Pebbly Loess in the Pine Barrens of Central Suffolk County, Long Island

Jessica Rezza (Jessica_Rezza@yahoo.com)
Stony Brook University, Stony Brook, NY

Link to Other research reports that describe pebbly loess on Long Island and Westchester County New York

Abstract

The central focus of this study is to analyze the soil texture of central Suffolk County, Long Island and investigate the presence of pebbles within the otherwise conventional loess deposit and compare results to previous studies of soil on Long Island and in Westchester County to examine the extent of this deposit. Mostly referred to as "pebbly loess", this diamict, a poorly sorted, unconsolidated sediment, has been reported in other distinctive glacial outwash areas, such as Ohio, Iowa, Alaska, and Minnesota. The process for deposition of a wind-blown silt that contains pebbles still puzzles geologists.

Loess was found throughout the Rocky Point Nature Preserve, Cathedral Pines County Park, Prossner Pines Nature Preserve, and adjacent regions. Pebbles were found in every sample collected, with the majority of samples containing 7% of pebbles or less by mass. 38% of samples were loamy sand, 34% were sandy loam, and 28% were sand, demonstrating a high sand/silt ratio with very limited amounts of clay. Most pebbles were sub angular to sub rounded quartz. 38% of samples contained at least trace amounts of charcoal. This sandy texture is ideal for a Pitch Pine forest cover to develop, and supports the identification of pitch pine, dwarf pine, white pine, white oak, scrub oak, and lowbush blueberry.

Introduction

The purpose of this study is to expand the area of research on pebbly loess on Long Island to include a wider range of data within the Long Island pine barrens by characterizing the nature of sediment located below the O-horizon as a distinct stratigraphic unit, and possibly determine a relationship between the soil textural class of the pebbly loess and local ecologies. This expanded research may provide clues as to how this sediment could have been deposited.

Loess is an unconsolidated, wind-blown sediment composed mainly of silt-sized particles with deposits showing little to no stratification and being mostly homogeneous (Kundic, 2005). It has been widely accepted that Long Island has been covered by loess as a glacial deposit. However, within the past few years, pebbles have been consistently discovered within the loess and can no longer be ignored as an error in collection. Professor Gilbert Hanson has somewhat affectionately termed the deposit "pebbly loess".

The presence of pebbles within the loess deposits is very troubling since pebbles are too large to be carried by wind and therefore suggests another process for deposition. Dominguez (2015) suggests deposits the pebbly loess of Long Island should be referred to as a diamict because her research of sediment in Suffolk County, Long Island is non-sorted, or poorly sorted, unconsolidated sediment containing a wide range of particle sizes. Although glacial processes have long been assumed for the sediment deposits on Long Island, other processes could be responsible for depositing diamicts such as mudflows, landslides, solidfluction, flowtill activity, and deformation by floating ice, along with recent hypotheses of a bolide impact event occurring at the time of the Younger Dryas cooling event (Dominguez, 2015).

Recent research in the Rocky Point Nature Preserve on Carolina Bay structures and their underlying stratigraphy have failed to reveal indisputable evidence of an impact crater as evidence of the bolide impact at the time of the Younger Dryas cooling event (Tvelia, 2015). Tvelia's research of the Carolina Bay structures just west of the blue hiking trail within the Rocky Point Nature Preserve showed a thick layer of sandy loess that was approximately 19 inches thick.

This study will further expand Tvelia's research within the nearly 6,000 acres of the Rocky Point Nature Preserve and include two parks, Cathedral Pines and Prossner Pines, south along Rocky Point Road (Route 21) in central Suffolk County, Long Island. Sampling will be done within the preserves along foot trails and bicycle trails as well as collecting some samples road side. This will be done in order to widen the range of soil studied within this pine barren region of Suffolk County.

Method

Samples were collected within a 10 square mile radius focusing on the Rocky Point Nature Preserve, Cathedral Pines, and Prossner Pines Nature preserve in order to avoid as much development as possible. Unfortunately, Long Island has become a very developed suburbia and undeveloped sites have become limited. Sites were chosen based upon ease of access by foot, usually by trail. Sample sites within each nature preserve were spaced out be about 0.1 miles and at least 3 meters off the foot trail to avoid any disturbance that may be associated with the foot traffic of the trail.

Once a site was chosen, a spade or a garden trowel was used to clear the debris from the surface of the ground then to dig approximately 25 centimeters to 1-meter-deep depending on the thickness of the O horizon, root density, and the need to be discrete. Approximately 100 gram samples were all collected from below the A horizon where the yellowish-brownish loess deposits are found using a large serving spoon from the wall along the hole dug. (Fig 1) Samples were then placed in a labeled, clear plastic bag. The coordinates were recorded using an application called My Elevation that records latitude and longitude using a cell phone signal. Ecology was recorded based upon observations using the hand held guide "A Field Guide to Long Island's Woodlands" (Springer-Rushia & Stewart, 1996).

