

## **Section 4 - Environmental Inventory and Analysis**

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### **Geology, Soils, Topography and Landscape Character**

The biggest influence on the local landscape was the Wisconsin period of glaciation. Nothing during the 10-15,000 years since has shaped the surface of the land as much as the advances and retreats of the glacier. The glacier both shifted deposits left by earlier glaciers and deposited more rock, sand, silt and clay as it receded. Rivers of melting ice carried sand and gravel with them and rearranged prior deposits. A glacier can be understood easiest if pictured as a giant moving conveyor belt, picking material up at one end, depositing it at the other, dropping some along the way, and shifting material under it as it moves along.

The northern and southern parts of town represent two types of glacial land forms. The irregular bumpy terrain of the southern part of town is known as kettle and kame formation. The potholes and ridges of this region can easily be pictured as piles of material deposited by the glacier. When the glacier receded, chunks of ice broke off and were deposited with other material dropped by the melting ice. The depressions in the local terrain known as kettle holes, or kettle ponds if below the water table, are places where the chunks of ice within the deposits melted away. Kames are the ridges formed by rivers beneath the glacier. The deep, excessively drained, coarse, sandy, Carver soil type dominates southern Kingston (USDA, 1969). These soils are poor in nutrients and water-holding capacity. Consequently, the uplands in this part of town are dominated by the pitch pine and scrub oak community similar to parts of Cape Cod and South Plymouth.

The flat, sloping landscape of the northern part of town is referred to as an outwash terrace formation since it was formed by glacial meltwater. Moving water tends to sort material by particle size, thus resulting in a patchwork of different soil types. The primary soil types of this portion of town are the Hinckley soils; deep, excessively drained, gravely loamy sands; the Merrimac soils; well-drained and somewhat excessively drained, sandy loams underlain by sand and gravel; and the very poorly drained, sandy and gravely Scarborough soils. Here, white pine and various oak species dominate the uplands. However, much of the land is covered by wetlands and flood plains where poorly drained organic peat and muck soils have formed on layers of silt and clay.

The main reason for interest in soil types is for their capacity to support development. Although soil limitations for on-site sewage disposal have been classified and mapped, these are only useful as general guides. Site specific studies are necessary prior to the design and citing of septic systems. Small layers of impermeable clay or silt not large enough to show up on these maps can cause systems to back up or effluent to flow laterally into nearby wetlands. In addition, the classification of soil limitations has changed since the soil survey for this area was developed. Soils that drain very quickly, such as sands and gravels of southern Kingston, were originally thought to be the best for septic systems. It has now been demonstrated that the lack of fine particles in these soils

make them filter certain pollutants more poorly than loam soils such as those found between the wetlands of northern Kingston.

A map is included in the Appendix which shows the description of the major soil groups of Kingston, extending from the water table to bedrock. Four soil types are present, classified on this Map as A, B, C, D, and E. They can be characterized as:

- A. Dominantly silt and clay
- B. Dominantly fine to coarse sand
- C. Dominantly fine to coarse gravel
- D. Chiefly loose, unstratified, unsorted sandy, silty gravel
- E. Silty boulder gravel

These generally run from north to south in the above order throughout Kingston, corresponding to the movement and deposition action of the glaciers. Various theories exist as to why these types were deposited in such order. For a complete description of the topographic expression, surface runoff, infiltration capacity, and water table characteristics of these soil groups, see the map showing "Surficial Deposits and Saturated Thickness" of soils in the drainage basins of southeastern Mass, Atlas HA-504, by Williams and Tasker for USGS, 1974 (not included in this report).

For more: check out *Roadside Geology of Massachusetts* by James W. Skehan, 2001

## Water Resources

Kingston's glacial history and location at a place where a major river meets the sea makes it rich with diverse types of water bodies and wetlands. Kingston is dotted with kettle hole ponds, particularly in the southern part of town, likely a reflection of the deep sand saturated reservoir designated by EPA as a sole-source aquifer. The Jones River in Kingston is the northern extremity of that self contained glacial formation known as Plymouth / Carver Sole Source Aquifer. In the northern half of town, one finds extensive wetlands associated with poorly drained soils adjacent to the Jones River and its tributaries. Most of the ponds of the northern half of town, although most likely originally wetlands, are man-made impoundments built to supply water power to early industries, many of which are now used and expanded for cranberry growing. The Water Resources Map in the Appendix identifies surface water, wetlands, watersheds of water supply areas, flood hazard zones, and zones of contribution to public supply wells.

### A. Wetlands

Kingston's wetlands are extremely diverse in both formation and vegetation. Wetlands can exist for several different reasons. The type of wetlands depends on the deposits underneath and the location of the water table. One type is a water table wetland, which generally occurs on sand and gravel deposits where the water table is close to the land surface or where depressions such as kettle holes occur. Septic system failure caused by the high water table usually results from development too close to these wetlands.

Another type is a perched wetland, generally formed on poorly permeable clay or silt layers where rainfall is prevented from rapidly infiltrating the soil. An adequate setback between septic systems and these wetlands is needed to ensure that the system is not over these impermeable layers.

In any type of wetland, organic peat and muck soils develop from decaying plant material. As this soil layer becomes thicker over time, the wetland vegetation changes as larger and larger plants can take root. In early stages, marsh type plants are seen such as those that begin filling in at the edges of shallow ponds. As these plants decay, cattails and shrubs, such as black alder, take hold and fill in the wetland further. In the older wetlands, tree species such as red maple or cedar, which have adapted to large amounts of moisture, are found.

The salt marshes adjacent to the Jones River depend on a different set of circumstances. Salt marsh grasses have adapted to the salinity and fluctuating water levels associated with the ocean edge. Decaying plant material causes these wetlands to grow upward over time.

B. Rivers, Ponds and Bays

The landscape of the northern half of Kingston is dominated by the Jones River and its tributaries. The Jones is unique in having its source, at Silver Lake, a Great Pond of 640 acres, and its mouth in the same town. Tributary to the Jones River are at least sixteen perennial streams (classified as rivers), which flow both from the north or south to form the main stem. The Jones River is just over eight miles long from Silver Lake to Kingston Bay with an average flow of 30.25 cubic feet per second (cfs) at the Elm Street dam. Flow is highest in early spring with a peak of 54.38 cfs in March. Late summer and early fall is the low flow period with only 15-17cfs passing the Elm Street dam. Below this point the river is tidal and increasingly saline to its mouth at Kingston Bay. The Jones River basin streams and wetlands are tapped for water supply and manipulated extensively for agriculture, primarily cranberry cultivation. Flow in the river is flashy in its response to heavy rain events, especially in winter and spring and because of increasing amount of impervious area. Base flow is critical to the river in drier months to sustain important wildlife and fish habitats. Low flow in the river has become an increasing occurrence as water is diverted out of town for municipal supply and evaporation increases as groundwater is pumped to water lawns, bogs, and maintain golf courses. This is developing as a significant problem in an area previously regarded as “water rich”.

