

18.0. LAND BORDERING ON THE OCEAN

18.1. Coastal Banks

a) Preamble. Coastal banks composed of unconsolidated sediment and exposed to wave action serve as a major source of sediment for other coastal landforms, including beaches, dunes, and barrier beaches. The supply of sediment is removed from such *sediment source* banks by wave action. It is a naturally occurring process necessary to the continued existence of coastal beaches, coastal dunes, and barrier beaches. These areas protect public safety because they dissipate storm wave energy, thus protecting structures and coastal wetlands landward of them from storm damage, erosion, and flooding.

Coastal banks, because of their height and stability, may act as a *vertical buffer* or natural wall, which protects upland areas from storm damage, erosion, and flooding. While erosion caused by wave action is an integral part of shoreline processes and furnishes important sediment to downdrift landforms, erosion of a coastal bank by wind and rain runoff, which plays only a minor role in beach nourishment, should not be increased unnecessarily. Disturbance to a coastal bank which reduce its natural resistance to wind and rain erosion causes cuts and gullies in the bank, and decrease its value as a vertical buffer. Vegetation tends to stabilize a coastal bank and reduce the rate of erosion due to wind and rain runoff. Undisturbed vegetated areas along banks are critical to reducing wind and rain erosion from at the top of the bank.

A particular coastal bank may serve as a *sediment source* and a *vertical buffer* or it may serve only one role. Coastal banks of either type provide habitat for wildlife, particularly nesting birds and provide habitat for rare plant and animal species where these occur. Characteristics of coastal banks which are critical to wildlife are bank steepness (i.e., slope), height, stability, soil grain size and compaction or consolidation, and vegetation cover and type. Coastal banks provide scenic views of the coast and in a natural condition are scenic in themselves, thus providing opportunities for birdwatching, hiking, photography, and other recreation. Land within 100 feet of the top of any coastal bank is significant to the protection and maintenance of a bank and therefore the wetland values.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering or building upon a coastal bank or land within a minimum of 100 feet from the top of a coastal bank, the Commission shall presume that the bank is significant to the protection of the following wetland values: flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; protection of wildlife and wildlife habitat; protection of rare species habitat, including rare plant and animal species; protection of recreation; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the coastal bank does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as 310 CMR 10.30 (2). In addition, a Sediment Source (i.e., eroding) Coastal Bank is a coastal bank which is or could be, as determined by the Conservation Commission, undergoing erosion or landward retreat and which is supplying sediment to a nearby Coastal Beach (including Tidal Flat), Coastal Dune, or Barrier Beach. A non-eroding, Vertical Buffer Coastal Bank is a coastal bank which is stable and is not undergoing and never will be, as determined by the Conservation Commission, erosion or landward retreat and which is not supplying sediment to a nearby Coastal Beach, Coastal Dune, or Barrier Beach.

d) Performance Standards.

1) When a Coastal Bank is determined to be a Sediment Source (i.e., eroding coastal bank), the following regulations shall apply:

- a) Proposed work shall not cause any adverse effect or cumulative adverse effect on the wetland values of the Coastal Bank.
- b) All projects shall be restricted to activities as determined by the Commission to have no adverse effect and no cumulative adverse effect on the ability of the eroding coastal bank to serve as a sediment source to coastal Resource Areas, bank height, bank stability, bank vegetation and wildlife habitat.
- c) All projects must provide a buffer strip to the top of the Coastal Bank that is sufficient to protect the values and functions of this type of Coastal Bank and to allow such Coastal Banks to continue to serve as a sediment source to coastal Resource Areas.
- d) Notwithstanding the above, minimal elevated walkways designed not to affect bank vegetation and sediment transport may be permitted to allow for pedestrian passage over a bank, provided that the ability of the bank to serve as a sediment source and its stability are not adversely affected.
- e) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- f) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

2) When a Coastal Bank is determined to serve solely as a Vertical Buffer Coastal Bank, the following regulations shall apply:

