Chapter 4
WATERSHED PROBLEMS AND OPPORTUNITIES

Approximately 40 percent of the land on Cape Cod has been developed (EOEA 2004). This development has degraded the natural environment of the Cape. Runoff from developed areas carries pollutants such as bacteria, nutrients, and toxic substances into the Cape's streams, ponds, and estuaries. Road and railroad networks cross the Cape's salt marshes, in many cases, with culverts or bridges that were built too small to allow normal tidal flushing of the marsh. Dams and road crossings on streams restrict or eliminate the upstream movement of anadromous fish to their historical spawning grounds. The increased level of public awareness of the negative effects of development on natural resources has led to the promulgation of local and state laws to reduce those effects. These laws and their implementing regulations prohibit or control many of the activities that, for example, resulted in restricting tidal flows to salt marshes or increasing pollutant loads to receiving waters. However, although these laws and restrictions control future development, they do not address existing conditions in developed areas. The purpose of the Cape Cod Water Resources Restoration Project is to mitigate the effects of some of this development on the region's existing water quality, fish, and wildlife by restoring degraded salt marshes, restoring anadromous fish passages, and improving water quality in shellfishing areas. Detailed information follows on the purpose and need for each of these types of projects.

Salt Marshes

"Tidal wetlands create the foundation of a coastal food web that supports a large variety of coastal fish and bird species. They also provide vital nesting and breeding habitats for migratory waterfowl along the Atlantic Flyway. Coastal wetlands serve as important nursery and spawning grounds for many commercially and recreationally important fish and shellfish species. They play a critical role in maintaining water quality. Additionally, tidal wetlands provide irreplaceable protection from the flooding associated with storm surges and other serious weather events—a serious risk to the environment and economy of Cape Cod. Tidal wetlands are arguably the most productive and valuable of all the state's natural systems.

Tidal restrictions cause hydrological changes that typically reduce the maximum elevations of tidal flooding and lower the water's salt concentration. These changes cause a major transformation in vegetation and alter the entire upstream salt marsh. Common Reed (Phragmites australis) and other invasive species that are more tolerant of brackish conditions often displace native salt marsh grasses and rushes, thereby reducing plant diversity and changing vegetative structure (from a low grassy meadow to a tall reedy thicket). This change in vegetation, in turn, causes a major shift in wildlife use, as once diverse native salt marsh creatures are replaced by fewer, more generalist species. In sum, most tidal restrictions — by altering hydrology and salinity — significantly harm upstream tidal ecosystems.

The loss and fragmentation of coastal wetlands that is caused by transportation infrastructure, tide gates, and other engineering structures, often reduce a wetlands system's capacity to store floodwaters and to protect inland ecosystems and properties from storm damage. Tidal restrictions sometimes exacerbate the damage caused by major coastal storms because they can impound storm water and thus increase the severity of flood events. Long-term restrictions cause wetland subsidence, setting the stage for even greater storm-surge damage when restrictions breach."

(Information from the Introduction, Cape Cod Atlas of Tidally Restricted Salt Marshes)

Cape Cod has about 6,800 acres of salt marsh. The Cape Cod Commission and the Buzzards Bay Project National Estuary Program have identified 182 wetland restrictions associated with transportation infrastructure (roads, bridges, culverts, railroads, etc.) on Cape Cod. These restrictions affect the hydrology of approximately 4,800 acres of salt marsh. Some of these restrictions are not remediable, because of development that has taken place around the marsh after the restriction was installed. In those situations, restoring full flushing would lead to inundation of homes, septic systems, or other appurtenances. However, restoration is possible at many sites. It is the intent of the sponsors and NRCS to identify sites where restoration may be feasible and will have the most ecological benefit, and to determine where the local interest is greatest and the communities are willing to raise their share of the costs of remediation. NRCS and the sponsors would then enter into agreements with those communities to carry out works of improvement. NRCS estimates that the Project would improve tidal flushing in 1,500 acres of salt marsh at a cost of $14.5 million, of which the NRCS share would be $11.3 million. Projects would be constructed over the course of several years to address this resource concern.

Fish Passages

"Anadromous fish live in the sea but must enter fresh water rivers and streams to spawn. Massachusetts coastal systems support 16 species of anadromous fish. Species such as the rainbow smelt, American shad and river herring (alewives and blueback herring) play an important role in recreational and commercial fisheries; therefore, program efforts tend to concentrate on these four. They are not only targeted by active fisheries but also serve as an important food source for the high-ranking predators such as striped bass and bluefish. Of the approximate 100 herring runs in Massachusetts, populations may vary in size from a few thousand to over a million individuals.

With a small number of exceptions, the important river herring spawning/nursery habitats on coastal streams have been made accessible through the construction of fishways. Many of these structures have deteriorated, and are often of obsolete design. The emphasis of future work should be on the replacement of these fish ladders in order to preserve or augment the populations they serve rather than to create new populations by accessing minor habitats. Stocking fish is also an important component of our work. When we have gained access to a spawning area either through ladder construction or some other means, we stock the new site with adult herring collected from a well-established population. The offspring of these fish will imprint on the new spawning grounds and return as mature adults in three to five years. To maintain a continuity of year classes, we typically carry on stocking in a single system for four or five consecutive years. This process of creating and enhancing Massachusetts' river herring populations has had a long history of success and has been used as a model for restoration programs in several other states.