Three Great Ponds stretch across the southern part of town. These are Smelt Pond, Muddy Pond and Indian Pond. Smelt Pond, of 49.5 acres, is located south of Raboth Road and north of Monk's Hill at the Plymouth Town Line. Town-owned Camp Nekon adjoins the west side of the pond and includes a small sandy beach. Muddy Pond, of 48.6 acres, off Route 80, south of the Kingston State Forest, is entirely surrounded by land owned by the Sisters of Divine Providence. A camp associated with Sacred Heart School is located on the pond. Indian Pond in the south western end of Kingston bordering the Town of Plympton off Route 80 covers more than 70 acres. This pond has been used for agricultural purposes for many years and not to long ago for recreational fishing and boating. In the late nineteenth century, the town leased the pond from the state to harvest its fish supply. Crossman Pond is also a Great Pond of 12.7+ acres off South St. near Rte 106 and is used for cranberry cultivation. Crossman was formerly part of the herring leases provided by the town during the first half of the 20<sup>th</sup> Century. There is reportedly a USGS level gage on the pond that is read by the nearby cranberry grower.

Kingston Bay contains many valuable resources, including wetlands, shellfish and finfish. Kingston Bay was once a popular and rich shellfishing area, with pollution closing the nearly 662 acres of shellfish waters that exist there. Recent efforts by the Jones River Watershed Association and the Town to improve water quality and control pipes

discharging untreated sewage and stormwater to the river have led to the opening of Icabod Flats for the first time since the late 1920's. Biologists from the state's Department of Marine Fisheries have estimated that some \$750,000 of shellfish remain unharvested because of this pollution. According to the last comprehensive study of Plymouth, Kingston and Duxbury Bay in 1974, the bay contained soft-shell clams, oyster, quahogs, scallops, mussels and razor clams. Its waters also harbored 24 species of finfish, the most abundant species were winter flounder, rainbow smelt, Atlantic tomcod, alewife and threespine stickleback. Species fished in adjacent waters included bluefish, striped bass, Atlantic mackerel and haddock. Lobster was also abundant in the area and continues as a fishery of interest. Water quality in the bay has dramatically improved since the Kingston sewer construction, improvements by Duxbury, and the adoption in 2007 by Kingston, Duxbury, and Plymouth Bays of the federal "No-Discharge" designation, which eliminates boater waste-water dumping. However, other impacts to fish include the Plymouth Nuclear Power Plant which has been shown to also have a negative impact on the flounder, herring and smelt populations. Changes from global warming will also impact the nature of the river and bays as evidenced by the arrival since about 2004 of the Sand Tiger Shark, previously considered a warm water mammal from Chesapeake Bay that has become a seasonal visitor to Kingston Bay and Jones River. The Sand Tiger is on the federal endangered species list. In the adjacent waters of Duxbury Bay, millions of oysters are now being cultivated using aquaculture methods. Kingston fishermen are also lobbying for the right to lease mudflats to grow oysters. These shellfish have a remarkable capacity to use the nutrients in the water column; each oyster can filter 2 liters of water an hour. This has helped to improve the water quality of the bay.

C. Stormwater

Communities across the nation are developing storm water management programs in order to protect water quality and property values, conserve habitat for fish and wildlife, and maintain desirable qualities in the community. Non-point source pollution resulting from stormwater runoff has been identified by the US EPA as posing a major threat to water quality nationwide. Kingston has re-submitted its Notice of Intent for its Phase II NPDES permit that discusses ways it will improve municipal road discharge to federal waters. The Jones River Watershed Association (JRWA) in Kingston, continues to assist with small projects intended to help improve understanding of the need to control and filter run-off from roads, lawns and other landscapes.

The JRWA was awarded a three year grant from the Sheehan Family Foundation to address this problem by undertaking Project Stream (Stormwater Runoff Education And Mitigation.) In the fall of 1994 JRWA, with assistance from the Highway Department and the Water

Department, installed a wetland-filtration system called "Storm-Treat" on the northeast side of the Elm Street dam. The Storm-Treat System is designed to achieve 90% removal of non-point source pollutants found in storm water (suspended solids, metals, nutrients, bacteria, oils, and other hydrocarbons). Kingston is the home of the first installation of the Storm-Treat System. This promising technology, which has been favorably reviewed by the U.S. Soil Conservation Service, is slated for further use in Kingston and several other New England Communities. A second treatment system (Vortechincs ) was installed at Marsh Road and Arrow Streets at the mouth of the river in 1997, also by JRWA. Under benefit of Coastal Pollution Remediation (CPR) Grants from Coastal Zone Management and matching funds from JRWA in 1999 and 2000, and a subsequent grant in 2001, the Town of Kingston has continued this work and improved storm drains on Rocky Nook Avenue and has proposed improvements elsewhere on the Nook. These efforts together with the start up of the new sewer system and improvements to Gray's Beach (319 Grant by to the Recreation Commission in 2001) will have a visible and immediate beneficial effect on the water quality of Kingston Bay and the lower Jones River. In 2006 & 7 the town and local watershed associations began retrofits at the Kingston Intermediate School that will mitigate negative impacts to Second Brook and provide education on rain gardens. A rain garden project was also installed at Jones River Landing to prevent unhealthy conditions in the facility and stop some road run-off to the estuary. Major impacts to water quality still impact the river as stormwater discharges from Rte 3, 3A, 27 and 106. Because a law suit brought by the Conservation Law Foundation clearly decided in 2008 that Mass Highway is NOT exempt from water quality rules, Kingston can request improvements along major routes of impact to the river and bay. With these improvements, water quality may be sufficiently improved in the tidal portion of the Jones River to remove it from the EPA's 303(d) list of impaired waters.

D. Groundwater

There is a common misconception that groundwater occurs as a giant underground river. It is not uncommon to hear people tell of the hidden river coming down from New Hampshire and discharging into Cape Cod Bay. However, the groundwater that is available to us is actually precipitation that soaks into the ground and is held as a thin film on soil particles and in the pores between particles. Some soaks all the way down to a layer where the pores are completely filled with water. The top of this layer is called the water table. If a river flows deep underground through the bedrock it still remains hidden to us today.