- a) Proposed work shall not cause any adverse effect or cumulative adverse effect on the wetland values of the Coastal Bank.
- b) All projects shall be restricted to activities as determined by the Commission to have no adverse effect on bank height, bank stability, bank vegetation and wildlife habitat.
- c) The Commission may allow projects to approach the top of such a Vertical Buffer Coastal Bank, which meet all other performance standards for the Coastal Bank, or condition such projects so that they meet all performance standards.
- d) Notwithstanding the above, elevated walkways designed not to affect bank vegetation and bank stability may be permitted to allow for pedestrian passage

over a bank, provided that the stability of the bank and wildlife habitat are not adversely affected.

- e) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- f) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

3) When a Coastal Bank is determined to serve as both a Sediment Source and a Vertical Buffer Coastal Bank, the performance standards specified for Sediment Source Coastal Banks shall take precedence over the performance standards specified for Vertical Buffer Coastal Banks.

4) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

18.2. Coastal Beaches and Tidal Flats

a) Preamble. Coastal beaches dissipate wave energy by their gentle slope, their permeability, and their granular nature which permit changes in beach form in response to changes in wave conditions. Coastal beaches serve as a sediment source for dunes and subtidal areas. Steep storm waves cause beach sediment to move offshore, resulting in a gentler beach slope and greater energy dissipation. Less steep waves cause an onshore return of beach sediment, where it will be available to provide protection against future storm waves. A coastal beach at any point serves as a sediment source for coastal areas downdrift from that point. The oblique approach of waves moves beach sediment along shore in the general direction of wave action. Thus a coastal beach is a body of sediment which is moving along the shore. Coastal beaches serve to prevent storm damage, erosion control, and flood control by dissipating wave energy, by reducing the height of storm waves, and by providing sediment to supply other coastal features, including coastal dunes, land under the ocean, and other coastal beaches. Interruptions of these natural processes by man-made structures reduce the ability of the coastal beach to perform these functions.

Coastal beaches are important for wildlife, shellfish and fisheries habitat and provide habitat for rare species of plants and animals where these occur. Coastal beaches are extremely important in recycling of nutrients derived from storm drift and tidal action. Vegetative debris along the drift line is vital for resident and migratory shorebirds, which feed largely on invertebrates which eat the vegetation. Below the drift line in the lower intertidal zone are infauna (invertebrates such as mollusks and crustacea) which are also eaten by shore birds. A number of birds also nest in the coastal berm between the toe of a coastal dune and the high tide line. In addition, isolated coastal beaches are important as haul out and resting areas for seals.

Coastal beaches and tidal flats are the most heavily used recreation areas of the town and provide opportunities for recreation, fishing, fowling, hunting and navigation. They are important for recreational and commercial shellfishing, fishing, and aquaculture. Coastal

beaches are aesthetically important when they are in a natural condition and do not contain imposing structures. They are part of the classic New England landscape.

Tidal flats are significant to fisheries and wildlife habitat because they provide habitats for marine organisms such as polychaete worms and mollusks, which in turn are food sources for fisheries and migratory and wintering birds. Tidal flats are also sites where organic and inorganic materials may become entrapped and then returned to the photosynthetic zone of the water column to support algae and other primary producers of the marine food web.

Coastal beaches and tidal flats serve as important habitats for a wide variety of wildlife. The degree of isolation from human-caused disturbances is a feature of a coastal beach, which is critical for the protection of wildlife. Coastal beaches and tidal flats are used by coastal birds for feeding areas, nesting sites, and resting sites. The natural erosional and depositional cycles, sediment grain size, water quality (including but not limited to turbidity, temperature, nutrients, pollutants, salinity, and dissolved oxygen) and circulation, and elevation of the land surface are all features of wildlife habitat which are critical elements for the protection of wildlife.