While MarineFisheries continues to address passage obstructions and degraded water quality, new problems have arisen. On Cape Cod, sandy soils combined with shoreline development and beach nourishment have contributed to a deposition of sand in the outlets of many spawning area ponds. During low water years, pond levels may drop below the outlet elevation trapping juvenile herring in the pond and delaying or preventing downstream migration.

A second concern is the increasing number of requests for water withdrawal permits either from surface water bodies or from wells close to anadromous fish habitats. Stream withdrawals may create migration barriers within the stream by lowering water levels and may also draw in and trap fish at the intake. Withdrawals from spawning areas can also reduce productivity by decreasing the spawning area available.

Conflicts between anadromous fish and agriculture operations have occurred historically and persist today. Agricultural impacts include blockage of passage, diversion of stream flow, entrapment and stranding of juveniles. Solutions to these problems are attainable with the cooperation of the industry, and MarineFisheries is working with farming associations to develop practice, which will eliminate many of these problems."

(Information from the Mass. Division of Marine Fisheries web site.)

Cape Cod has 109 miles of freshwater streams, nearly 1,000 ponds covering almost 11,000 acres, and 41 herring spawning ponds covering 5,400 acres. DMF has identified and inventoried 93 structures on Cape Cod that need repair if they are to work as designed. It is the intent of the sponsors and NRCS to identify sites where improving or replacing fish passage structures is feasible and will open the greatest acreage of spawning upstream, to determine where the local interest is greatest and the communities are willing to raise their share of the costs of remediation, and then to enter into agreements with those communities and DMF to carry out works of improvement. NRCS estimates that the Project would improve access to 4,200 acres of herring spawning habitat at a cost of $5.3 million, of which the NRCS share would be $4.4 million. Projects would be constructed over the course of several years to address this resource concern.

Shellfish Areas

Cape Cod has 430,000 acres of shellfish beds. Shellfishing, for commercial and recreational purposes, is a multi-million dollar industry in Massachusetts. Economic value to Cape Cod includes the wholesale value of the shellfish themselves, the price of permits and licenses, the cost of shellfishing gear, and all the revenue attributable to the restaurant trade, tourist lodging, etc. Some shellfishermen only harvest wild stock; others also raise shellfish in areas, known as aquaculture grants, that are leased to them by the local community.

Shellfish populations are cyclical, and in general follow an eight-to-ten-year cycle of growth and decline in numbers. Shellfishing areas vary in productivity. Good beds are worth thousands of dollars annually, during both the growth and decline cycles; others are barely worth harvesting, and can remain untouched for several years. Over time, unharvested shellfish beds typically become buried in silts and other sediment. This tends to smother the ocean bottom at those sites, and reduce oxygen levels in the underlying flats. As oxygen levels fall, shellfish become unable to survive, and those beds that are silted over can become unproductive. Therefore, as long as there is enough economic or recreational incentive to do so, shellfishing can help sustain shellfish populations by disturbing the sea floor, and allowing better exchange of oxygen between sea water and the underlying substrate.

Barring large incidents, such as the oil spill that occurred in Buzzards Bay in 2003, or the red tide bloom of spring 2005, during which thousands of acres of shellfish beds were temporarily closed, the ability to harvest shellfish is based on the presence or absence of fecal coliform bacteria in the waters overlying the beds. The U.S. Food and Drug Administration sets the limit for shellfishing at 14 colonies of fecal coliform bacteria per 100 mL of water or 70 colonies of total coliform bacteria per 100 mL of water.

DMF follows FDA guidelines and regulates the opening or closing of shellfish beds in Massachusetts. DMF conducts sanitary surveys of all shellfish areas and their near-shore contributing watersheds, identifying as many sources of possible contamination as it can find. In many cases, road drainage systems are the sources of water pollution. Stormwater runoff can pick up bacteria, as well as other contaminants, as it flows across roads, farmland, other open land, lawns, etc., and dump this water into

storm drain systems, where it flows into coastal waters. Stormwater runoff treatment systems can be effective, depending on a number of factors, in reducing the levels of pollutants discharged to receiving waters. All runoff treatment systems must be tailored to site conditions (soils, slopes, drainage area, amount of impervious area, depth to seasonal high water table, proximity to receiving waters, type of improvement desired, etc.). It is the intent of the sponsors and NRCS to identify road drainage systems where treatment is feasible and will have the greatest impact on water quality in shellfishing areas, and to determine where the local interest is greatest and communities are willing to raise their share of the costs of remediation. NRCS would then enter into agreements with those communities and DMF to carry out works of improvement. NRCS estimates that the Project would improve water quality over 7,300 acres of shellfish beds at a cost of $8.2 million, of which the NRCS share would be $6.4 million. Projects would be constructed over the course of several years to address this resource concern.