GLACIAL GEOLOGY/SOILS

Reference is made to the discussion and overview provided in the 2005 report by CLA Engineers to Russell Waldo & Associates. EECOS field investigations substantiated the information contained in that report and material available from the CT state Natural History Survey office and geological maps. What we feel is essential to identify and highlight here is how important and educational the geological features and stories are to the overall ecology and ecosystem services that the East River Preserve supports.

The abovementioned report breaks the bedrock into two broad categories from the same geologic "terrane" of primarily metamorphic rocks with some igneous granite mixed in. Primarily, the area is underlain by the Monson Gneiss that derives from broken down components of ancient continental granite that was eroded and subsequently deposited 100's of million years before the present in a inland sea referred to as the Iapetos anticline. These sediments underwent great heating and pressure as they were compressed and folded over the eons causing the mineral components such as feldspars, biotite mica, and quartz to coalesce into distinct bands that give the rock its characteristic grainy, laminar, "pepper and salt" appearance. One can see this displayed in the many outcrops throughout the property. Along with this Monson gneiss, one finds very similar outcrops of the Middletown Formation of gneiss and granitic rock (granofels with hornblende) from the same terrane.

What is significant about these similar bedrock types is that they controlled the subsequent shaping and sculpting energies of the Quaternary era glaciations. The erosion resistance and hardness of surfaced folds in these metamorphosed granites became the upland areas of the property as massive, thick sheets of ice scraped over the landscape of southern Connecticut. Weaker portions of the rock found along lines of faulting and tectonic movement gave way to the ice sheets and were carved out and, in a sense, backfilled with glacial till material that was extruded beneath the ice as it moved over the buried landscape. The rounded and elongate shape of the uplands and general northwest to southeast trend of these tectonic lines ("strike and dip of fault lines" to the field geologist) gave rise to an appropriately Connecticut descriptive term of "whaleback ridges." Viewed without the cloaked presence of vegetation and soil overburden, the ridges would appear as a pod of gigantic leviathans as they rise gently up to the surface and dip steeply back down into the ground. In this sense, the landscape, soils, and geohydrology of the East River Preserve and surrounding southern Connecticut with similar geologic history is said to be "bedrock controlled."

State of Connecticut (CT600)			
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
3	Ridgebury, Leicester, and Whitman soils, extremely stony	135.3	20.9%
17	Timakwa and Natchaug soils	5.6	0.9%
29B	Agawam fine sandy loam, 3 to 8 percent slopes	41.4	6.4%
37E	Manchester gravelly sandy loam, 15 to 45 percent slopes	3.2	0.5%
38C	Hinckley gravelly sandy loam, 3 to 15 percent slopes	20.0	3.1%
45B	Woodbridge fine sandy loam, 3 to 8 percent slopes	0.2	0.0%
52C	Sutton fine sandy loam, 2 to 15 percent slopes, extremely stony	4.9	0.8%
58C	Gloucester gravelly sandy loam, 8 to 15 percent slopes, very stony	2.1	0.3%
60B	Canton and Charlton soils, 3 to 8 percent slopes	0.1	0.0%
60C	Canton and Charlton soils, 8 to 15 percent slopes	0.0	0.0%
62C	Canton and Charlton soils, 3 to 15 percent slopes, extremely stony	11.0	1.7%
73C	Charlton-Chatfield complex, 3 to 15 percent slopes, very rocky	285.5	44.1%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	107.4	16.6%
75C	Hollis-Chatfield-Rock outcrop complex, 3 to 15 percent slopes	2.7	0.4%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	0.3	0.0%
98	Westbrook mucky peat	14.4	2.2%
103	Rippowam fine sandy loam	6.2	1.0%
306	Udorthents-Urban land complex	1.0	0.1%
W	Water	6.6	1.0%

What lies above and over the bedrock cradle of the land is what is referred to as the surficial geology. Generally speaking, in New England anyway, the soils have developed out of this surficial geological material either from the abovementioned glacial tills spread at differing depths over the bedrock surface, or from glacial sedimentary deposits. The abovementioned engineering report does a sufficient job of describing the till and glaciofluvial deposits that one finds on the property, as well as the bedrock controlled depressions that subsequent to deglaciation became the vast network of wooded wetland soils and valuable water storage features found throughout the East River Preserve. What they failed to report from their literature review is the significant depths of glacial outwash deposits and littered, rock-strewn surface of ground moraine features one encounters throughout the property.