Although groundwater does flow, it generally moves as slowly as a few feet per year. Flow patterns can be changed by large discharges or withdrawals of water, particularly in areas where the water table is relatively flat.

What determines whether or not the groundwater in a particular area is usable as a source of water is the depth to the water table, the thickness of the saturated zone, and the size of the pores. The word "aquifer" is used to refer to a source of groundwater usable for public supply wells. Information on Kingston's aquifers has recently been documented in a study by the U. S. Geological Survey in a report entitled "Yield and Water Quality of Stratified-drift Aquifers in the Southeast Coastal Basin, Cohasset to Kingston, MA", by James Persky, report #91-4112, published in 1993. The Department of Environmental Management also contracted for a "virgin yield analysis" of the Jones River Watershed by the firm GZA GeoEnvironmental Technologies, Inc., the report was completed in 2003. It can be found on line at <http://www.mass.gov/envir/water/publications/southcoastal/jonesRiverWatershedAssessment/>

All of Kingston's municipal water supply comes from groundwater wells. This is true of the surrounding towns of Duxbury, Plymouth, and Pembroke too. Plympton residents have individual water supply wells. Much, if not all, of the water supply for Kingston, Plymouth, Carver, Wareham and Plympton is derived from the EPA designated (1991) Sole Source Aquifer. Meaning that, in theory, all these people are drinking from the same underground reservoir of water and would do well to work together to protect it. In 2007 the Secretary of Environmental Affairs established a working group of local/regional representatives to strategize on methods to protect this shared resource.

Flood plains in Kingston are located primarily along the Jones River and its tributaries. The 100 year flood plain elevation line has been mapped as part of the Federal Emergency Management Agency's program for flood insurance for landowners in the flood hazard areas. Kingston has adopted Flood Plain District Zoning, which was updated at the 1994 Annual Town Meeting, allowing only land uses which will not impede flood waters.

See the most recent State GIS Map (available at the Conservation Commission offices), which shows aquifers and "outstanding water resources and non-forested wetlands" with endangered habitats—updated periodically as GIS software and technique improves. Kingston adopted Conservancy and floodplain zoning to provide warning to developers and protect these important areas.

## Vegetation

Since the northern and southern parts of Kingston represent two different types of glacial land forms, the soils present in each area generally support different types of vegetation. The dry land to the north and west of town tends to be more open, having once been cleared for use in farming or altered for cranberry growing. A few tree farms exist growing fir, spruce, and scotch pine, but much of this old farmland has been developed for housing. Those fields that were abandoned years ago have grown into forests dominated by eastern white pine, with several varieties of oak, maple, cherry, locust, birch, and the occasional abandoned or vagrant apple. A few small areas not logged for generations contain beech trees, hickory, and the struggling remains of the once proud American chestnut, strong indicators of a climax forest. Below the woodland canopy grow mountain laurel, many ferns, pink & white lady's slipper, mayflower, greenbriar, holly, poison ivy, etc. On the edges of the woodland are shrub layers containing high bush and low bush blueberry, raspberry, pepperbush, mountain laurel, witch hazel, and bayberry. The wetland and river edges contain willow, red maple, speckled alder, silky dogwood, ironwood, many grasses, ferns, sedges, and other similar wetland species. The invasive common reed, *phragmites australis*, is crowding the true salt marsh of the estuary and creeping to the freshwater/tidal interface, with purple loosestrife in beginning stages mixing with narrow leaved and common cattail to name only a few marsh dwelling plants.

Leaving Silver Lake to the west and traveling east along the Jones River and its floodplain, much of the adjacent wetlands and many of the small tributaries to the river have been altered to form cranberry bogs and associated man-made water holding ponds. These support many of the above mentioned wetland species. Much of the middle and lower portions of the river are clogged with aquatic vegetation, probably due to two main factors: decreased flow due to diversion of waters from Silver Lake, and increased pumping in Kingston, Pembroke and Duxbury, and the increase of the presence of nitrates and phosphates from agricultural, lawn fertilization, stormwater and septic systems along the river.

Just west of the Town Center is "Blackwater Swamp" with remnant and emerging stands of Black spruce, now uncommon in this area, and white cedar. It is also home to some rare wetland mosses. From this swamp emanates Stony Brook, a lower tributary that meets the Jones River at Landing Road near Rte 3 overpass in the estuary. Stony Brook receives considerable nutrients in its journey crossing town center. Blackwater Pond was assessed for fish habitat and restoration in 2007 by JRWA with the Division of Marine Fisheries. They found unacceptably low dissolved oxygen levels in July and August and indications of enrichment, likely from cranberry bogs. These findings will impact the effort to restore fish passage at the historic C. Drew dam on Stony Brook at Maple Street. Nutrients must be reduced and algae growth seen to blanket the pond bottom at Blackwater must be controlled.

Furnace Brook enters the Jones River above Sampson pond at the Elm Street bridge and dam. It emanates from Indian Pond and runs about 2.65 miles north feeding many bogs, mill ponds, Kingston's municipal well and the forest. From the Elm Street Bridge east, the water in the Jones River becomes increasingly brackish and influenced by the tides. Cattails and phragmites give way to the more salt tolerant grasses and reeds of the marsh along the river's winding path to Kingston Bay. To the south and east, the rolling kames of sand and gravel support vegetation which is hardy in the face of underground drought (since these hills do not keep rainwater near the surface). White pine, pitch pine and scrub oak are trees that can tolerate such conditions on the top of these hills. On the slopes of these inclines grow larger oaks, maple, cherry, beech, and other less tolerant species. The kettles below often contain water if they are lower than the water table. On their edges grow red maple, willows, highbush blueberry, swamp honeysuckle, arrowwood and other wetland edge species. Many of these kettle holes contain vernal pools supporting a wide variety of rare and uncommon plants such as Plymouth Gentian and New England Boneset. They also provide a breeding habitat for many special species such as mole salamanders, wood frogs, and fairy shrimp. "Dukes Hole", in the southern part of town, is an excellent example of a kettle hole which contains water for part of the year. It is an outstanding example of a vernal pool and is rich with associated forms of wildlife.

Open fields northeast of Indian Pond are an important site for many dry grassland species including the rare blazing star and Plymouth gentian. Indian Pond is considered to be a good quality Coastal Plain Pond. The swamp east of Furnace Brook, north of Route 80, in and near Sampson Park and the Faunce Memorial Forest is considered to be a good quality red maple swamp with hemlock and white pine. It is also one of the few places in Kingston where one can find American holly.