Characteristics of coastal beaches and tidal flats which are critical to the protection of fisheries, shellfish, and aquaculture include: distribution of sediment grain size, movement of sediment, water quality (including the characteristics given above), and water circulation, and beach relief topography, slope and elevation. Characteristics of coastal beaches and tidal flats which are critical to prevention of storm damage, erosion control, or flood control include sediment volume and form, their ability to respond dynamically to wave action, natural erosional and depositional cycles, and wave intensities.

Characteristics of coastal beaches and tidal flats which are critical to recreation are topography, sediment grain size, water quality (including the characteristics given above), water circulation rates and patterns, unobstructed access along shore, natural erosional and depositional cycles, and wave intensity. Characteristics of coastal beaches which are critical to aesthetics are natural erosion and deposition cycles, relief topography, slope and elevation, sense of openness and solitude. Land within 100 feet of a coastal beach or tidal flat is considered to be important to the protection and maintenance of coastal beaches and tidal flats, and therefore to the protection of the wetland values. The degree of isolation from human-caused disturbances is a desirable feature of a coastal beach, which is a critical element for the protection of wildlife.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering, building upon or degrading a coastal beach or flat or within a minimum distance of 100 feet of a coastal beach or flat, the Commission shall presume that the beach or flat is significant to the protection of the following wetland values: flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and wildlife habitat;

protection of rare species habitat, including rare plant and animal species; protection of recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the coastal beach or tidal flat does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as 310 CMR 10.27 (2).

d) Performance Standards. When a Coastal Beach, Tidal Flat or land within a minimum distance of 100 feet of a Coastal Beach or Tidal Flat is determined to be significant to a wetland value, the following regulations shall apply:

1) Any project on a coastal beach shall not cause an adverse effect or cumulative adverse effect by increasing erosion, decreasing the volume or changing the form of any such coastal beach or an adjacent or downdrift coastal beach.

2) Notwithstanding the above, beach nourishment with clean sediment of a grain size compatible with that on the existing beach may be permitted provided there is no permanent adverse effect upon the wetland values or upon submerged aquatic vegetation.

3) When tidal flats are significant to protection of shellfish, shellfish habitat, fish or fisheries, the performance standards for Land Containing Shellfish (DWR 18.5) shall apply.

4) In addition to complying with the requirements of DWR 18.5, a project on a tidal flat shall have no adverse effect or cumulative adverse effect, on fisheries and/or wildlife habitat caused by alterations in water circulation, alterations in the distribution of sediment grain size, and changes in water quality, including, but not limited to, other than natural fluctuations in the levels of dissolved oxygen, temperature or turbidity, or the addition of pollutants.

5) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect or cumulative adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.

6) Refer to Section DWR 23.0 et seq. for additional project-specific performance standards.

7) Performance standards for activities or work proposed in the buffer zone to a Coastal Beach or Tidal Flat are specified in DWR 22.0.

8) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.3. Coastal Dunes

a) Preamble. Coastal dunes aid in storm damage prevention, erosion control, and flood control by supplying sand to coastal beaches. Coastal dunes protect inland coastal areas from storm damage and flooding by storm waves and elevated sea levels because such dunes are higher than the coastal beaches which they border. Vegetated cover contributes to the growth and stability of coastal dunes by providing conditions favorable to sand deposition. On retreating shorelines, the ability of coastal dunes bordering a coastal beach to move landward at the rate of shoreline retreat allows these dunes to maintain their form and volume. Characteristics of coastal dunes which are critical for storm damage prevention, flood control, and erosion control include: ability of dune to erode and change in response to coastal beach conditions; dune volume, sediment grain size, and slope; dune form which can change with wind and natural water flow; amount, continuity, and density of vegetative cover; and ability of the dune to move landward or laterally.