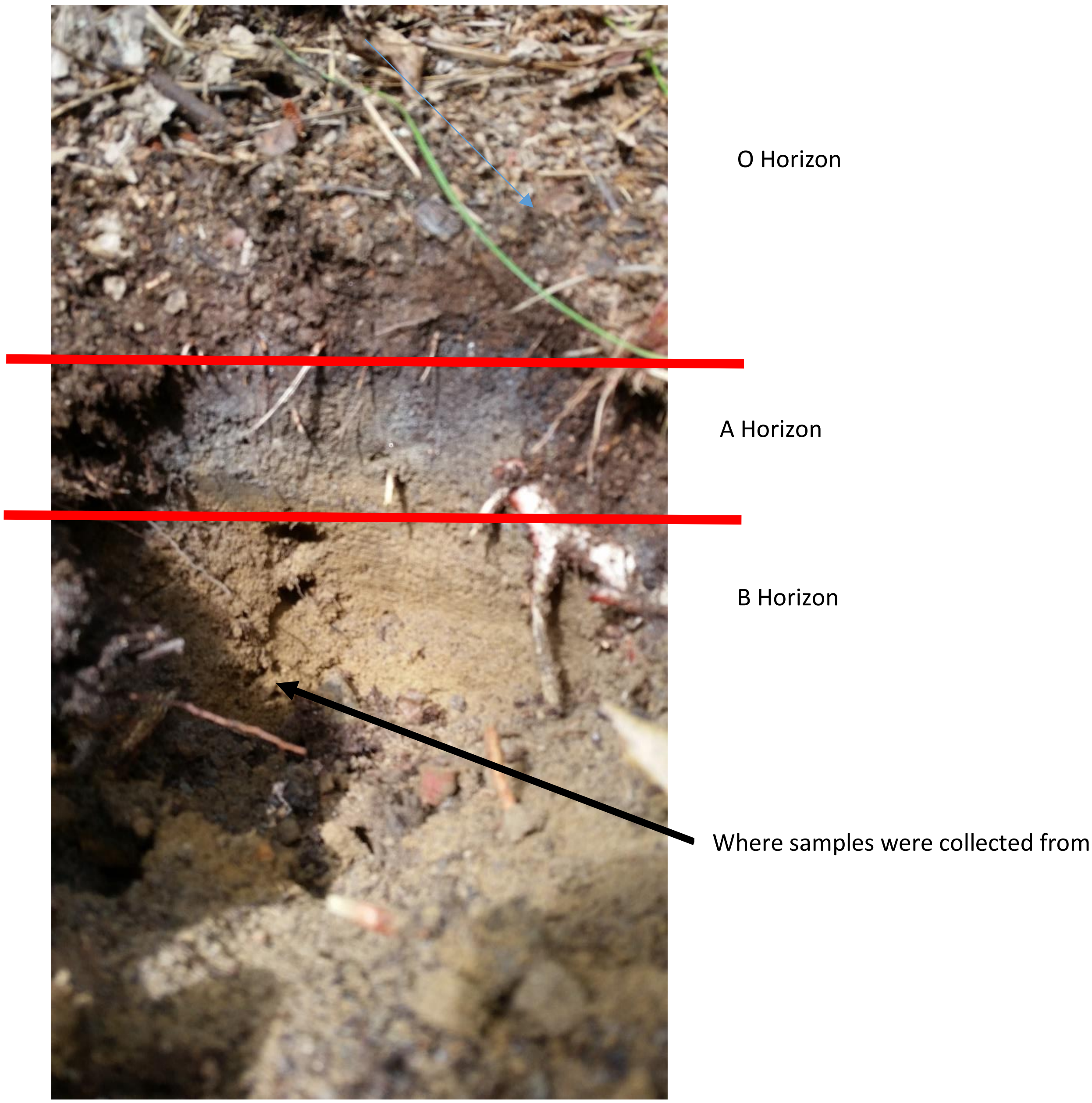

Figure 1: An example of the where in the soil profile samples were collected from

After samples were collected, they were spread out in a thin layer on a sheet of paper to dry for at least 24 hours before the grain size analysis. Samples were massed using a tabletop digital kitchen scale. Next, samples were sieved using a 2 millimeter screen, breaking up clumps of soil by hand in order to separate out the pebbles. Pebbles were then massed on the same scale and recorded the ratio by weight. Charcoal was identified by sight either when the samples were drying or as they were being sieved. Suspected charcoal was crushed in order to determine whether if it was actual charcoal, organic matter or dark-colored pebbles.

Procedure for grain size determination involved placing 15 mL of sediment into a 50 mL centrifuge tube, adding 1 mL of dispersant, and adding tap water to reach 45 mL volume. Samples were placed in an ultrasonic cleaner for the full 4-minute cycle to de-clump the

sediment sample. Each test tube was then vigorously shaken for 2 minutes and settling rates were recorded. Sediment that fell within the first 30 seconds was called sand, silt settled over the next 30 minutes, and additional sediment that settled over 24 hours was termed clay. This procedure originated from Soil Texture of Fracture protocol and was modified based on suggestions from Dr. Gilbert Hanson (ecoplexity.org). To precisely record the amount of sand and silt, a bright light was shone on the centrifuge tube to help read the volume through the still unsettled sample (Fig 2). It should be noted that the centrifuge tubes did not start its markings until 5 mL, however, no samples had less than 5 mL of sand, therefore, precision was not put at risk.

Figure 2: An example of how measurements were taken during grain size analysis using the centrifuge tubes.

Results

A table including all of the locations, masses of samples, grain-size data, percentages by mass of pebbles, soil texture class, and indications of charcoal present are listed in Appendix A. Figure 4 below shows a Google Earth image depicting all of the locations where samples were gathered. All of the samples analyzed contained at least some pebbles, with a range of 0.61%-28.11% by mass of pebbles (Fig.3). The majority of pebbles were approximately 2mm-3mm in diameter with the largest pebble having a diameter of 36 mm, while most pebbles were sub angular to sub rounded. All large pebbles appear to be quartz.

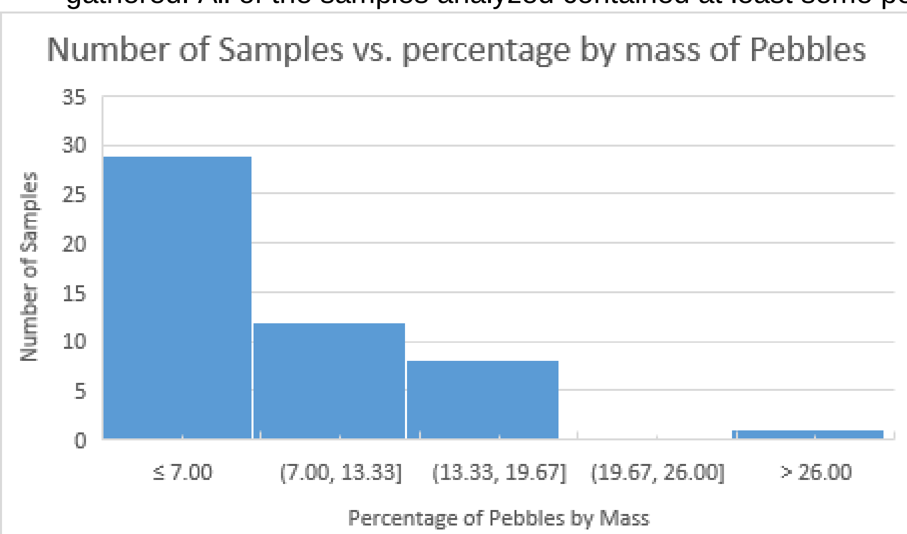

Figure 3 Histogram of percent by mass of pebbles of different grain size in mm.

