(2) No new coastal revetments or hard coastal engineering structures of any type shall be constructed on a barrier beach.
(3) No activities or structures shall be permitted which prohibit the natural movement of sand and water along the beach, or which prohibit the inland migration of the barrier beach.
(4) No activities or structures shall be permitted which increase storm damage, erosion, sedimentation, flooding of adjacent properties or Resource Areas, or which cause adverse effects on the wetland values.
(5) 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.
(6) Refer to 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 Barrier Beach 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.

21.0. RIVERS

21.1. Riverfront Area

a) Preamble. Riverfront areas are likely to protect private or public water supply, protect groundwater, provide flood control, provide erosion and sedimentation control, provide storm damage prevention, prevent pollution, protect land containing shellfish, provide wildlife and wildlife habitat, protect fisheries, provide rare species habitat where rare species occur, and provide recreational and aesthetic values. Land adjacent to rivers and streams can protect the natural integrity of these water bodies. The presence of natural vegetation within riverfront areas is critical to sustaining rivers as ecosystems and providing these public values. The riverfront area can prevent degradation of water quality by filtering sediments, toxic substances (such as heavy metals), and nutrients (such as phosphorus and nitrogen) from stormwater, nonpoint pollution sources, and the river itself. Sediments are trapped by vegetation before reaching the river. Nutrients and toxic substances may be detained in plant root systems or broken down by soil bacteria. Riverfront areas can trap and remove disease-causing bacteria that otherwise would reach rivers and coastal estuaries where they can contaminate shellfish beds and prohibit safe human consumption. Natural vegetation within the riverfront area also maintains water quality for fish and wildlife.

Where rivers serve as water supplies or provide induced recharge to wells; the riverfront area can be important to the maintenance of drinking water quality and quantity. Land along rivers in its natural state with a high infiltration capacity increases the yield of a water supply well. When riverfront areas lack the capacity to filter pollutants, contaminants can reach human populations served by wells near rivers or by direct river

intakes. The capacity of riverfront areas to filter pollutants is equally critical to surface water supplies, reducing or eliminating the need for additional treatment. In the watershed, mature vegetation within riverfront areas provides shade to moderate water temperatures and slow algal growth, which can produce odors and taste problems in drinking water.

Within riverfront areas, surface water interaction with groundwater significantly influences the stream ecosystem. The dynamic relationship between surface and groundwater within the "hyporheic zone" sustains communities of aquatic organisms which regulate the flux of nutrients, biomass and the productivity of organisms including fish within the stream itself. The hyporheic zone extends to greater distances horizontally from the channel in large, higher order streams with alluvial floodplains, but the interaction within this zone is important in smaller streams as well.

By providing recharge and retaining natural flood storage, as well as by slowing surface water runoff, riverfront areas can mitigate flooding and damage from storms. The root systems of riverfront vegetation keep soil porous, increasing infiltration capacity and preventing erosion. Vegetation also removes excess water through evaporation and transpiration. This removal of water from the soil allows for more infiltration when flooding occurs. Increases in storage of floodwaters can decrease peak discharges and reduce storm damage. Vegetated riverfronts also dissipate the energy of storm flows, reducing damage to public and private property.

Riverfront areas are critical to maintaining thriving fisheries. Maintaining vegetation along rivers promotes fish cover, increases food and oxygen availability, decreases sedimentation, and provides spawning habitat. Maintenance of water temperatures and depths is critical to many important fish species. When groundwater recharges surface water flows, loss of recharge as a result of impervious surfaces within the riverfront area may aggravate low flow conditions and increase water temperatures. In some cases, summer stream flows are maintained almost exclusively from groundwater recharge. Small streams are most readily impacted by removal of trees and other vegetation along the shore.

