers). Given their origin, coastal banks may be composed of various materials, ranging from solid bedrock to sediments consisting of silt, sand, or unconsolidated rocks and soil. The banks that are unconsolidated and are exposed to wave and wind energy are subject to erosion. Planting these areas can:

- Help reduce erosion and stabilize the bank (reducing potential storm damage)
- Effectively replace engineered structures
- Enhance wildlife habitat and aesthetics

Selecting plants that are appropriate for the rugged conditions of a coastal bank will help ensure that the landscape serves these benefits.

Planting to Help Reduce Erosion and Stabilize Coastal Banks

The stability of coastal banks made up of loose materials such as sand, rocks, or soils can be greatly improved by plants. A thickly planted area can prevent the surface runoff of rainwater or snow melt from creating gullies or ruts in the bank. Plants also absorb the water that falls to the ground or enters the groundwater, reducing the seepages within a bank that could cause landslides, slumps, or a bank collapse. Rows of thick drought-tolerant grasses planted across the face of a bank create a natural barrier that slows water runoff and allows sediment to be deposited, allowing the bank to gradually build up. (Be sure to avoid planting rows of plants in such a way that they channel the water downhill and increase erosion.) A strip of dense shrubs, perennials, or deep grasses along the top of a coastal bank can also limit access and foot traffic that may otherwise aggravate erosion or be a safety concern.

Grasses that are extremely tolerant of the salt spray and exposure to wind and waves, such as American beachgrass (*Ammophila breviligulata*), can help build up windblown sediments on the face of banks or bluffs, and effectively bind the soil with their thick, fibrous root systems. The roots of beachgrass can establish themselves quickly, while allowing other plants to take hold. Other native grasses and smaller low-growing shrubs, such as switchgrass (*Panicum virgatum*), bearberry (*Arctostaphylos uva-ursi*), and common juniper (*Juniperus communis*), can be grown on the slopes of banks—their root structure and surface area also provide stability. Larger native shrubs, such as bayberry (*Myrica pensylvanica*) and beach plum (*Prunus maritima*), are also good choices for exposed areas of a coastal bank since they are hardy and tolerant of salt spray and drought. Trees, such as black cherry (*Prunus serotina*), pitch pine (*Pinus rigida*), Eastern red cedar (*Juniperus virginiana*), and white oak (*Quercus alba*), may be beneficial for stability, since their root structures are either deep or spreading. However, locating trees on banks should be done carefully to ensure that the weight of the tree does not contribute to bank instability. In general, trees should be placed on lower slopes or set back from steep slopes. On steep slopes where planting is difficult, biodegradable erosion fabric, such as coconut fiber or coir mesh, may be used as a temporary erosion control effort, before plants take root.

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Plantings can buffer wave energy while maintaining natural sediment transport, and are therefore allowed under state and local wetlands protection regulations. Plantings are also substantially less expensive and more aesthetically appealing than structural measures. And while any form of bank stabilization interferes with the natural processes of erosion, plants are a more natural stabilizer. But, they need to be live plants with roots—brush, vegetative debris, discarded Christmas trees, and other materials act to limit the growth and establishment of plants, do not help bind soils, and therefore should not be placed on top of (or on the face of) a coastal bank.

Very few species of plants are resilient enough to withstand the rugged conditions on a coastal bank. Dry, sandy soils and exposure to salt and wind make a very specific niche for only the hardiest of plants to survive. Picking the right plants will save you time and money and will better serve the environment. Certain native species have survived and thrived in this environment for years and are therefore the obvious choice for planting. The top and face of the coastal bank is where the landform is most exposed to wind, salt spray, and storm waves."

Additional information from Massachusetts Executive Office of Energy and Environmental Affairs' Coastal Zone Management can be found at: http://www.mass.gov/eea/agencies/czm/program-areas/stormsmart-coasts/coastal-landscaping/

Town of Weymouth Conservation Commission Design Guidelines for planting on Coastal Banks