The most southeasterly part of town contains sandy and gravelly soils that are very dry and well drained. Scrub pine and scrub oak are the dominant species here since they can tolerate fire well, while white pine cannot. Much like Myles Standish State Forest in Plymouth, this area is often subject to major fires and therefore has very similar vegetation. The top of the hills are dry with very dense thickets of scrub pine and oak. Until recently, this area historically had seen very little development because of the soil. Except for the area around Smelt Pond, the land was primarily used as woodlots. Much of the vegetation in this area is now being cleared for commercial, industrial, and housing development. Rich in sand and gravel, the area continues to be extensively mined for this resource—despite a local by-law prohibiting extraction for mining purposes. This area comprises a major part of the sole-source aquifer for Kingston and some surrounding towns. The rolling steep gravel hills act like stacked sponges and supply pressure at the base of the aquifer. It is highly probable that the area's water table and the aquifer will be altered by these changes. The lowering of the water table will alter groundwater, pond and vernal pool levels. Vegetation types will change and many species that use vernal pools will presumably be affected. Muddy Pond is known to contain seven rare, Massachusetts State-listed species. "Most of these species are indicators of a coastal plain pondshore natural community. Coastal plain ponds are directly linked with the underground aquifer, and the water level in the ponds typically reveals the height and

fluctuations of the local water table. Many of the coastal pondshore community rarities are "specialists" inhabiting the zone between high (winter) and low (summer) water, where the environmental stress can be extreme. The yearly fluctuations in the water table help to maintain a viable coastal plain pondshore community, and also to impede encroachment by woody plants and invasive exotics through inundation. Because Muddy Pond has been identified as an exemplary occurrence of such a coastal plain serious consideration should be given to protecting the water resources and shoreline habitat that drive this wetland system and sustain the State-listed species found there" (Nickerson, 1978). Concerted effort should be applied to work continue to engage the Sisters of Divine Providence and other environmental groups to protect this globally important coastal plain pond. With the close proximity of the reconstructed route 44 and the development in nearby Plymouth, Kingston can expect intense environmental pressure on this area. The town should be careful to examine the potential impact of its Muddy Pond well site, now being evaluated by the Water Commissioners, on the water levels of Muddy Pond before putting this well online.

Agricultural land and managed forests are provided with incentives from the State for remaining as such through the reduced tax assessment programs authorized under Chapter 61 and 61A of the Massachusetts General Laws. Currently Kingston has several managed forests under Chapter 61 and many cranberry bogs and surrounding support areas under Chapter 61A. See Appendix A – Inventory of Protected and Unprotected Land for a comprehensive listing. Agriculture is primarily cranberry bogs, but also includes, blueberries, and horses.

### **Fisheries and Wildlife**

The Division of Marine Fisheries has identified the Jones River as an important run for alewife, Blueback herring, rainbow smelt, American Eel and shad. In the tidal reach white perch, stickleback, striped bass, white flounder, blue fish and the recent Sand Tiger sharts have been found, as well as snapping turtles, mud crabs, green crabs, shot shell clams, sea worms, blood worms, grass shrimp and a variety of arthropods. Smelt Brook, Stony Brook, First, Second and Third Brooks also provide important habitat for rainbow smelt. Jones River is the southern most location for smelt in the Gulf of Maine, and one of the largest spawning habitats in Massachusetts. These are species that depend on the river in which they hatched to reproduce. These fish depend on a certain volume and rate of flow and a certain combination of chemical constituents to be effective at spawning and maintaining their population. Smelt can grow to the age of five, but finding fish this old is increasingly rare.

Dams, low flow, high nutrients and low dissolved oxygen impact the health of diadromous and native populations, which includes the native brook trout. In 2008, JRWA received a grant to commission a feasibility study on the removal of Wapping Road dam. This dam presents an obstacle to migrating aquatic populations especially river herring (alewives and bluebacks) and American Eel. The Association is working diligently to promote improvements that would help decimated populations to rebound. Of considerable concern is the loss of native trout habitat, and JRWA with the

Conservation Commission is developing a restoration plan for Pine Brook in Cranberry Watershed Preserve to bring back the meandering, cool river that will support the historic trout population. This work will begin in 2008. Restoration activities are needed throughout the watershed to repair damage from dams, agriculture, roads and residential development. Fish are important to the function and structure of the ecosystem and to the survival of the human community. The fish habitat in Jones River feed the fish stocks in the ocean and are essential to the health of the Gulf of Maine.

In areas such as Southeastern Massachusetts, where large tracts of wildlife habitat have been interrupted by the construction of homes and roads, the value of small protected parcels as wildlife habitat is enhanced if corridors connecting those areas are also protected. Many local species, such as the whitetail deer and red fox, require access to a mixture of forest, wetland, and open land for the food and shelter needed for survival. Migratory birds and birds of prey also rely heavily on this mixture of environment. These species and others, such as coyote, cottontail rabbits, ruffed grouse and quail, are most often sighted at the edge between forest and open areas provided by local powerlines, woods roads, or fields. Hawks are frequently sighted soaring over open fields and wetlands. Protected corridors, such as those provided by powerlines and wetlands along the Jones River and its tributaries, provide additional habitat as well as access between protected habitat areas. The wetland areas are themselves important to the survival of wildlife. Wetlands provide water and a productive source of plants needed for food. Wetlands also tend to have an ameliorating effect on extreme temperature conditions, thereby providing essential shelter for wildlife in summer and winter (Nickerson, 1978).

The Jones River Watershed Association's June 2000 report *Silver Lake & Jones River Watershed Study* documents many of the fish and macroinvertebrates species found in the Jones River and tributaries as well as mussel species (including two species of special concern) in Silver Lake. A copy of this report can be found in several town offices, and in the Executive Office of Environmental Affairs. Fish sampled in the upper Jones River were found to be more representative of pond fish than river fish, because of low flows, low dissolved oxygen and high temperatures.

The U.S. Fish and Wildlife Service, in conjunction with the Wastewater Facilities Planning Study, identified Kingston as a possible location of the Plymouth red-bellied turtle, and several sightings of these animals has been confirmed. This is a Federally-listed endangered species found only in Plymouth County. Loss of pond habitats is a primary reason for the decline of this species.

The Massachusetts Division of Fisheries and Wildlife's Natural Heritage Program houses a data base on the locations of rare species and sensitive natural features. (See list and information following this section, p. 56 et seq.) Several rare species are listed as having been sighted in Kingston. The sightings of rare species have been concentrated in the area of Wolf Pond, Muddy Pond, Indian Pond and Rocky Pond in the southern part of town. In addition, the following areas are considered by the Natural Heritage Program to be excellent habitat for uncommon plant and animal associations.