Riverfront areas are important wildlife habitat, providing food, shelter, breeding, nesting, migratory, and overwintering areas for wildlife and for rare species where they occur. Even some predominantly upland species use and may be seasonally dependent on riverfront areas. Riverfront areas promote biological diversity by providing habitats for an unusually wide variety of upland and wetland species, including bald eagles, osprey, and kingfishers. Large dead trees provide nesting sites for bird species that typically use the same nest from year to year. Sandy areas along rivers may serve as nesting sites for turtles and water snakes. Riverfront areas provide food for species such as wood turtles which feed and nest in uplands but use rivers as resting and overwintering areas. Riverfront areas provide corridors for the migration of wildlife for feeding or breeding. Loss of this connective function, from activities that create barriers to wildlife movement within riverfront areas, results in habitat fragmentation and causes declines in wildlife

populations. Wildlife must also be able to move across riverfront areas, between uplands and the river.

Vernal pools are frequently found within depressions in riverfront areas. These pools are essential breeding sites for certain amphibians and obligate and facultative vernal pool species of plants and animals which require isolated, seasonally wet areas without predator fish. Some vernal pool species, particularly amphibians, require areas of undisturbed woodlands as upland habitat during the non-breeding seasons. Some species require continuous woody vegetation between woodland habitat and the breeding pools. Depending on the species, during non-breeding seasons these amphibians may remain near the pools or travel one-fourth mile or more from the pools. Reptiles, especially turtles, often require areas along rivers to lay their eggs. Since amphibians and reptiles are less mobile than mammals and birds, maintaining integrity of their habitat is critical.

Riverfront areas in a natural condition are aesthetically valuable and offer opportunities for recreational fishing, hunting, canoeing, camping, swimming and other recreational activities. In those portions so extensively altered by human activity that their important wildlife habitat functions have been effectively eliminated, riverfront areas are not significant to the protection of important wildlife habitat and vernal pool habitat.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering or building upon a Riverfront Area, the Commission shall presume that the land 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; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the Riverfront Area does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as 310 CMR 10.58 (2). The Inner Riparian Zone is the area from 0 – 100 feet from the river's mean annual high water line; and the Outer Riparian Zone is the area from 100 – 200 feet from the river's mean annual high water line, stream or creek.

d) Performance Standards. When a Riverfront Area is determined to be significant to a protected value, the following regulations shall apply:

(1) Except as stated below, the Commission hereby incorporates 310 CMR 10.58 in its regulations for all matters related to Bylaw jurisdiction in lands within 200 feet of rivers and streams.
(2) Notwithstanding the above, a river is any natural flowing body of water that empties to any ocean, lake, pond, other river, stream or wetland and which

flows throughout the year. Perennial rivers, streams and creeks are rivers; intermittent streams are not. Notwithstanding 310 CMR 10.58, the burden of proof shall be on any applicant to show that a river, stream or creek is not perennial (i.e., is intermittent).

(3) For any river or stream that is tidally influenced, the Commission, upon any claim that any such waters do not qualify as a river under these regulations, shall consider factual information and evidence concerning the degree of tidal effects, including but not limited to, water body morphology, flow, volume, tidal range, salinity, wildlife habitat, shellfish habitat, fish and fisheries, and the nature of other Resource Areas in determining whether or not the water body is a river or stream or not. The burden of proof shall be on the applicant to demonstrate that the flowing body of water does not have primarily riverine characteristics.

(4) Notwithstanding any provisions of 310 CMR 10.58, the Commission shall presume that the mean annual high water line of a non-tidal river is coincident with the outer (landmost) boundary of any Bordering Vegetated Wetland (as defined in these regulations) that may be adjacent to the river. This presumption may be overcome upon a clear showing that the mean annual high water line is closer to the river. Such evidence may include hydrological measurements and calculations prepared by a registered professional engineer and/or hydrologist, and/or stream flow stage data from U.S. Geological Survey stream gauges and survey. For non-tidal rivers lacking any Bordering Vegetated Wetland, the inner boundary of the 200-foot Riverfront Area shall be the top of Inland Bank as determined by the first observable break in slope or the mean annual flood level, whichever is lower. For tidal rivers, the inner boundary of the 200-foot Riverfront Area shall be the mean annual high water line.

(5) Notwithstanding any provisions of 310 CMR 10.58, the alternatives analysis shall include only lots adjacent to the lot(s) being proposed for development, or located in the near vicinity.

(6) 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 10.59.

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

(8) Refer to DWR 23.0 et seq. for additional project-specific performance standards.