The western most portion of the property above and along the river contains the phenomenal "kame terrace" feature of stratified glacial drift deposits composed of layers of sands and gravels. As the ice sheets stalled out over Long Island Sound and began to melt away, massive rivers of water rushing within and over the ice flows deposited their bed loads of water worn sediments, silts, sands, and stony gravels of varying sized materials in depressions alongside and on top of the wasting ice surfaces and ice controlled proglacial lakes. Just such a landscape existed in the past 10,000 years or so giving rise to the deep sand and gravel deposit that underlies the fields and bluffs that stand above the East River. Depressions and undulations in these fields were caused when the glacial ice underlying the deep, waterborne sediments eventually melted away causing the land to subside and/or be further eroded by surface water down cutting through the sediments.

The contrast between the relatively undisturbed Pleistocene (glacial and post-glacial epoch) deposits and the man-altered landscape to the north where the town's brush and stump dump and scattered water bodies and subdivisions are located is a telling example of how society values and makes use of these glacial deposits through time. One could build a land use history course out of these two contrasting areas; one area being the former Goss Farm with its long history of pastoral use and watershed protection now serving those functions as the East River Preserve. The other area, immediately adjacent to the north, tells the more common Connecticut stratified drift history of aggregate mining down to bedrock and deeper into the water table.

The further into the heart of the Preserve (east) that one goes, the more surficial glacial features one encounters. Already mentioned are the smooth, rounded elongate bedrock ridges that trend through the property. Wetlands pool up and spill over through a series of connected or isolated depressions in between the ridges where underlying till and silt deposits created an impervious underlayment to water. These wetlands over the eons have developed deep organic soils and associated plant communities that provide

invaluable water filtering and storm water storage functions in addition to the remarkable ecological communities and biodiversity they support.

In several locations in and around these wetlands, quite notably in the northern half of the property, EECOS encountered glacial outwash features known as "eskers." These appear in the landscape as relatively steep sided, sinusoidal and linear hillocks composed of unstratified glacial outwash deposits that derived from fast moving subglacial meltwater streams and rivers. They generally are truncated as a result of either changes in the land post glaciation or because of how they wove in and out of the glacial ice as it thinned and melted in situ. The eskers create wonderful opportunities for the location of elevated trails, serving birdwatchers and the like as a sort of ground-based canopy walk where one looks directly out into the crowns of the trees that grow on them down slope.

Perhaps the most telling periglacial surface features found over and over again throughout the East River Preserve are the rock strewn and boulder rich surfaces that can best be referred to as ground moraines or small areas of push moraines. Glacial moraines in general are the result of the bulldozing action of a glacier. Rocks, debris, and even previously standing forest vegetation can be pushed up and entrained into these glacial features at the margins of the ice, most typically at the terminus or front of the glacial ice mass. Other forms of moraine include the massive amounts of debris that is dragged along and carried on the surface of the glaciers and set down on the ground once the glaciers melt away. This extremely rock and boulder rich material is known as ground moraine and is found throughout the East River Preserve. Other unique occurrences found on the Preserve are what are referred to as push moraines. As the glacial ice sheets stalled over Long Island Sound and left one massive end moraine feature which is today known as Long Island, there were brief intervals where glacial readvancement occurred during the long period of glacial "retreat or recession." These readvancing movements tended to be localized in certain places and generally short-lived but led to the pushing together in long linear piles much of the rocky, bouldery deposits that had previously been dropped off. In several locations on the East River Preserve, one can encounter these elongated "boulder piles" which run generally east-west for short distances but suggest that a brief readvance of ice created these smaller push moraines.

The last, but often most popular, glacial remnants found throughout the landscape of the Preserve, especially notable on the higher elevations, are the ubiquitous occurrence of erratic boulders. These large to medium sized boulders, often comprised of rock materials not related to the bedrock terrane in which they have landed, were conveyed generally within the glacial ice or on top of the ice sheets from locations further to the north and then "rafted" into position once the ice melted in place. Many are found prominently on the

hilltops along ridges often occurring in groups or forming lines of stones through the forest called "boulder trains." These are wonderful features to climb onto and sit for a while to observe wildlife and contemplate the forested landscape.