HABITAT TYPES of the HAMILTON - TRENTON - BORDETNTOWN MARSH (Marsh)

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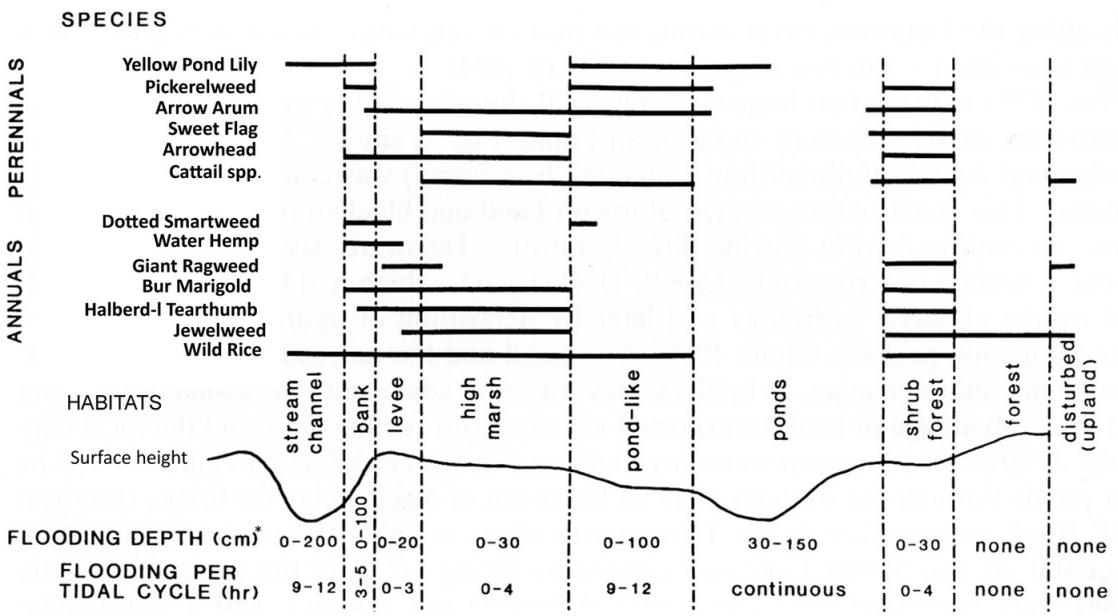
Archaeological, historical, and natural sites of the Marsh combine to provide a rich tapestry of experiences for anyone interested in exploration. The quest for a particular plant or animal species may be diverted by the remains of a brick factory, a Revolutionary Warship, or an arrowhead. The 1250 acres of wetland, which are part of the area known as the Marsh, occupies an ancient meander of the Delaware River where one can find palustrine and riverine, as well natural and constructed wetlands. Half of the wetlands are tidal. The diversity of habitats supports many kinds of plants and animals. A plant list (1988, Bartonia 47: 1-17; 2005, Journal of the Torrey Botanical Society, 132:323-354; with subsequent observations) has 904 species (as of March 2011). About 245 species of birds have been observed with 108 species nesting there. Other groups of animals are less well known. The distribution of plants and animals, whether along a tidal stream or at the edge of a pond, is determined by the duration and depth of flooding. Organisms differ in their tolerances to water.

The area referred to as the Marsh, including uplands that are publicly owned, encompassed more than 3000 acres.

Zonation and Distribution of Hamilton -Trenton Marsh Plants

Distribution patterns for dominant herbaceous plant species is related to flooding depth and duration in tidal freshwater wetland habitats.



* 1 inch = 2.54 cm

Diagrammatic representation of major habitats, flooding depth, flooding duration, and distribution patterns for dominant wetland species. Numbers of species located in the various habitats are indicated. (Reproduced with permission from the Philadelphia Botanical Club; Leck, M.A. , R.L. Simpson, D.F. Whigham, and C.F. Leck. Bartonia 54: 1-17. 1988).

Wetlands:

Rivers -- A number of tidal rivers define this wetland; these include the Delaware River and Crosswicks, Watson, and Duck Creeks. Although miles from Delaware Bay, tidal influence on the Delaware River occurs as far north as Trenton where tidal amplitude is more than 6 feet. The water here, however, is fresh. Crosswicks Creek, Duck Creek, Watson Creek, and smaller channels are also tidal. Much of the eastern bank of the Delaware River is a cobble shore and water movement is generally too fast for the growth of many large plants called macrophytes, but certain plant species, e.g., New York Ironweed and Sneezeweed may be found near the high tide line. In deeper water where water flow is slower, Water Smartweed and Yellow Pond Lily (Spadderdock) may be found. The banks of other streams are mud and, again, where water movement is rapid no macrophytes grow. However, in flowing water phytoplankton, tiny microscopic photosynthetic cells, are the base of important food chains that support fish, including Killifish, Johnny Darter, Alewife, Shad and Yellow Perch, and in the Delaware River near the Duck Island constructed wetland, Short-nosed Sturgeon. The fish populations, in turn, support fish-eating birds such as Mergansers, Cormorants, Osprey, Egrets, and Herons. River Otter has recently reestablished in the Hamilton - Trenton Marsh and are occasionally seen along Crosswicks Creek and elsewhere.