Coastal dunes are important habitats for a wide variety of wildlife, particularly birds and rare species of plants and animals where these occur, for feeding and nesting areas. Amount of vegetation, dune height and slope, sediment grain size, and degree of isolation from human-caused disturbances are all features of dunes which are critical characteristics for the protection of wildlife. The pervious nature of coastal dunes allows for the infiltration of surface waters and therefore recharges groundwater and public and private water supplies, and also filters out pollutants. Characteristics of coastal dunes which are critical to protection of aesthetic values and wetland scenic views are dune form, slope, elevation, size of dunefield, degree of isolation, proportion and scale of dunes in relationship to other land forms. Land within 100 feet of a coastal dune is considered to be significant to the protection and maintenance of coastal dunes, and therefore to the protection of the wetland values which these areas contain. The degree of isolation from human-caused disturbances is a desirable feature of a coastal dune, which is a critical element for the protection of wildlife.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering or building upon a coastal dune or within 100 feet of a coastal dune, the Commission shall presume that the dune is significant to the protection of the following wetland values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and wildlife habitat; protection of rare species habitat, including rare plant and animal species; protection of recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the dune does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as 310 CMR 10.28 (2).

d) Performance Standards. When a Coastal Dune or land within a minimum distance of 100 feet of a Coastal Dune is determined to be significant to a wetland value, the following regulations shall apply:

- (1) A proposed project shall not cause any adverse effect or cumulative adverse effect on the ability of a Coastal Dune to migrate or undergo other change in shape, volume of sediment or location due to natural processes.
- (2) With the exception of engineered coastal dunes, no new coastal revetments or coastal engineering structures of any type shall be constructed on a Coastal Dune.
- (3) Pedestrian walkways must be designed as determined by the Commission so as to minimize disturbance of vegetative cover.
- (4) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37.
- (5) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- (6) Performance standards for activities or work proposed in the buffer zone to a Coastal Dune are specified in DWR 22.0.
- (7) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw..

18.4. Salt Marshes

a) Preamble. A salt marsh is a highly productive type of coastal wetland that produces large amounts of organic matter and provides valuable habitat. A significant portion of this material is exported as detritus and dissolved organics to estuarine and coastal waters, where it provides the basis for a large food web that supports many marine organisms, including fish and shellfish. Salt marshes also provide spawning and nursery habitat for several important estuarine forage fish. Salt marsh plants and substrate

remove pollutants from surrounding waters. The network of salt marsh vegetation roots and rhizomes bind sediments together. The sediments absorb chlorinated hydrocarbons and heavy metals such as lead, copper and iron. The marsh also helps retain nitrogen and phosphorus compounds which can cause algal blooms and changes in ocean plankton and plant communities, particularly eelgrass.

The underlying peat serves as a barrier between fresh groundwater landward of the marsh and the ocean, thus helping to maintain the level of the groundwater and protecting public and private water supplies by preventing saltwater intrusion.

Salt marsh vegetation, cord grass, and underlying peat and soils are resistant to erosion and dissipate wave energy, thereby providing a buffer that reduces wave damage and coastal erosion. Salt marshes are important feeding areas for many types of fish, shellfish, invertebrates, and aquatic and terrestrial wildlife. The marsh, including its creeks and open water, also provides important shelter for many aquatic and migratory birds. The degree of isolation from human-caused disturbances is critical for the protection of wildlife. Where rare species of plants and animals occur, salt marsh provides important rare species habitat.

Marshes help absorb pollutants, but there is a careful balance of nutrient and pollutant input. Because the marsh is the basis for such a large food web, bioaccumulation of pollutants and toxins can mean that relatively low levels of pollutants may be detrimental. Some of the characteristics of salt marshes which are critical to their health and ability to protect wetland values include: the growth, composition, and distribution of salt marsh vegetation; the amount of flow and level of both tidal and fresh water; the water quality (including but not limited to turbidity, temperature, nutrients, pollutants, salinity, and dissolved oxygen) of both tidal and fresh water; the presence and depth of peat; rate of marsh productivity; and the diversity of the animals and plants making up the marsh community. Salt marshes provide excellent areas for recreational activities such as bird watching, boating, hunting, fishing and shellfishing. Salt marshes in a natural condition are aesthetically valuable. Land within 100 feet of a salt marsh is considered to be significant to the protection and maintenance of salt marshes, and therefore to the protection of the wetland values.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering or building upon a salt marsh or within a minimum distance of 100 feet of a salt marsh, the Commission shall presume that the salt marsh is significant to the protection of the following protected values: protection of public or private water supply; protection of groundwater; flood control; erosion and sedimentation control; storm damage prevention, including coastal storm flowage; prevention of water pollution; protection of fisheries; protection of shellfish; protection of wildlife and wildlife habitat; protection of rare species habitat, including rare plant and animal species; protection of recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the salt marsh does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as CMR 310 10.32 (2).