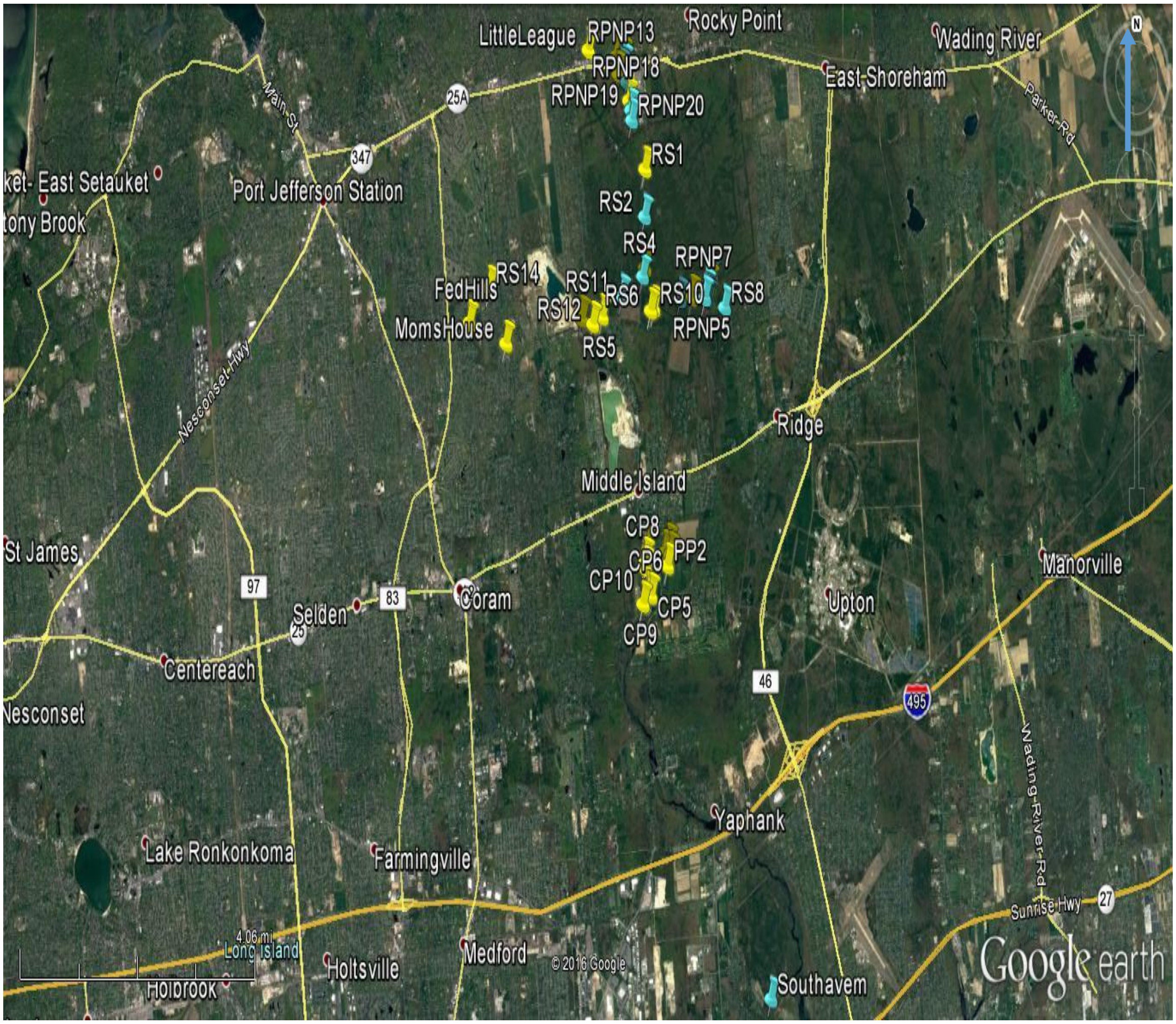

Figure 4: A geographical map representing all of the sample sites. A blue pin indicates charcoal was present in the sample, while a yellow pin indicates charcoal was not.

The soil texture diagram in Figure 5 represents all of the samples collected. Samples are color coded based upon where they were collected. Clay was in extremely low abundance in all samples collected with the highest concentration of clay being slightly more than 6%. The loess collected and analyzed varied in color from yellowish to brownish and was mostly made up of unconsolidated sediment. The most common soil textures were loamy sand (38%), sandy loam (34%), and sand (28%) (Fig 6).