21.2. Anadromous/Catadromous Fish Runs, Banks along Fish Runs, and Lands Under Fish Runs

a) Preamble. Fisheries are one of the wetland values under the Bylaw. Anadromous and catadromous fish are renewable natural resources that provide recreational and

commercial benefits. In addition, throughout their life cycle such fish are important components of freshwater, estuarine, and marine environments and are food sources for other organisms. Fish runs provide habitats for other fish, shellfish and wildlife. Characteristics of fish runs which are critical to the protection of anadromous/catadromous fish include: ease of fish passage upstream and downstream, accessibility of spawning and nursing grounds to fish, volume and rate of water flow in both migratory and spawning areas, and water quality (including turbidity, temperature, pollutants, nutrients, salinity, pH, and dissolved oxygen). Fish runs are important for recreational and commercial fisheries, and provide aesthetically valuable areas for such activities.

b) Wetland Values and Presumption of Significance. Whenever a proposed project involves removing, filling, dredging, altering, or building upon a fish run or within a minimum distance of 100 feet of a fish run, the Commission shall presume that the fish run is significant to the protection of the following wetland values: 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; and protection of aesthetics. These presumptions may be overcome only upon a clear showing that the fish run and the land under a fish run does not play a role in protecting one or more of the wetland values given above.

c) Definition – Same as 310 CMR 10.35 (2).

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

(1) A proposed project shall not cause an adverse effect or cumulative adverse effect upon the wetland values of a Fish Run.
(2) Proposed projects shall not be permitted to fill a fish run, impede the upstream or downstream migration of fish, or change the volume, rate or quality of water flow or water quality in a fish run.
(3) 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 for Coastal Resource Areas or 310 CMR 10.59 for Inland Resource Areas.
(4) Refer to DWR 23.0 et seq. for additional project-specific performance standards.
(5) Performance standards for work or activities proposed in the buffer zone to a Fish Run are specified in DWR 22.0.
(6) The Commission may impose such additional requirements as are necessary to protect the wetland values protected under the Bylaw.

22.0. BUFFER ZONE

a) Preamble. The 100-foot buffer zone to Resource Areas specified in the Bylaw and in DWR 2 (1-5) provides critical protection for Resource Areas. Most human activities likely to come under the review of the Commission take place in the buffer zone.

Adverse effects to Resource Area buffers are likely to have an adverse effect and cumulative adverse effect on the wetland values.

A buffer zone in a naturally vegetated condition can act like wetlands in removing nitrogen and phosphorus from entering receiving waters by serving as sinks, filters and transformers of suspended and dissolved nutrients. A buffer can remove 50-100% of sediments via filtration through natural organic litter. Absorption of ground water via mature trees can take up 14 times more water than an equivalent area of grass. Bank and stream channel stability is dependent on the anchoring ability of root systems and slowing of runoff velocity and flow diffusion provided by the buffer. Vegetation in the buffer can act to moderate water column temperatures and levels of dissolved oxygen.

The higher the water temperature, the more deleterious the effects of release of nutrients (phosphorus and nitrogen) from sediments. As nutrient concentrations in water increase, the likelihood of algal blooms and eutrophication increases, resulting in lower oxygen levels. The buffer provides corridors and connector and dispersal routes for wildlife, as well as habitat for breeding, nesting, development, feeding, basking, cover, hibernation, aestivation, and migratory activities.

Buffers reduce the adverse effects of adjacent land uses on wetlands. Buffers reduce wetland impacts by moderating impacts of stormwater runoff including stabilizing soil to prevent erosion; filtering suspended solids, nutrients, and harmful or toxic substances; and moderating water level fluctuations. Buffers help to prevent water pollution and protect public or private water supplies. They reduce the adverse impacts of human disturbance on wetland habitat including blocking noise and glare; reducing sedimentation and nutrient input; reducing direct human disturbance from dumped debris, cut vegetation, and trampling; and providing visual separation. They also provide essential habitat for wetland-associated species for use in feeding; roosting; breeding and rearing of young; and cover for safety, mobility and thermal protection.

Wetlands with important functions and values or wetlands which are sensitive to disturbance will require greater buffers to reduce the risk of disturbance. Wetland functions, values, and sensitivity are attributes that will influence the necessary level of