d) Performance Standards. When a Salt Marsh or land within a minimum distance of 100 feet of a Salt Marsh is determined to be significant to a wetland value, the following regulations shall apply:

- (1) A proposed project shall not cause any adverse effect or cumulative adverse effect upon salt marsh productivity and wetland values of a salt marsh.
- (2) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate and rare plant species, as identified by procedures established under 310 CMR 10.37.
- (3) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- (4) Performance standards for activities or work proposed in the buffer zone to a Salt Marsh are specified in DWR 22.0.
- (5) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

18.5. Land Containing Shellfish

a) Preamble. Shellfish are one of the wetland values protected by the Bylaw. Land containing shellfish is found within many of the Resource Areas protected by the Bylaw. In addition to the regulations for those Resource Areas as given above in these regulations, this section discusses additional protection for shellfish and shellfish habitat. Land containing shellfish is important to the protection of marine fisheries in addition to the protection of shellfish. Shellfish in the Town of Duxbury are a very important recreational and commercial resource and an important economic commodity for fishermen and the Town. Shellfish used as a human food resource need very clean, uncontaminated water, since they have the ability to concentrate very low levels of pollutants. Shellfish are a valuable renewable resource. The maintenance of productive shellfish beds not only assures the continuance of shellfish themselves but also plays a direct role in supporting fish stocks by providing a major food source.

Characteristics of land containing shellfish which are critical to the protection of shellfish include, but are not limited to, are: water circulation patterns, rates of water flow, and amounts of water; the relief, elevation, distribution, grain size, and pollutant load of the sediments; water quality (including turbidity, temperature, pollutants, nutrients, salinity, and dissolved oxygen); and public access to the site for the purpose of shellfishing, fishing, hunting, or navigating. Opportunities for recreational shellfishing and shellfish aquaculture help maintain the coastal aesthetics values and enhances the coastal experience of the Town.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering or building upon land containing shellfish or the water over land containing shellfish or within a minimum distance of 100 feet of such land, the Commission shall presume that the land containing shellfish is significant to the protection of the following wetland values: prevention of water pollution; protection of fisheries; protection of shellfish; protection of recreation; protection of aquaculture; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that land containing shellfish does not play a role in protecting one or more of the values given above. The Commission may require information on historical abundance or harvests of shellfish, a shellfish habitat survey, or other information concerning historical or existing shellfish habitat at the site.

c) Definition – Same as 310 CMR 10.34 (2).

d) Performance Standards. When a Land Containing Shellfish or land within a minimum distance of 100 feet of Land Containing Shellfish is determined to be significant to a wetland value, the following regulations shall apply:

- (1) A proposed project shall not cause any adverse effect or cumulative adverse effect on Land Containing Shellfish.
- (2) A proposed project shall not change water quality (including but not limited to changes in turbidity, temperature, salinity, dissolved oxygen, nutrients and pollutants), water circulation, or natural drainage from adjacent land.
- (3) A proposed project shall not obstruct or limit the ability of the public to gather shellfish recreationally or the ability of commercial fishermen to harvest shellfish or obstruct or limit an existing aquaculture project.
- (4) Notwithstanding the above provisions, no project may be permitted which will have any adverse effect on specified habitat of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.37.
- (5) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
- (6) Performance standards for activities or work proposed in the buffer zone to Land Containing Shellfish are specified in DWR 22.0.
- (7) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.