Silver Lake, in the vicinity of Forge Pond, is shown on the NHESP Atlas to be an important area for rare wetland species. The spotted and eastern box turtles, among other reptilian species, have been found on Silver Lake Sanctuary and the remaining portions of the Emerson land. The lake also provides an extraordinary resource for a wide array of migratory and resident birds and mammals and recent sightings of the Eastern Timber Rattlesnake in Silver Lake Sanctuary.

Blackwater Swamp is considered to be "...a good quality cedar swamp with an extensive shrubby peat bog. It is also the only current site in Southeastern Massachusetts for the black spruce and the hare's cottontail."

Since about 2005, beaver, river otter, mink, and fishers are rebounding in the watershed, and wild turkeys have become re-established in remarkable numbers. Bald eagles have been sighted in Kingston Bay and on Silver Lake during January.

### **Scenic Resources and Unique Environments**

Scenic landscapes were mapped by the DEM Landscape Inventory in 1982. The area identified as a "distinctive" scenic landscape in Kingston includes the marshes at the mouth of the Jones River and spans northwest through the Miramar-Bay Farm area. These views of the tidal Jones River can be peeked at when passing over either on Route 3 or on the commuter train from Plymouth and Kingston Station. Beautiful views of the Kingston Duxbury Bay can be appreciated from Bay Farm; and Kingston and Plymouth Bay can be viewed from Boundary Lane and Gray's Beach.

The farms, forests, cranberry bogs and surface waters of Kingston provide scenic drives along many local roads. The following roads have been designated as Scenic Roads under M.G.L. Chapter 40, Section 15c and Section 7A3; Indian Pond Road, Brook Street, Landing Road, River Street, Winter Street, Brookdale Avenue and Winthrop Street, Rocky Nook Avenue, Sylvia Place Road, Bay Farm Road, Elm Street and Grove Street.

Monks Hill in Camp Nekon offers a spectacular view of Cape Cod Bay and the forests of Southern Plymouth County. On a clear day, Boston and Provincetown can both be detected from the fire tower on the hill, as views extend to five counties and Rhode Island.

There are scenic views of the south side of Silver Lake from private property on Lake Street, as well as from Silver Lake Commons and from Silver Lake Sanctuary.

The views from the single-lane bridge carrying Elm Street over the Jones River are distinctive, including the view across the millpond to the west, the rushing water of the river dropping over the dam and fish ladder to the east, and the steep slope on the north bank of the river.

Perhaps overlooked by many, even though passed by once or more a day, are rock outcroppings on the southeast side of Elm Street just beyond, and adjacent to, the Coughlin and Coughlin building near the parking lot. They are named Coomer's Rocks because the property in this immediate area was owned by William Coomer prior to 1727. Close examination reveals that these are significant outcroppings. The first one, nearest the building, is approximately 80' x 102' overall. The second is approximately 150' south of the first and has dimensions of about 36' x 78'. The third rock is 75' further south, approximately 60' x 150' overall. The highest of these formations above ground appears to be in the 10' range. Since the 2001 Plan the land adjacent to the rocks has been developed into 55 and older condominiums. Blasting of some portions of the rocks occurred rendering them somewhat smaller.

<b>DESIGNATED SCENIC ROADS - KINGSTON, MA</b>	
Landing Road	In Entirety
Elm Street	From intersection of Brook Street to intersection with Main St.
Indian Pond Road	In Entirety
Sylvia Place	In Entirety
Brookdale Street	From intersection of Winthrop Street to intersection with Winter Street
Winthrop Street	In Entirety
Rocky Nook Ave.	In Entirety
River Street	In Entirety
Lake Street	In Entirety
Grove Street	In Entirety
Bay Farm Road	In Entirety
Elm Street	Intersection of Brook Street to Plympton Town Line
Brookdale Street	Remainder from Winthrop St. to Pembroke Street.

## **Environmental Problems**

### **A. Hazardous Waste Sites**

There are at least four hazardous waste sites which have been detected and are in the process of being cleaned up. Included are the site behind the Kingsbury Square shopping plaza which forced closure of the town's Winthrop Street Well; a gasoline spill at the Exxon Station on Summer Street which has contributed to the continued closure of the Winthrop Street well; the Cobb and Drew site off Prospect Street (1992); the Clean Harbor site off Joseph Street; the Fire Station site on Maple Street. To this list the old Anderson's junk yard on Wapping Road should be added, but this has not been listed at this time, and re-zoning of the parcel to business and commercial was granted at the April 2008 town meeting.

B. Landfills

The landfill owned by the town has been phased out in favor of the solid waste being brought to the regional incineration facility known as SEMASS (in the Town of Rochester). The landfill is closed and capped, and the site is still being used as a transfer station, and recycling materials are still collected here. The septage pits north of Smelt Pond have been also been closed.

C. Erosion

There is localized soil erosion from various sources which is affecting the water quality of Smelt Brook, First Brook, Second Brook, Stony Brook and the Jones River. Storm water runoff is cited as a serious problem in the Jones River study. Storm water runoff into Smelt Brook continues to be a major problem due to blowing sand and extreme run-off from the sand and gravel operations around the South Industrial Park, the poor storm drainage controls on Marion and Galen Roads and from Route 3.

D. Chronic Flooding

There is periodic flooding of Landing Road at Stony Brook where the Jones River empties into Kingston Bay at the east end of River Street at the Town Landing. The Rocky Nook section of the town receives heavy waves from storms in the Bay, and Gray's Beach which has undergone major restoration under benefit 319 grant and town funds, requires seasonal maintenance after winter storms. There have been periodic breakthroughs in the Duxbury barrier beach due to severer storms. These require upkeep to avoid impacts to the Kingston shoreline.

E. Tidal Restrictions and Dams

***Tidal Restrictions***

- There are ten (10) tidal restrictions in the Jones River estuary, as inventoried in the *Draft Atlas of Tidal Restrictions on the South Shore of Massachusetts (December 8, 2000 draft)*, by the Metropolitan Area Planning Council. These are a variety man-made structures, tide-gates, culverts, bridges and dams which appear to restrict tidal flushing and which are, at least in part, responsible for the invasion of the reed *phragmites* and the loss of diverse salt marsh habitat.
- There are two locations on Smelt Brook, with culverts under the railroad bed and under Route 3A—reduction in habitat impacts the Smelt spawn in this brook.
- There is another culvert under the railroad bed at the end of Spring Street, affecting the salt marsh in that location.