Ponds -- Sturgeon Pond, Spring Lake, and Rowan Lake (on some maps: tidal), as well as areas impounded by the highway construction of I-195, I-295, and NJ-129 interchange and Tide Pool in the Duck Island constructed wetland, are to some degree, created by humans. They are of different ages and depths and have distinctive characteristics. Both Spring Lake and Sturgeon Pond show the effects of hydrological succession with obvious natural filling in along edges. With time and no human intervention, they eventually would become marshes and then swamps. Additional impoundments have, since 1992, been created by Beaver. The ponds have submerged and floating macrophytes that do not occur in other wetland types. These include duckweeds, Creeping Water Primrose, which is rare in New Jersey, and Mermaid-weed. The ponds provide habitat for amphibians, such as Bullfrogs, Green Frogs, and Pickerel Frogs, and turtles including Red-bellied, Eastern Painted, Snapping, and Red-Eared. Great-blue Herons, Green Herons, Ring-necked Ducks, and Wood Ducks are frequently observed in ponded areas.

Marshes -- Examples of both tidal and nontidal marshes are found within the Marsh. Marshes may be found at the edges of ponds, along tidal channels, or other poorly drained areas. This wetland type, distinguished by non-woody vegetation, may be dominated by perennial species such as Cattails or Reed Grass, stands of which may grow 10 or more feet tall. Many annual species, including Giant Ragweed, Water Hemp, Water Smartweed, and Wild Rice, dominate among tidal channels. The high marsh has Bur Marigold, Jewelweed, Halberd-leaved Tearthumb, and Dodder. Interspersed among the annuals are other perennials (e.g., Arrow Arum, Sweet flag, and River Bulrush). These marshes have high plant species diversity compared to salt marshes. The seasonal changes, from mud in January, to a carpet of tiny seedlings in March, to vegetation more than 8 feet tall in August, are truly amazing. Because of such prodigious growth, tidal marshes are among the most productive ecosystems in the world. In addition, a number of plant species considered rare in parts of the Delaware River Estuary grow here. Some such as Wild Rice are common; others like Subulate Arrowhead and Estuarine Beggar's Ticks appear to have more specific requirements and are less frequent.

Marshes provide habitat for Muskrats, Marsh Wrens, Least Bitterns, Yellowthroats, and Red-winged Blackbirds. An excellent place to look for Muskrat lodges, especially in winter, is the marsh on the north side of Spring Lake.

Shrub Forest -- As swamps, shrub forest wetlands are characterized by woody species. Shrub forests occur at the edges of marshes adjacent to upland areas; they also occur at the edges of

marshes where they grade into swamps, with trees forming a distinct canopy, which in turn grade into wet forests and then to upland. The shrub thickets of Silky Dogwood, Buttonbush, Alder, Arrowwood, Red Maple, and Swamp Ash occur on hummocks surrounded by marsh. Some shrub forests, because of their openness and variety of microenvironments, support wildflowers such as Bitter Cress, Fringed Loosestrife, Purple-stemmed Aster and Turtlehead. In contrast, other areas are quite impenetrable. Among the animals observed have been Baltimore Butterflies, Woodchuck(!), Willow Flycatchers (nesting), Eastern Kingbirds, Cardinals, and Brown Snake.

Wet Forests -- West of Spring Lake is a low-lying wooded area dominated by Red Maple and Sweet Gum. Nine species of ferns, including Rattlesnake Fern and Netted Chain-Fern may be seen in a leisurely one-hour walk. Among the animals found in these wet woods are Grey Squirrels, Chipmunks, White-tailed Deer, Raccoons, and Red-tailed Hawks.

Wet woods may also be found on the flood plain of Crosswicks Creek up stream of the Route 206 bridge. Tree species there include Willows, Box Elder, and White Ash. Vines of grape, Virginia Creeper, and Poison Ivy festoon the trees along the stream banks. Skunk Cabbage may be locally common.

Disturbed Wetland Edges -- Highway construction, which began in 1984, caused considerable disturbance in some areas. Such open places provide a transitory habitat for a variety of species. For example, during a Torrey / Philadelphia Botanical Clubs trip in September 1990, 12 Smartweed species were observed. Birds commonly found along disturbed edges are: Goldfinches, White-throated Sparrows, and Indigo Bunting.

Constructed Wetland -- The Duck Island constructed wetland is the largest Department of Transportation wetland mitigation project in New Jersey. The 94-acre site has approximately 70 acres of wetlands, of which about 70% are tidal; this replaces 57 acres lost during highway construction. Prior to mitigation, Duck Island had no existing wetland except for a small poorly drained area that covered less than one quarter acre. Now there are a series of tidal channels and eight islands of varying sizes and elevations above mean high tide. Wetland construction was completed in stages beginning in fall 1993 and extending to November 1994.