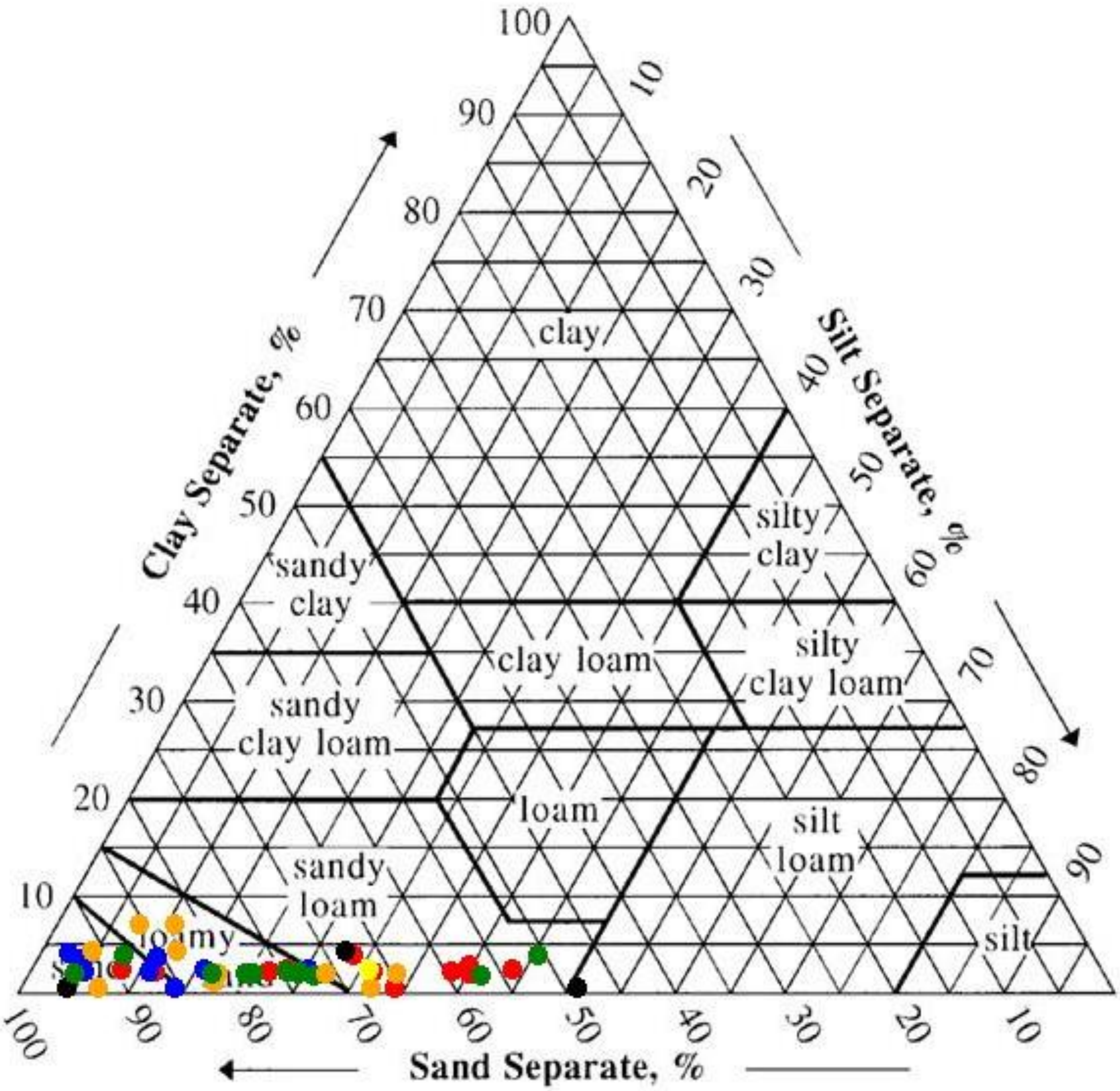

Figure 3: Soil Texture Triangle for all samples in this study. Orange represents samples in Cathedral Pines and Prossner Pines. Green represents samples taken roadside. Black represents samples in developed areas. Blue and red are for Rocky Point Nature Preserve

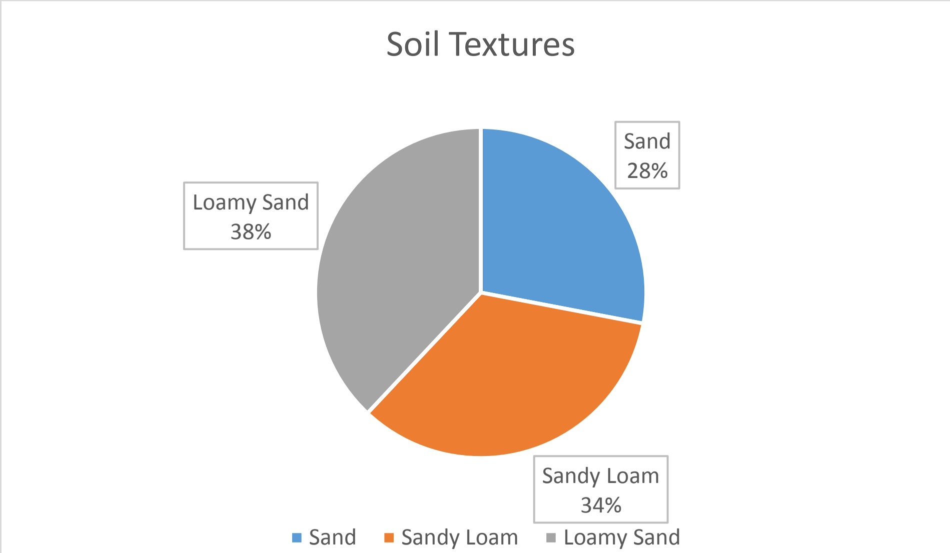

Figure 4: A pie chart representing all of the soil textures found in samples collected

The ecology at each of the sites where samples were collected were very similar. The Rocky Point Nature Preserve contained pitch pines, dwarf pines, white oak, scrub oak, dwarf oak, scrub maple, pine barrens heather, lowbush blueberry, bearberry, huckleberry, poison ivy, New York ferns, lady ferns, turkey tails, ink cap mushrooms, reindeer lichen, and grasses. It contained the most variety amongst the flora studied (Fig 7).