1. All plant species (trees, shrubs & perennials) listed as invasive species in Massachusetts shall be removed from site. Identified invasive species are listed on the Massachusetts Executive Office of Energy and Environmental Affairs' Department of Agricultural Resources Massachusetts Prohibited Plant List (http://www.mass.gov/eea/agencies/agr/farm-products/plants/massachusetts-prohibited-plant-list.html) or identified by the Massachusetts Invasive Plant Advisory Group. (https://www.mass.gov/service-details/invasive-plants)
    a. Trees may be cut flush to grade with the stump remaining and treated with an herbicide tinted with green dye.
    b. Shrubs, perennials, and vines shall be removed including as much of their root zone as possible without damaging or de-stabilizing the coastal bank.
2. Maintain and protect any trees, shrubs, perennials, and vines that are not listed on the Massachusetts Prohibited Plants List from the State's Office of Energy and Environmental Affairs, or by Massachusetts Invasive Plant Advisory Group.
3. Revegetate coastal bank with appropriate trees, shrub, and ground cover species. Preference will be for salt tolerant species native to Massachusetts. Fast growing species and those with deep and/or rhizomatous root zones will be planted in all areas to ensure stability of the bank. See plant selection chart; attached.
    a. Vegetative coverage shall be 75% by 5 years after installation – meaning that species are densely planted at the maximum spacing recommended or closer. Shrubs should comprise 45-60% of the area coverage.
    b. Planting area shall cover 100% of disturbed areas and areas with invasive removal.

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c. Minimal plant sizes have established as the following:

Canopy trees:	6’ or 10 gallon deciduous
Understory trees:	5’ or 7 gallon deciduous/5’ multi-stem/5’ height evergreen
Large shrub:	3 gallon deciduous/24”-36” evergreen
Small shrub:	2 gallon deciduous/18”-24” evergreen
Groundcover:	1 gallon deciduous/evergreen
Perennial:	1 gallon

4. All disturbed areas must be reseeded with a salt tolerant seed mix or native and/or naturalized grass seed species. A cover crop must also be applied with the seed mix. See seed mix recommendations; attached.
    a. Application rates must match those specified by the manufacturer.

5. Per the Town of Weymouth’s Order of Conditions, all slopes over 3:1 must be covered with an erosion control blanket which shall be biodegradable and contain no synthetic materials. An erosion control blanket made of 100% coconut fiber with biodegradable woven jute on both sides is recommended.

6. It is recommended that the homeowner contracts with a qualified environmental restoration specialist to prepare an invasive species control plans and/or planting plan to ensure it meets requirements set herein.

7. Planting should be arranged in a manner so to mimic naturalistic plantings without planting in rows which will reduce the benefit of planting for erosion control.

8. Vista pruning of non-invasive species may be allowed, if approved by the Weymouth Conservation Commission.

9. All debris, including pruned or removed vegetation, as well as non-organic debris, shall be removed from site and legally disposed of.

10. Any impacts to established plantings of American beachgrass (*Ammophila breviligulata*) will be restored to a pre-construction condition.
    a. American beachgrass shall be planted three (3) culms per planting hole and spaced 18 inches on center.

11. No work (removal, pruning, or planting) may commence until approval with an Order of Conditions has been issued by the Weymouth Conservation Commission. The homeowner must comply with all conditions set forth in the associated Order of Conditions as issued, including but not limited to:
    a. Operation and maintenance log
    b. Erosion and sedimentation controls
    c. Vehicular access and scheduling

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Estimated costs

Clearing and plantings costs will vary depending on existing conditions, including previous disturbances of vegetation, diversity of existing vegetation (trees versus shrubs/vines, etc.), the coverage of invasive plants in the vegetated areas, steepness of coastal bank, remoteness from roadway or construction access, contractor, etc. These estimated costs per 10 square feet should be used for budgetary purposes only and a site assessment and planting plan for individual sites will be necessary.

- The homeowner should assume an additional 8%-10% consultant fee for preparation of removal and planting plans and permitting.
- Removal costs have greater variability based on existing conditions, and may range from $300-$600 per 100 square feet of coastal bank. An average of $475 per 100 sq ft coastal bank has been estimated. The steeper the bank and longer over-beach access for construction vehicles will increase costs, and areas of coastal bank with more dense invasive vegetation and/or areas with significant trees will also increase costs.
- The revegetation with native, salt tolerant species, with a coverage of 75% of coastal bank may range from $650-725 per square foot of disturbed coastal bank based on the conditions set forth in the design guidelines established above. An average of $685 per 100 sq ft coastal bank has been estimated.