- On Stony/Halls Brook, there is a culvert under Landing Road and the dam at the Cobb & Drew factory site. Upstream of Stony Brook, where Tussock Brook flows under the highway into Stony Brook there is a restrictive tide-gate owned by Mass. Highway.
- On the main trunk of the Jones River, the bridge that carries Route 3 represents a restriction as defined by the rock rip-rap embankment and support structure in the river; the railroad bridge is a second restriction - both these are amply set off with invading *phragmites* stands along the river; then as the river passes under Route 3A, the culvert under the Great Bridge is a restriction -reduced to one opening from the original multi-culvert of a century past; and finally there is the Elm Street dam, which restricts the influence of the tide upstream of this location.

In the *Draft Atlas*, MAPC recommends a priority listing for remediation of three sites. These are: Landing Road - enlarge the box culvert to restore the 30 acre upstream salt-marsh, beat back the phragmites, and improve tidal flushing; Tussock Brook - remove the dam (tide-gate), in order to enable anadromous fish to migrate to the wetland habitat upstream; Halls Brook (Stony Brook) at the Cobb & Drew site off Maple Street - install a fish ladder to encourage anadromous fish to migrate and spawn upstream, better yet, remove the dam.

### ***Dams***

Chief among the thirteen (13) readily identifiable dams in the Jones River watershed are the following:

- The primary Jones River Dam at Elm Street, two miles upstream from the mouth of the river at Kingston Bay. This dam has been in place to support the long standing bridge over the Jones and to carry Elm Street and historic cart paths. In the Seventeenth and Eighteenth Centuries the dam functioned to hold water to power the water wheel for the town's water supply. A fish ladder to benefit the anadromous fish runs of alewife and river herring has always been a part of the structure. In August 2001 the failing concrete fish ladder of the 1950's was replaced by an Alaskan Steep Pass. This repair was funded by the state legislature. In 2008 the Kingston Water Department is evaluating the feasibility of small hydro-power at Elm Street, a plan not at all favored by those concerned with restoring fish runs. This is a project of potential conflict as communities wrestle with appropriate alternative energy solutions.
- The Wapping Road Dam is approximately one mile (1.2mi) as the river runs upstream of Elm Street. The dam is owned by the owner of the adjacent Industrial Park. The dam has been reconstructed several times, and was originally of earthen construction with a by-pass

channel. The dam functioned historically, successively, to provide power for the Triphammer sawmill, forge, and woolen factories. Now it is a fish impediment and a problem for the owner whose building foundation is in disrepair and is part of the dam structure. As stated previously, JRWA has a grant from NOAA through the Gulf of Maine Council on the Environment to perform a feasibility study to restore fish passage beyond Wapping Road. The project started in June 2008.

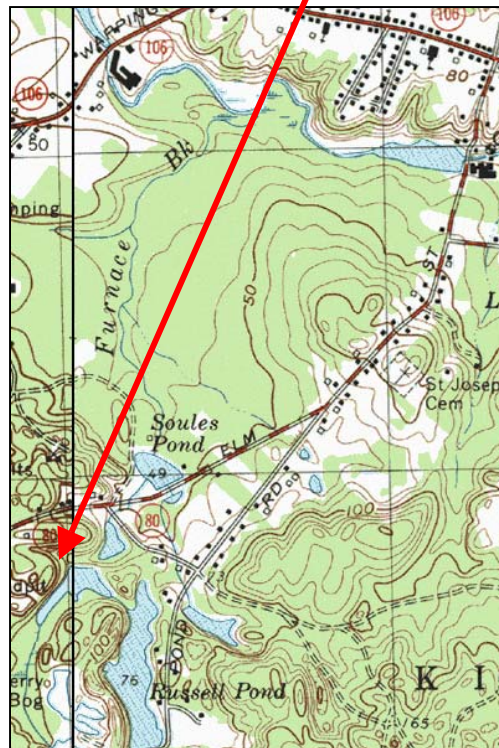
- Forge Pond Dam. This is the dam one-half mile downstream of the outlet of Silver Lake at the headwater of the Jones River. It is a concrete structure built about 1905 and is owned by the City of Brockton. Currently the dam has no fish passage, but the City is required to demonstrate feasibility of a low level out-let to return flow to Jones River. Installation of a fish-ladder, or a dam breach here, would remove the last impediment to the alewife return to the unparalleled spawning habitat of Silver Lake. JRWA is committed to restoring the herring run to the lake and is laying groundwork work now (2008) to accomplish this.
- Foundry Pond Dam—on Smelt Brook is associated with and owned by the proprietor of the Cobb & Drew tack factory on Prospect Street. This dam is a concrete structure across Smelt Brook. There is no fish ladder. Removal of the dam would empty Foundry Pond and probably return it to a sizable wetland habitat, and potentially enlarge the Smelt spawning habitat of Smelt Brook. Well into the Twentieth Century fish rights were sold to people who would carry smelt by the barrel to Smelt Pond to spawn. It is possible that historically Smelt Pond was the destination habitat for these rainbow smelt. Restoration of this fish run should be evaluated—but would require removal of the Foundry Pond dam. Because the factory was the site of a DEP & EPA clean up in about 1990—and still releases oil to the brook, an evaluation of the sediments in the pond should be required. In 2008 the property owner is considering hydro-power.
- Maple Street/C. Drew Dam—Another historical remnant, this factory specialized in forged tools, well regarded the world over, and had a water wheel for power. In dangerous disrepair, this dam should be evaluated for removal or at least the installation of a fish ladder—but removal seems most appropriate at this time. The dam creates a pond in Stony Brook just beyond town center. Removing this obstruction may allow the alewife to return to Blackwater Swamp which could be helpful in controlling difficult to access areas known to refuge EEE bearing mosquito populations. Given the construction of the new Pottle Street playing fields adjacent to the swamp, the re-introduction of fish could be a good strategy for controlling the mosquito breeding without the use of harmful pesticides.

- Soules Pond Dam is an instream dam on Furnace Brook (aka Trout Brook) which is owned by the town and is near the Soules Pond well. It has a fishway and is the only active alewife run in Kingston. Fish continue to spawn in the pond as evidenced in the JRWA herring count in 2008.

- Bryant Mill Dam and Sylvia Pond Dam are upstream of Soules Pond. Sylvia's has a long beautiful ladder leading to the Pond. The dam and surrounding land is owned by the Wildlands Trust of Southeastern Massachusetts which has been directed by the Division of Dam Safety to address maintenance and repairs. The Wildlands Trust is working with JRWA to maintain the existing spawning habitat until the herring run can be restored to Silver Lake.