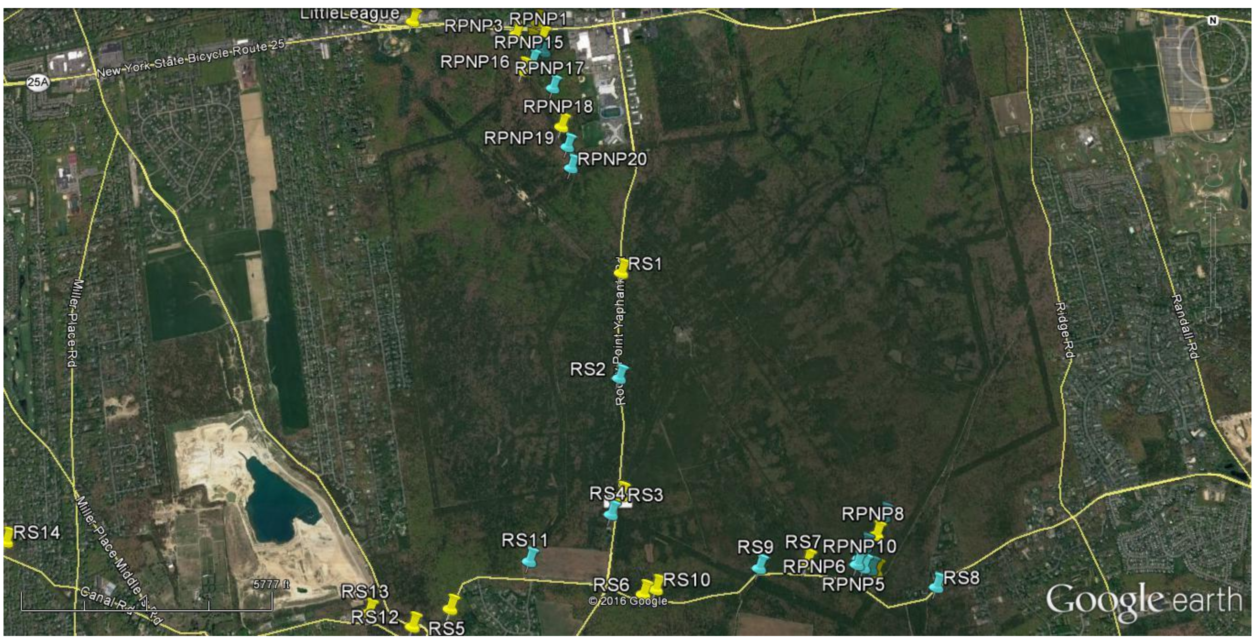

Figure 5: A geographical map indicating where samples were collected in the Rocky Point Nature Preserve. Blue pins indicate charcoal was found at that site while yellow pins indicate charcoal was not present.

The ecology in Prossner Pines was mostly white pine trees approximately 70-80 feet tall. There were few scattered pitch pine, scrub oak, lowbush blueberry, and pine barrens heather. Across the street in Cathedral Pines, there was more variation including more pitch pine, dwarf pine, poison ivy, dwarf oak, New York fern, lady fern, ink cap mushroom, and grasses.

The ecology at the developed sites including, Little League field parking, Mom's House Roadside 13 and Roadside 14 included some pitch pine, mostly white oak, scrub oak, poison ivy, and grasses. It was more difficult to specify naturally occurring flora due to the obvious human impact on the area.

It also should be noted that charcoal was present in 38% of samples. 13 samples from the Rocky Point Nature Preserve, 5 samples collected road side, and 1 sample from Southaven Park in Yaphank contained at least some charcoal. The majority of charcoal observed was approximately 1mm in length ranging all the way up to 21mm in length. Figure 6 shows a map with all of the locations of the collected samples with yellow pins representing samples that did not contain charcoal and blue pins representing samples that did have charcoal.

Discussion

The loess sediment found throughout central Suffolk County is an un-stratified geologic unit that has a yellow-brown color and varies from sand to sandy loam. It is also containing a mean mass of pebbles of 7.74%It appears to be a distinct and consistent geological unit. These results were similar to those done in Westchester samples (Danz, 2016) and in previous work done on Long Island (Dominguez, 2015).

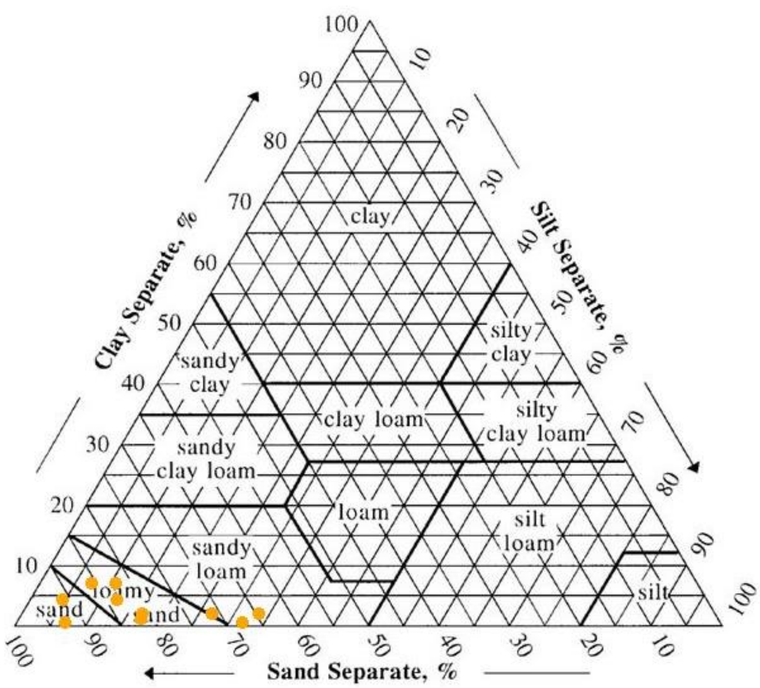

Figure 6: The soil texture triangle representing samples taken from Cathedral Pines County Park and Prossner Pines Nature Preserve

The samples taken from within Cathedral Pines and Prossner Pines are shown in Figure 8. Results show an extremely high percentage of sand with 20% of samples being classified as sand, 60% of samples being classified as loamy sand, and 20% of samples being classified as sandy loam.

These high concentrations of sand seem to correlate with the high concentration of white pines and pitch pines in the area. Prossner Pines Nature Preserve, in particular, is composed almost completely of white pines, which were planted there in 1812 (Suffolk County Department of Parks). There were no other significant trees taking up the canopy and had slight variety in the smaller underlay. Figure 9 shows a Google Earth Image from above of the areas sampled on both the East and the West side of Rocky Point Road, CR21. There was no charcoal found in any of the ten samples taken from these sites, which could support the claim that charcoal found in other samples is more indicative of more recent and less widespread forest fires in the area.

