

Embryo Dunes



Embryo Dune Field, Plymouth Beach

Photo: Jim Fenton

**Submitted in support of Appeal and Request for Superseding Order of
Conditions
For Plymouth Long Beach Management Plan
Plymouth, Massachusetts
DEP File No. SE57-2339**

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Definition: Embryo dunes or shadow dunes are dry beach features (above mean high water/wracklines) that are formed by wind deposited sand on and leeward of wracklines, flotsam, vegetation, and driftwood. These objects decrease the wind velocity and allow the wind blown sand to be deposited on the downdrift side. These embryo dunes can form embryo dune fields and become the seaward edge of future foredunes. On some beaches dunes migrate seaward as well as landward in the Northeast. The demonstration project that was done on four private properties on Long Beach this summer documents that the embryo dunes would become the seaward edge of the foredunes.



Embryo dune field formation in 42' travel corridor after ORV closure (7/13/08)



Embryo dune field in 42' travel corridor destroyed by ORVs after reopening (8/9/08)

Embryo dunes can be changed by being overwashed by spring tides and storm driven waves, but the base object (wrack, flotsam) and ecological functions of these features can survive the temporary natural, alteration. However, they cannot survive being driven on by ORVs as shown by the above photograph.



Embryo dunes (pink flags) and wrack landward of a 12' travel corridor 8/15/08

The above photograph depicts embryo dunes with the pink flagging. If the Town implements a 42 foot wide ORV travel corridor from mean high water at the location shown in the above photograph ORVs would be traveling six to ten feet **landward** of the most seaward pink flag (furthestmost on right) in the embryo dune field. The results of the 42 foot travel corridor would be the destruction of the embryo dunes, destruction of the seeds and culms in the wrack and the potential loss of the nutrients that wrack provides to pioneer and foredune plants. It would also interrupt the sand transport processes from the beach to the foredunes by compacting the sand and making it less available to be transported by the saltation (bouncing) and rolling. An alternative compromise would be a thirty foot wide travel corridor as measured from a true mean high water line. This would reduce the adverse impact on the embryo dune fields.

Functions of Embryo Dunes

Under the *Massachusetts Wetlands Protection Act Regulations, 310 CMR 10.28 (1)*, Coastal Dunes are significant to storm damage prevention, flood control, and wildlife habitat interests. Under the *Wetlands Protection Act, Chapter 131 section 40*, wildlife habitat is defined as those areas which, due to their plant community composition and structure, hydrologic regime or other characteristics, provide important food, shelter, migratory or overwintering areas or breeding areas for wildlife.

The embryo dunes on sections of the Bay side north of the Cross-over on Long Beach , if left to the natural processes would become foredunes. However, the use of ORVs on the embryo dune fields for passage and parking has prevented this seaward expansion of the primary dunes from occurring. This alteration has significantly diminished the ability of the Coastal Dune 10.28 and Coastal Beach 10.27 from providing storm damage prevention, flood control, and wildlife habitat. Both the storm damage prevention and flood control interests would be protected if this barrier beach was allowed to have its foredunes expand seaward into the embryo dune fields. The barrier beach would then become wider and provide better protection to private properties during storm events and rising sea levels.

The embryo dunes on Long Beach are used by many species of birds, mammals and invertebrates. State and federally listed species such as the piping plover, least terns and roseate terns use the embryo dunes for nesting, feeding, and rearing of young. Tern fledglings being fed by their parents can often be found waiting in the embryo dune fields. They will also use the beach berm for a wind “lift” advantage when starting to learn flight. During high tides, the embryo dunes, particularly those north of the groin provide important roosting (resting) areas for large numbers of migratory shorebirds on Long Beach. Long Beach is a significant shorebird staging area that provides regionally important food and resting habitat during their fall southward migration. Shorebird species feed on the Bay side tidal flats during low tide and roost on the adjacent embryo dunes and berm during high tides when they are not displaced by ORVs or pedestrian human disturbance.

Species such as coyote, red fox, mink, long tailed weasel, mole, white-footed mouse and meadow vole feed on seeds, invertebrates (e.g. beetles, annelids, copepods) living under wrack, and vegetation associated with embryo dunes. This transition area from the mean high tide line wrackline to the foredune has high species diversity.

As noted above, embryo dunes often form on and leeward of wrack. Wrack is a very significant source of nutrients for vegetation and seed source for embryo dune pioneer plants such as sea rocket (*Cakile edentula*), dusty miller (*Artemisia stelleriana*), and culms of American beach grass (*Ammophila breviligulata*). When embryo dunes and the associated wrack are occasionally overwashed by spring tides or storm waves, these functions, nutrient and seed sources are not destroyed, they are usually just relocated within the embryo dune field or foredune. However, destruction of seeds and culms does occur when embryo dunes are driven on by ORVs. Wrack is crushed and buried in the tire ruts and will not provide the sand trapping function it had on the surface of the sand. It also loses its function as macrofauna habitat when crushed, desiccated and buried by ORVs.