- Russell Pond Dam is an earthen dam in private hands, declared a safety problem by the state Division of Dam Safety. Russell Pond is connected to Sylvia Pond by a tiny tributary and augments the alewife spawning habitat of Sylvia Pond, and is the topmost habitat in the spawning run. The dam was formed almost two centuries ago to power a sawmill by damming Winter Meadow Brook. The earthen structure leaks and neighbors have concerns about an untimely breach and flooding downstream. The town should undertake to convince



the property owner to move toward responsible ownership and deal with this problem before a catastrophic breach can occur. The property owner has been difficult to contact.

Other dams are located on Pine Brook, Howard Brook, Hall's Brook, Bassett Brook, Jones River Brook, Barrows Brook and Fountainhead Brook. Most are earthen dams with concrete, stone and wooden sluice gates or weirs. Most were originally sawmills and are now used to hold back irrigation water for associated cranberry bogs. Many manipulations and changes have occurred by private owners over the years. The town should inventory and document the dams on the tributaries of the Jones river and evaluate their usefulness, state of repair (or lack thereof), and management regimes, if any. All of these structures impact the health of the Jones River ecosystem by trapping sediments and nutrients, causing warming of the water, preventing fish movement and increasing aquatic vegetation. An understanding of the dams, their function and management and impacts is necessary to preserving, improving and restoring the health of Jones River.

F. Sedimentation

Sedimentation into lakes, streams, and ponds usually occurs as a result of erosion from construction, new lawns, yard or agricultural work, and sanding of roadways. The sediments will mix in the water column causing turbidity which can clog fish gills and disturb other water organisms. The sediments will eventually settle, possibly suffocating fish eggs, bottom feeders, and important microorganisms. Sediments often carry heavy metals and other pollutants which can come from fertilizers and roadside wastes.

The impact of chronic sedimentation can be seen as some of Kingston's most visible waters show signs of eutrophication. Forge Pond, Sampson Pond, and the Jones River just above the old Barnes Worsted factory (Wapping Road dam impoundment) are so thick with lily pads and hydrophilic grasses that canoeing or kayaking in the summer months is barely possible on these stretches of the river. Russell Pond on Indian Pond Road has developed a serious infestation of Eurasian milfoil in addition to its dam leakage problems. Smelt Pond is also choked with milfoil and requires restoration management. Nutrient loads from inadequate or failed septic systems, cranberry bog discharges, sediments from direct stormwater discharges to the river and its tributaries, coupled with the chronic reduction in flow due to water withdrawals, have encouraged this growth of weeds which can stagnate the river flow. The seasonal life and death cycle of the vegetation consumes the available oxygen thereby driving out or killing the resident fish populations. The dead vegetation sinks after seasonal die-back adding to the accumulation

of the organic sediments on the river bottom and trapping additional nutrients which stimulates next year's growth of water weeds.

Smelt Brook and First Brook are two streams where the impact from sediments is less visible, although the load from First Brook can be seen where this tributary enters the Jones River just south of the 3A bridge. In both these streams, the influence from sediment loads is the most likely cause for the decline of the anadromous and resident fish populations.

Most causes of sedimentation can and should be controlled by using careful construction, sound landscape and agricultural techniques, and the best management practices for treatment of stormwater runoff. Because most of the older street drains discharge directly into water bodies, upgrading of drainage systems and retrofitting catch basins is a town-wide problem that must be addressed.

G. Development Impact

The relocation of Route 44 through the southern portion of Kingston has and will continue to cause negative environmental impacts including alteration of wetlands, intrusion on critical wildlife and vegetation habitats, and interruption of wildlife corridors. Since the highway is at grade separated with a wide right-of-way and safety fencing, the ability of wildlife to move safely through this section of town has been severely restricted. Although the Town of Kingston Conservation Commission and Open Space Committee made a serious effort to require mitigation of these impacts by requiring the bridging of the vernal pools and land adjacent to Great Mink Hole, the DEP superseded the town's Order of Conditions. Kingston negotiated a "pedestrian access culvert" to allow for the safe passage of people and wildlife under the highway. The 300' foot long tunnel for wildlife and pedestrian passage under Rte 44 was required by the Conservation Commission to connect Camp Nekon and the State Forest lands with undeveloped land near Muddy Pond on the south side of the reconstructed Route 44. Unfortunately this underpass is dominated by off-road vehicles and motorcycles causing extreme negative impact on the forest and environment.(2008)

The development of Indian Pond Estates made the realization of the 1995 Open Space Plan "Duke's Hole Corridor" impossible. An eighteen hole golf course was constructed surrounded by hundreds of "trophy homes". Clear cutting and vast earth moving for the development resulted in sedimentation and erosion into the Duke's Hole vernal pool, as well as Second and Third Brooks. Hundreds of acres are being irrigated using well water to establish and amintain the golf turf, despite the project being denied a Water Management Act permit by the Department of Environmental Protection.

Lack of enforcement of environmental laws, if left unchecked, will continue to erode Kingston's valuable natural assets, and cause the decimation of the natural wildlife populations. Although the deer herd and coyote populations appear to be increasing at the moment—once these begin to threaten the new suburbia because of the dwindling range of open space, residents are likely to become intolerant of the wildlife that threatens their sense of safety and manicured landscapes.

The fragmentation and isolation of small areas of wildlife will increase even more if the Town fails to preserve the proposed "Open Space Corridor" between Camp Nekon and the State Forest. Studies have shown that open spaces are much more effective for both people and wildlife if the areas are somehow connected.

"Habitat fragmentation is the process whereby a large continuous area of habitat is both reduced in area and divided into two or more fragments. These fragments are often isolated from one another by modified or degraded habitat. Habitat fragmentation can lead to the rapid loss of the species remaining, since it creates barriers to the normal processes of dispersal, colonization, and foraging. Particular fragments may lack the range of food types and other resources necessary to support permanent populations of certain species. Habitat fragments may experience altered environmental conditions and increased levels of pests, making them less suitable for the original inhabitants. In particular, the decline of numerous songbird species in North America has been linked to habitat fragmentation.

One intriguing suggestion for managing a system of nature reserves has been to link isolated protected areas into one large system through the use of habitat corridors: strips of land running between the reserves (Simberloff and Cox 1987; Simberloff et al. 1992). Such habitat corridors, also known as conservation corridors or movement corridors, could allow plants and animals to disperse from one reserve to another, facilitating gene flow and colonization of suitable sites. Corridors might also help to preserve animals that must migrate seasonally among a series of different habitats to obtain food; if these animals are confined to a single reserve, they could starve. The idea of corridors has been embraced with enthusiasm by some park managers as a strategy for managing wide-ranging species."