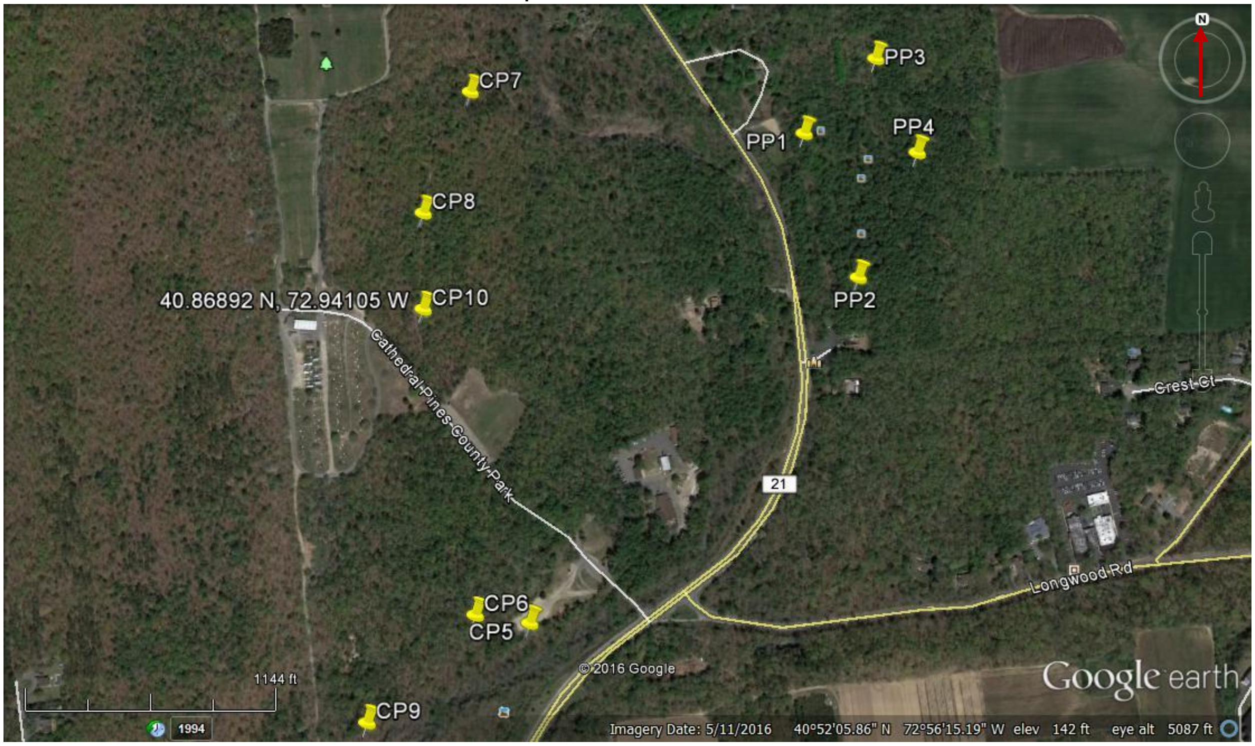

Figure 7:: A geographical map indicating sites visited within the Cathedral Pines County Park and Prossner Pines Nature Preserve.

The samples taken from the Rocky Point Nature Preserve show a slightly higher concentration of silt, however the overall texture of the soil remains to be on the sandy side (Fig 10). Samples taken from the Eastern side of the Rocky Point Nature Preserve tend to be slightly sandier than their silty counterparts from the Northern section of the Rocky Point Nature Preserve.

In the Northern section of the Rocky Point Nature Preserve, see Figure 11, 64% of samples were sandy loam, 21% of samples were sand, and 15% of samples were loamy sand. Half of the samples recovered from this section also contained charcoal, with most pieces of charcoal being approximately 0.5mm-2mm in diameter. Charcoal was recovered at least 6cm below the

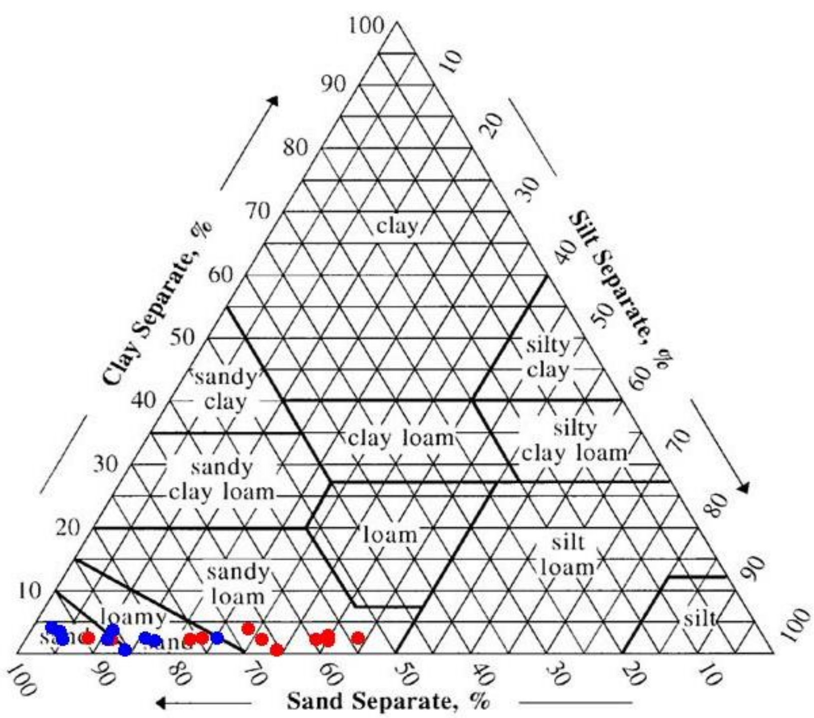

Figure 8: The soil texture triangle representing samples from the Rocky Point Nature Preserve. Blue dots represent samples from the Eastern section and Red dots represent samples from the Northern section

O horizon. This section of the preserve is also where Tvlia (2014,2015) focused his studies on the Carolina Bay features further to the West of where these samples were collected.

