

Designing for Wildlife in the Bluebelt

by Robert J. Brauman, Dana F. Gumb, Jr. and Chris Duerkes

The Staten Island Bluebelt program considers the needs of local wildlife by incorporating numerous habitat improvement initiatives into its capital sewer projects on Staten Island. The Bluebelt's system of streams, ponds and other wetlands is a flood control and water quality improvement system that encompasses about one third of Staten Island's land area, or 14,000 acres. The natural areas preserved as part of the Bluebelt present an opportunity to protect and enhance existing wildlife habitat while creating new habitat wherever possible.



A green frog rests in a Bluebelt constructed stormwater wetland.

The creation of wildlife habitat is especially important in New York City's urban areas, where very few large tracts of undeveloped land remain. In the Bluebelt, the New York City Department of Environmental Protection (NYCDEP) designs stormwater best management practices (BMPs) to provide four items essential for fauna: food, habitat, protective vegetative cover and breeding sites – such as amphibian pools where offspring are born, grow and mature.

The NYCDEP provides food sources for local wildlife at Bluebelt sites by creating diverse communities of native plant species. A native plant is a naturally occurring species that has inhabited an area for a long period of time. Bluebelt BMPs, such as ponds and streams, include extensive landscaping with native plants, providing food such as berries, fruits, seeds, nuts and nectar. Today, visitors to completed Bluebelt projects can observe a wide variety of wildlife, including beneficial insects, birds, small mammals, amphibians and fish, resting and feeding on these plants. Birds observed at the Bluebelt wetlands include green herons, yellow-billed cuckoos, crested flycatchers, Baltimore orioles and screech owls.

The greater the variety of habitat “niches” within a given area, the greater the variety of animals that can live there. Brush piles, downed trees and boulder piles are common design features of Bluebelt ponds and streams. These features create a variety of habitat types within the sites. They provide areas where animals can hide from predators or seek refuge from inclement weather. In many cases, trees that are removed during the construction phase of a project are saved and laid on the ground as “habitat logs.” Animals that live on



A habitat log and boulder were salvaged during construction and placed adjacent to a constructed wetland. Note the acorns on the boulder left by chipmunks, which use it as a feeding post from which they can watch for predators.



Root wads shown here were driven into a pond bottom for wildlife habitat. The wads were submerged as the restored pond filled with water.

the forest floor, such as red-backed salamanders, have made homes under many of the habitat logs.

In 1998, a wetland and pond restoration project, also known as BMP RC-1, was carried out at Mill Pond in the Richmond Creek watershed. Here, trees removed during construction were used in a novel way to create fish and turtle habitat. Instead of being wood chipped, the trees were cut down such that the roots were kept intact and attached to the trunks. The trunks and roots were inverted and driven into the bottom of the restored pond, with the roots protruding up from the pond bottom. The inverted roots provide structural diversity to the otherwise flat pond bottom, and the spaces between the roots become areas for small fish to hide and feed on insects. Since installation, painted turtles and egrets have been observed perched on the root wads, which sit just below the surface of the water.

Another simple and effective way to attract wildlife to the Bluebelt is to leave select dead trees standing, rather than removing them.

continued on page 42

continued from page 41

Standing dead trees host a far greater diversity of species than what is ordinarily found in live trees. Cavity-nesting birds such as woodpeckers use dead trees for nesting, as do owls, flying squirrels, raccoons and an enormous variety of insects. There are often opportunities to leave standing dead trees around the periphery of wetland creation sites. Only trees that do not pose a hazard to people or property are considered, and trees are “topped” or trimmed when safety is a concern.

Areas that meet the breeding requirements of wildlife are also important components of habitat creation. BMP RC-8, another wetland in the Richmond Creek watershed, has two wetland cells at a higher elevation than the main pond. They were designed to collect water during heavy rain events for extra storage and to create breeding sites for frogs. Ponds that dry each year are ideal breeding sites, as they typically lack fish that would otherwise eat frog eggs and tadpoles. To ensure that the pools would be appropriate for breeding frogs, they were designed to be shallow, allowing them to dry during the summer. Native plants, logs and branches were placed in the pools to provide places for the frogs to attach their eggs. The sites have proved a success, with green frogs breeding in these pools since construction. Painted turtles, garter snakes and muskrats have also been found making their home in the pools.

The Mill Pond restoration also features a man-made fish bypass to allow the movement of fish upstream past a newly constructed stone weir. Prior to construction, hundreds of fish congregated at the base of the existing stone dam. The old dam, in need of reconstruction, had impeded the movement of fish upstream into Richmond Creek since its construction in the 1960s. When the new weir was built, the NYCDEP improved aquatic habitat by constructing a “step pool” bypass at the base of the new weir. During periods when there is sufficient flow in the creek, fish can move up a series of three rocky pools and into Mill Pond.



Photo courtesy of NYCDEP

A dead tree is left standing for cavity-nesting birds and other wildlife. The tree was topped to prevent hazards to the adjacent roadway and utility wires.

In particular, American eels are a species that take advantage of the bypass: born in the Sargasso Sea, in the North Atlantic Ocean between the West Indies and the Azores, they migrate to freshwater streams and rivers where they grow to maturity. Once mature, the eels migrate back to the Sea to breed. Eel numbers have dropped dramatically over the past century due partly to stream blockages and dams. The fish bypass in the Richmond Creek Bluebelt allows eels to continue their natural migration. Several fish species such as golden shiners, banded killifish and white perch can be found in the stream above the weir since the construction of the bypass. The increase in fish abundance in the creek has led to the presence of more



Photo courtesy of NYCDEP

A “step pool” fish bypass in Mill Pond was created to allow the movement of fish past the newly constructed stone weir.



Photo courtesy of NYCDEP

A pre-fabricated culvert is shown being installed over field stones in the Conference House Park Bluebelt.

piscivorous (fish-eating) birds, such as egrets and herons.

In addition to fish ladders, the Bluebelt designs take other steps to help reconnect fragmented habitats, such as placing natural field stones in culvert bottoms. These stones range from six to 12 inches in diameter, and function to reduce the flow velocity in culverts and provide resting spaces for fish. Many of the small fish species in Staten Island's freshwater streams require low water velocities and resting areas to move upstream. These fish often cannot move upstream due to flows in culverts with smooth, concrete bottoms. The spaces between the stones provide resting areas so that fish may pass through the culvert.

At the many Bluebelt wetland sites, chipmunks and squirrels can be seen using boulder piles as vantage points, warily keeping an eye



Photo courtesy of NYCDEP

Wild Bergamont (*Monarda fistulosa*) is one of the many native wildflowers installed at the constructed wetland sites.

out for danger while they feed on acorns. Green frogs abound near the breeding pools. Turtles can be commonly found basking on logs placed in the constructed wetlands, and shy wood ducks feed among the native wetland plants. The Bluebelt program is a prime example of how simple, economical techniques to improve wildlife habitat can be easily incorporated into stormwater management projects. The Bluebelt program demonstrates NYCDEP's ongoing commitment to improving the natural environment of New York City.

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