As an example, a homeowner wanting to establish a set of stairs from their residence down the coastal bank to the public beach could assume the following for the removal of invasive plants and the revegetation of an area:

- Assume a 50 foot long stair, with a vegetation clearing established for 12 feet on either side of the proposed 3 foot wide stair = 50’ x 27’ = 1,350 sf to be cleared and revegetated
- Assume 1,350 sf/100 x $475 average clearing = $6,412.50 for clearing
- Assume 1,350 sf/100 x $685 average planting = $9,247.50 for planting
- Assume 10% design consultation fee = $1565
- Total project fee = $17,225.00

Exceptions & exclusions

- Cost of stair (labor and materials) is not included in the estimated costs.
- Additional erosion control measures (coir logs, live stakes, etc.) may be necessary in areas showing erosion. These measures are not included in the estimated costs.

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Coastal Bank Restoration Guidelines – Plant Palette

All species listed below are native to Massachusetts; all species are considered salt tolerant. Some of these species are less commercially available at standard nurseries, and need to be sourced from nurseries specializing in native species and/or ecological restoration.

Follow town of Weymouth Conservation Commission design guidelines for panting on coastal banks for required species diversity.

Botanical name	Common name	Height	Tolerance/Attributes	Characteristics
Canopy trees:				
Nyssa sylvatica	Black gum, sweet gum	40’ to 80’	Use sparingly: low salt tolerance	Good food source for wildlife; distinctive branching habit; attractive fall foliage color
Populus deltoides	Cottonwood	75’ to 100’	Fast growing; expansive root system stabilizes slopes	Buds & catkins provide food for birds
Populus tremuloides	Quaking aspen	50’ to 60’	Pioneer species; can form colonies supporting banks	Good food source for wildlife
Prunus serotina	Black cherry	To 80’		Provides food for wildlife
Quercus alba	White oak	To 100’	Deep root system helps to stabilize slopes	Acorns provide food source for wildlife
Understory tree:				
Betula lenta	Sweet birch, black birch	To 60’	Pioneer species; tolerates low fertility; moderate salt tolerance	Aromatic bark
Betula papyrifera	Paper birch	50’ to 70’	Fast growing; pioneer species; moderate salt tolerance	Peeling white bark
Betula populifolia	Gray birch	20’ to 40’	Fast growing; pioneer species; moderate salt tolerance	Non-peeling white bark
Juniperus virginiana	Eastern red cedar	10’ to 40’	Pioneer species; good for a windbreak	Evergreen; provides food, protection & nesting cover for birds
Pinus rigida	Pitch pine	To 50’	Pioneer species	Evergreen

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Botanical name	Common name	Height	Tolerance/Attributes	Characteristics
Large shrubs:				
Amelanchier canadensis	Shadbush, downy serviceberry	To 20’	Should be planted towards the top of coastal bank where protected from wave action	Attractive foliage color & bloom; good food source for birds
Aronia arbutifolia	Red chokeberry	6’ to 10’	Root growth helps to stabilize slopes; moderate salt tolerance	Attractive foliage color & bloom; good food source for birds
Clethra alnifolia	Sweet pepperbush	6’ to 12’	Thicket-forming; good for bank stabilization; best planted towards the top of bank	Provides food & cover for birds; good pollinator species; fragrant blooms
Cornus racemosa	Gray-stem dogwood	To 12’	Root growth helps to stabilize slopes	Provides food for birds
Cornus sericea	Redtwig dogwood	6’ to 10’	Rapidly growing; root growth helps to stabilize slopes	Provides food for wildlife
Ilex glabra	Inkberry	6’ to 12’	Root growth helps to stabilize slopes; best planted towards the top of bank	Evergreen; both make & female plants are necessary for berry production
Morella pensylvanica	Bayberry	5’ to 7’	Thicket forming; root growth helps to stabilize slopes	Evergreen; good food source for birds; aromatic leaves
Prunus depressa	Sand cherry		Mat-forming shrub is excellent for erosion control	Attractive red-purple foliage year round
Rhus typhina	Staghorn sumac	To 15’	Fast growing; root growth helps to stabilize slopes	Attractive fall foliage; good food source for birds
Salix discolor	Pussy willow	6’ to 15’	Good for bank stabilization	Attractive buds
Sambucus canadensis	Elderberry	6’ to 10’	Fast growing; root growth helps to stabilize slopes	Edible fruit & wildlife food source; attractive blooms
Small shrubs:				
Ceanothus americanus	New Jersey tea	3’ to 4’		Attractive blooms
Comptomia pelegrina	Sweet fern	2’ to 4’	Root growth helps to stabilize slopes	Aromatic leaves
Prunus maritima	Beach plum	4’ to 6’	Rapidly growing; root growth helps to stabilize slopes	Edible fruit & wildlife food source
Rosa virginiana	Virginia rose	To 0.5’	Fast growing	Attractive blooms
Vaccinium angustifolium	Lowbush blueberry	To 2.5’		Edible fruit & wildlife food source; attractive fall foliage
Vaccinium corybosum	Highbush blueberry	To 6’		Edible fruit & wildlife food source