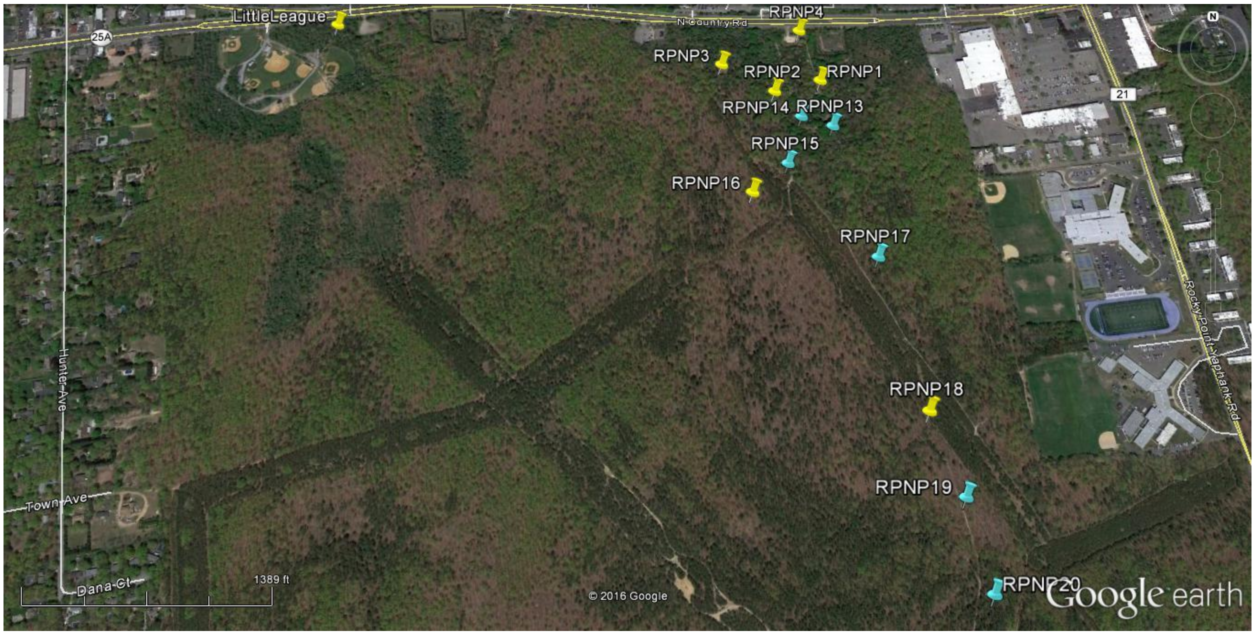

Figure 9: A geographical map indicating where samples were collected in the northern part of the Rocky Point Nature Preserve. This corresponds with the blue data points of the soil texture triangle of Figure 10. Blue pins indicate charcoal was found in the sample.

The Eastern section of the Rocky Point Nature Preserve was sandier in composition with 75% of samples being classified as sand and 25% of samples being classified as loamy sand. This section also hosted the highest concentration of charcoal found, with 75% of samples containing at least some pieces of charcoal. Charcoal in this area was as large as 15mm across. According to the New York Times, there was a large fire in this area in August of 1999 (McQuiston, 1995). This could possibly explain the larger pieces of charcoal, however, without radiocarbon dating of the samples it is impossible to conclusively rule out any other theories for deposition, such as widespread forest fires around the time of the Younger Dryas cooling event.

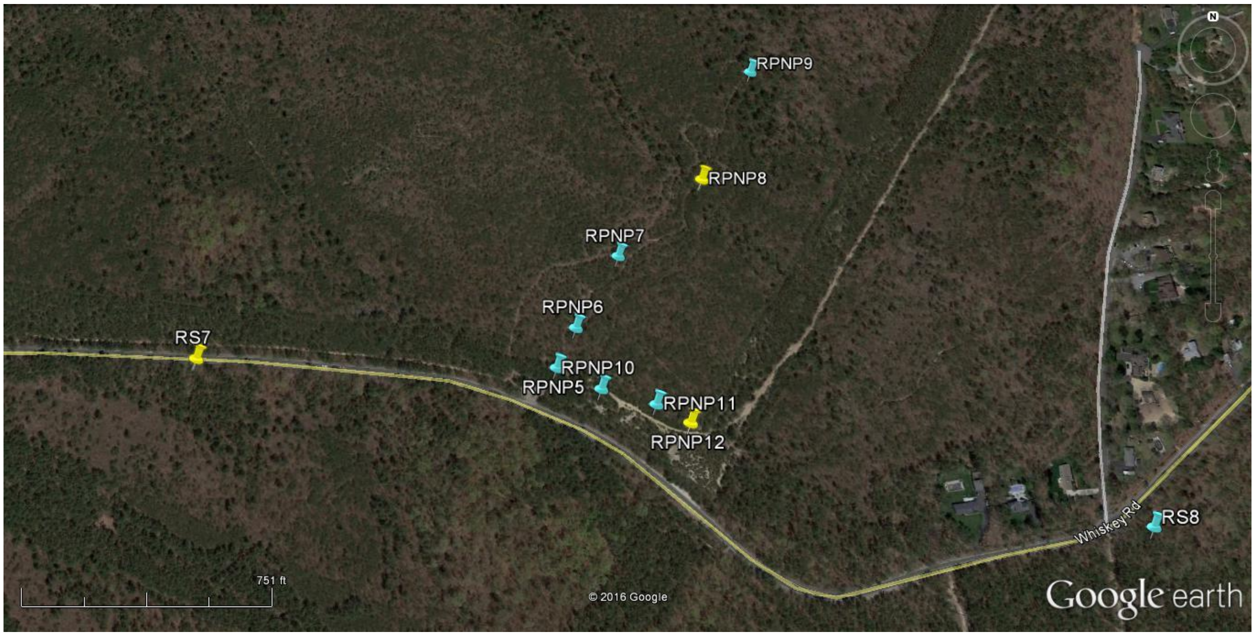

Figure 10: A geographical map indicating where samples from the eastern section of the Rocky Point Nature Preserve. These samples correspond with the red points of the soil texture triangle in Figure 10. Blue pins indicate charcoal was found in the sample.

Also included in this study were 5 sites that were close in proximity to more highly developed areas (Fig 13). These sites were Roadside 12, Roadside 13, Roadside 14, Mom's House, and Federal Hills. Areas sampled were in sections that seemed to have not been disturbed. This was mostly done to expand the research area further East to West and to see if there were any similarities between sites in the nature preserves.