*(Essentials of Conservation Biology / Richard B. Primack, pages 165,338, 339)*

It is currently unknown how wide a corridor has to be to preserve the habitats for the diverse and wide ranging wildlife in the town of Kingston. Experts contacted by the Open Space Committee all agree that these corridors should be as wide as possible. The Massachusetts Division of Fisheries and Wildlife has specified that area sensitive species such as the wild turkey, which has just made a recent comeback to Kingston, the white breasted nuthatch, and the hairy woodpecker all require greater than 1,000 acres of contiguous forest land to maintain viable breeding populations. As forests are fragmented by permanent development, these species disappear from remaining woodland. These open space corridors will also greatly influence people. They will allow many more people to access the large open space areas without having to drive or walk the roads or ‘trespass’ to get to them.

Some similar impacts can be expected as a result of the MBTA commuter rail line through the northern and eastern section of town. The fencing and other barriers needed along portions of the railroad bed, which is essentially at grade, cuts off existing paths and driveways, making access to important natural habitats such as the Blackwater Swamp difficult if not impossible. (The town is in discussions with the MBTA to resolve access impasse between the new Town Hall and Pottle fields site.) Frequent, fast running trains are a safety hazard to people and wildlife, while air and ground pollution from the diesel engines and noise pollution are a distinct intrusion to the natural environment along the rail corridor. One of the proposed open space corridors will hopefully help in mitigating the effects of the MBTA layover station.

The increasing sprawl of developments requires more roads to be created, results in more traffic, more schools, playgrounds, and services. The conversion of private open space into residential housing also dramatically increases the use of existing protected public open space. In order to preserve the natural amenities of the town in the face of this development, Kingston must continue its efforts to acquire and protect more of its open space in order to sustain the current quality of life in the community.

#### H. Gravel Removal Problems

Earth removal or gravel mining in any scale has been prohibited by town by-law since 1970 in the town of Kingston. This by-law has been altered on a number of occasions in attempts to strengthen it. Earth removal has been approved, however, by the Board of Selectmen since the early 1980's in order to allow planned industrial developments to bring the land site to the proposed grade and for cranberry bog construction.

This permitting process has allowed extensive gravel mining at South Eastern Sand and Gravel on Elm Street, now a proposed 155 unit

residential development, and in the South Industrial Park (now the 730 residential and mixed commercial 40R proposal) for over ten years. By 2000, well over two million cubic yards of gravel have been removed from this area under the auspices of an industrial subdivision. The processing of cement waste and the grinding of tree stumps also occur on this site. In addition, the MBTA used this site as one of its staging areas during the reconstruction of the railway and the re-processing of the old railway roadbed materials. By January 1994, the MBTA became determined to use a portion of the site for the regional railroad station and layover yard. A large amount of gravel has been removed for construction of this site with no permitting required from the town. This area abuts the water overlay protection zone for the proposed Second Brook well site. Considerable land use planning will be necessary to preserve Smelt Brook and the underlying aquifer - as well as the nearby open space land and Smelt Pond. Further gravel removal should not occur.

The Official Website of the Massachusetts Division of Fisheries & Wildlife (MassWildlife) [Mass.Gov](http://Mass.Gov)



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### Rare Species by Town

#### MESA (Massachusetts Endangered Species Act) and Federal Status

E = Endangered

T = Threatened

SC = Special Concern

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### Most Recent Observation

This field represents the most recent observation of that species in a town. However, because they are rare, many MESA-listed species are difficult to detect even when they are present. Natural Heritage does not have the resources to be able to conduct methodical species surveys in each town on a regular basis. Therefore, the fact that the 'Most Recent Observation' recorded for a species may be several years old should not be interpreted as meaning that the species no longer occurs in a town. However, Natural Heritage regards records older than twenty-five years historic.

Click on a town below to view MESA-listed species for that town. To print the species for a particular town, highlight the species using your mouse, go to Print under the File Menu, click on 'Selection' under 'Print Range' and click OK.

For more information about a particular species, view the list of [Natural Heritage Fact Sheets](#).

These data were extracted from the database of the Natural Heritage and Endangered Species Program in August

2006.

Town of Kingston

<b>Town</b>	<b>Taxonomic Group</b>	<b>Scientific Name</b>	<b>Common Name</b>	<b>MESA Status</b>	<b>Federal Status</b>	<b>Most Recent Observation</b>
KINGSTON	Amphibian	Ambystoma laterale	Blue-spotted Salamander	SC		2005
KINGSTON	Amphibian	Hemidactylium scutatum	Four-toed Salamander	SC		1930
KINGSTON	Bird	Haliaeetus leucocephalus	Bald Eagle	E	T	1999
KINGSTON	Butterfly / Moth	Callophrys hesseli	Hessel's Hairstreak	SC		1987
KINGSTON	Butterfly / Moth	Papaipema sulphurata	Water-willow Stem Borer	T		1994
KINGSTON	Dragonfly / Damselfly	Anax longipes	Comet Darner	SC		1994
KINGSTON	Dragonfly / Damselfly	Enallagma laterale	New England Bluet	SC		1994
KINGSTON	Dragonfly / Damselfly	Enallagma recurvatum	Pine Barrens Bluet	T		1994
KINGSTON	Mussel	Leptodea ochracea	Tidewater Mucket	SC		1999
KINGSTON	Mussel	Ligumia nasuta	Eastern Pondmussel	SC		1999
KINGSTON	Reptile	Emydoidea blandingii	Blanding's Turtle	T		1994
KINGSTON	Reptile	Pseudemys rubriventris pop. 1	Northern Red-bellied Cooter	E	E	1979
KINGSTON	Reptile	Terrapene carolina	Eastern Box Turtle	SC		2003
KINGSTON	Vascular Plant	Panicum philadelphicum	Philadelphia Panic-grass	SC		1985
KINGSTON	Vascular Plant	Dichanthelium wrightianum	Wright's Panic-grass	SC		1985
KINGSTON	Vascular Plant	Rhynchospora scirpoides	Long-beaked Bald-sedge	SC		1980
KINGSTON	Vascular Plant	Sagittaria teres	Terete Arrowhead	SC		1980
KINGSTON	Vascular Plant	Polygonum puritanorum	Pondshore Knotweed	SC		1986
KINGSTON	Vascular Plant	Sabatia kennedyana	Plymouth Gentian	SC		2002
KINGSTON	Vascular Plant	Eupatorium novae-angliae	New England Boneset	E		2002

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EMAIL: <mailto:kingstonopenspace@gmail.com>

SUBJECT: OS Plan Update-Comment on Section 4; Page # (please indicate page #s)