By October 1995, more than 300 plant species, not including landscaping plants, had been found. Many were weedy species associated with upland areas. Some were transitory, observed on only one occasion (e.g., Riverbank Quillwort). By 2004 many more had been reported. Several rare species such as Estuarine Beggar's Ticks, American Waterwort, Subulate Arrowhead, Torrey's Rush, Narrow-panicled Rush, Water Willow, and a Hop Tree, found on the wooded fringe adjacent to the Delaware River, have made botanizing exciting.

The constructed wetland, because of its proximity to the Delaware River as a source of many water dispersed seeds and its openness soon after construction was completed, provided habitat for many species not found in other areas of the Marsh.

Among the animal species observed since October 1994 are: more than 100 species of birds, including a dozen species of waterfowl, egrets, herons, Black Vultures (feeding on Carp), Snipe, Bobolinks, and Blue Grosbeaks; fish including Carp (mating), Bullhead, Banded Killifish, and Shiner; amphibians / reptiles, including Fowler's and American Toads (and tadpoles), Snapping Turtles, and a Ribbon Snake; mammals including Beaver, Deer, Fox, Muskrat, Opossum, Raccoon Woodchuck, White-footed Mouse, Microtus (this vole caused extensive winter browse damage on Black Locust); and invertebrates, including Bluecrabs, Asiatic Clam, and River Mussel. Beaver and muskrat lodges have been found.

This constructed wetland provides a unique outdoor laboratory for monitoring the progress of vegetation change (succession) in a tidal riverine setting. Colonization patterns by plants and animals should provide valuable insights regarding natural community dynamics and success of created wetlands.

Uplands:

Upland Forests -- There are two types of upland forests, second growth in places that were once agricultural fields or otherwise altered by human activities and the oak woods along the bluffs north of Bordentown. The second growth forests, which may be found along the bluffs near Spring Lake and on the islands near Spring Lake and the Hamilton Water Treatment Plant, are dominated by Oaks, Tuliptrees, and other hardwoods. These woods support a variety of wild flowers, including the spring-blooming Mayapple, Dutchman's Breeches, and Celandine. In open sandy areas on Duck Island and near Spring Lake in summer can be found Blue Curls, Wild Sensitive Plant, and Bush Clovers, as well as native grasses, such as Little Bluestem and Indian Grass. Such second growth woods can also be observed around the perimeter and just north of the constructed wetland on Duck Island. There the dominant tree species is Black Locust.

The oak woods on the bluffs overlooking Crosswicks Creek near Bonaparte's Landing contain Tuliptrees, Black Gums, a few Eastern Hemlocks and Pitch Pines, as well as White, Chestnut, and Black Oaks. There is even an American Chestnut sprout. Unique for this part of New Jersey are dense thickets of Mountain Laurel and Great Rhododendron that dominate the shrub layer. In spring morels may be found. Except for destruction caused by a tornado during late June 1996, this appears to be the least disturbed of the wooded areas within the Abbott Farm National Landmark.

During the course of the year, a great variety of birds may be found in upland forests especially during spring and fall migrations. Nesting Brown Thrashers, Song Sparrows, and Carolina Chickadees are common in second growth forests; Titmice and Chickadees are common in the Mountain Laurel-Rhododendron thickets; Blue Jays are wide ranging.

Disturbed Areas -- Construction and maintenance activities along roadways, the railroad, sewage treatment plants, and other buildings, as well as places where tidal debris is deposited offer obviously altered and disturbed environments. They occur on a variety of soil types and are places to look for weeds and other plants whose lifestyle is suitable for these open, often ephemeral habitats. Among the more interesting species found in such places have been Camphor-Weed, Slender Vetch, and Lance-leaved Coreopsis. In the spring, Princess Tree. with its bare branches and large blue flowers, is conspicuous. Perhaps one of the most notable finds was Pale Indian Plantain, an endangered species; this was found in an area that had been burned in the 1950's(?). Another element of human activity are the numerous bridges that cross waterways; the beams of the bridges are prime nesting sites for the endangered Cliff Swallow.

Summary: Habitats of the Hamilton – Trenton – Bordentown Marsh

Wetlands (all freshwater)
Tidal –
- *Rivers and channels* that wend through marsh- and swampland
- *Marsh* (dominated by non-woody vegetation)

Swamp (dominated by trees and / or shrubs)
Constructed wetland on Duck Island

Non tidal –

Ponds, including some caused by beaver dams
Marshes and swamps
Wet woods, in low-lying places
Floodplains, temporally inundated when the Delaware River, Crosswicks and Watson Creeks flood

Uplands (along the bluffs and on islands within the Marsh)

Second growth forests – where agriculture once occurred
Oak woodlands - along the bluffs, where in some areas there are thickets of Mountain Laurel and Rhododendron.

Distribution of plants across habitats is based on specific tolerances to, e.g., hydrology (depth and duration of flooding) and shade. Among the adaptations for surviving in wetlands are tissues (aerenchyma) that transports oxygen-containing air to parts (roots, rhizomes) in anaerobic soil and the production of adventitious and / or surface roots.

The differences among species tolerances can be seen in this springtime photograph of a small tidal channel. The light green are seedlings of Wild Rice that can tolerate the wetter channel, back from the Wild Rice are Arrow Arum and Cattail. (Photograph, © M.A. Leck).