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Botanical name	Common name	Height	Tolerance/Attributes	Characteristics
Groundcover:				
Arctostaphylos uva-ursi	Bearberry	0.5' to 1'	Root growth helps to stabilize slopes	Attractive fall foliage; good food source for wildlife
Juniperus communis	Common juniper	1' to 2'		Evergreen; good food source for birds; size & spread dependent on wide selection of commercially-available varieties
Perennials:				
Andropogon gerardii	Big bluestem	To 6'	Moderate salt tolerance; must be planted towards top of coastal bank; root growth helps to stabilize slopes	Provides attractive winter interest; provides shelter & food source for birds & wildlife
Asclepias tuberosa	Butterfly weed	To 2'	Moderate salt tolerance; must be planted towards top of coastal bank; root growth helps to stabilize slopes	Attractive blooms; attracts pollinators & butterflies
Aster spectabilis	Eastern showy aster	1' to 2'	Root growth helps to stabilize slopes	Attractive blooms;
Echinacea purpurea	Purple coneflower	To 4'	Use sparingly: low salt tolerance	Attractive blooms; attracts pollinators & butterflies
Gaillardia aristata	Blanket flower	To 2'	Use sparingly: low salt tolerance	Attractive blooms
Liatris spicata	Blazing star, gayfeather	To 4'	Use sparingly: low salt tolerance	Attractive blooms; attracts pollinators & butterflies
Panicum virgatum	Switchgrass	3' to 6'	Root growth helps to stabilize slopes	Provides cover & nesting materials for birds & wildlife
Penstemon digitalis	Beardtongue	To 4'	Moderate salt tolerance	Attractive blooms; attracts pollinators & butterflies
Solidago sempervirons	Seaside goldenrod	To 4'		Attractive looms

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Seed mix recommendations:

Seed mix recommendations have been provided, but substitutions may be considered and must be approved by the Town of Weymouth's Conservation Commission. Application rates must match those specified by the manufacturer.

This seed mix is specially blended to provide a selective of native and naturalized grasses that tolerate salty conditions on upland areas that receive salt spray. This seed mix will assist in quickly revegetating recently disturbed sites.

The seed mix shall contain the following species:

- *Andropogon gerardi* (big bluestem)
- *Elymus Canadensis* (Canada wildrye)
- *Festuca rubra* (creeping red fescue)
- *Juncus tenuis* (path rush)
- *Panicum amarum 'Atlantic'* (Atlantic coastal panic grass)
- *Panicum virgatum* (switch grass)
- *Sorghastrum nutans* (Indiangrass)

This seed mix is available as *New England Salt Tolerant Grass Mix* from New England Wetland Plants of Amherst, MA and as *New England Coastal Salt Tolerant Grass Mix* from Ernst Seeds of Meadville, PA

Application information:

- Seeding rate of this mix is 45 pounds per acre.
- A cover crop must be applied to assist in establishment and stabilization of soils. Use a cover crop of 30 pounds per acre *Avena sativa* (grain oats) from Jan 1 to Aug 1 or *Secale cereale* (grain rye) from Aug 1 to Jan 1 with this mix.
- Always apply on clean, weed-free bare soil. Fertilization is not required unless the soils are particularly infertile.
- Seed mixes can be applied by hydro-seeding or by hand for small areas.
- Best results are obtained with a spring seeding and will benefit from a light mulch of weed-free straw (not hay) to conserve moisture. If conditions are later than usual, watering may be necessary.
- Per the Town of Weymouth's Order of Conditions, all slopes over 3:1 must be cover with an erosion control blanket which shall be biodegradable and contain no synthetic materials. An erosion control blanket made of 100% coconut fiber with biodegradable woven jute on both sides is recommended.