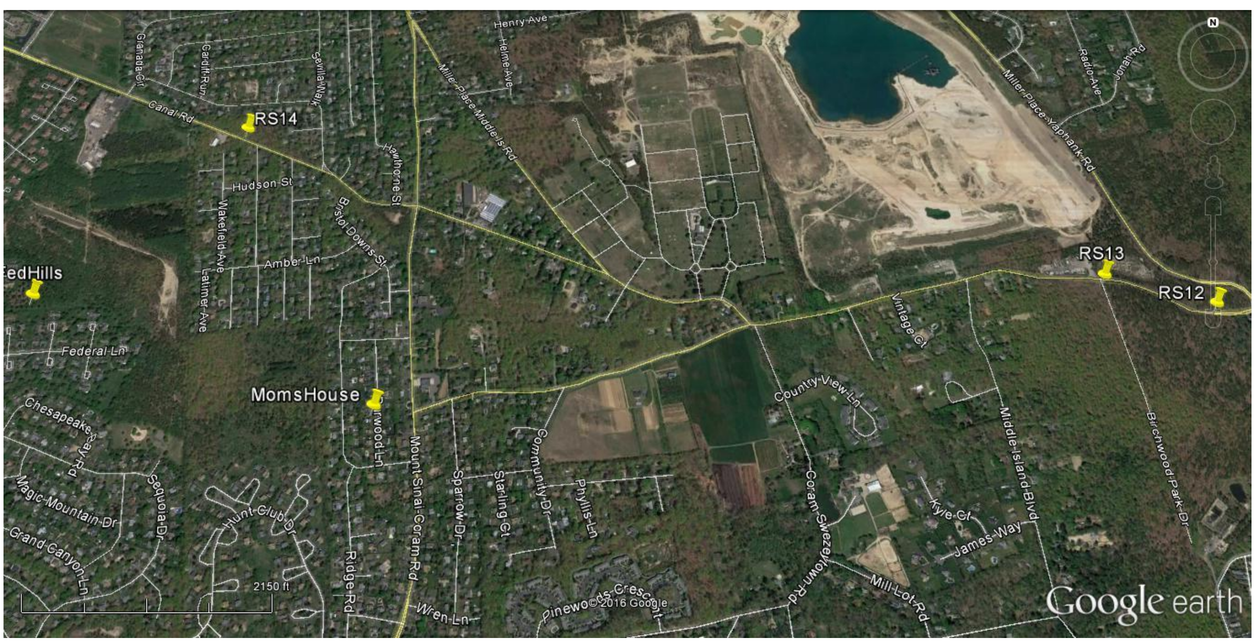

Figure 11:: A geographical representation of where samples were collected in more developed areas of Long Island.

Although these more developed regions hosted higher concentrations of white oak and significantly less pitch pine, 80% of samples were loamy sand and 20% were sand, which is consistent with samples collected in less developed areas. It is also difficult to determine which flora would be naturally occurring in these somewhat disturbed areas and which flora were brought in and/or altered by development.

According to the United States Department of Agriculture, pitch pine tends to grow in soils with sandy to gravelly texture that are relatively shallow and have a low pH of about 3.4-5.1. Pitch pine forest covers typically also contain Eastern White Pine, Chestnut Oak, Bear Oak, White Oak-Black Oak-Northern Red Oak, Shortleaf Pine, White Pine-Chestnut Oak, and Atlantic White-Cedar. Generally, the most common shrubbery associated with the Pitch Pine forest cover is lowbush blueberries, black huckleberry, dangleberry, sheeplaurel, bear-oak stands, and staggerbush. Serotinous cones make areas that are prone to fires ideal sites for pitch pine to develop (USDA website).

The sandy outwash plains of glacial origin coupled with the high acidity of rainfall on Long Island make it an ideal home for Pitch Pine forest cover. The results of the soil analysis of the pine barrens in central Suffolk County, Long Island show a mostly sandy texture that pitch pine favor which was expected. The consistent

Conclusion

The constant occurrence of pebbles throughout every sample collected in central Suffolk County provides further evidence for the pebbly loess being a distinct geologic unit. The results of this study show a consistent high sand concentration, low to no clay concentration, and relatively low silt concentration, with all soil textures being either sand, loamy sand, or sandy loam. These soil textures are perfect for the development of Pitch Pine forest cover which dominates the ecology in central Suffolk County. Further research would need to be conducted to determine if this pebbly loess is a controlling factor on the flora within the pine barrens. Although it is still uncertain exactly what process would deposit an unsorted, homogenous layer of pebbles, sand, silt, and clay, it is clear that this layer is a distinct feature of Long Island and Westchester County (Danz, 2016).

Acknowledgments

I would like to thank my husband, Michael Rezza, for his help in not only collecting the samples used in this study, but for giving up a large part of our kitchen for several weeks to be dedicated to the analysis of soil samples. I would also like to thank my 4-year-old son for helping mommy dig holes and collect dirt. Cheryl Reinheimer for pushing the stroller through the woods and helping dig holes. Professor Hanson for providing a rich research experience that can easily be translated into a research experience for high school students.

References

Danz, A. 2015. Beginning Stages to Determining the Primary Erosive Force that Shaped the Pebbles on Long Island, Site Location: Suffolk County Farm, Yaphank, NY, https://www.dropbox.com/s/hg4qfa51i5771f7/Beginning%20Stages%20Danz.docx?dl=0

Danz, A. 2016. Comparing Westchester Sediment to Long Island Loess; A Mapping Project, http://www.geo.sunysb.edu/lig/Conferences/abstracts16/danz.pdf

Dominguez, K. 2015. Grain size analysis and soil stratigraphy across Suffolk county: proxy for classification of sediment as a diamect http://www.geo.sunysb.edu/lig/Conferences/abstracts15/Dominguez.pdf

Kundic, V., 2005., Age and Provenance of Long Island Loess, MS Thesis Stony Brook University, 61 p. http://pbisotopes.ess.sunysb.edu/reports/kundic-thesis.pdf

McQuiston, J. T., 1995. Fire Ravishes L.I. Pine Barrens, Causing Residents to Evacuate, NY Times, 8/23/1995 http://www.nytimes.com/1995/08/23/nyregion/fire-ravages-li-pine-barrens-causing-residents-to-evacuate.html

Protocol Soil Texture or Fractions, http://ecoplexity.org/?q=node/183

Soil Texture Triangle Calculator, http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/?cid=nrcs142p2_054167

Springer-Rushia, L., Stewart P.G. 1996. A Field Guide to Long Island's Woodlands.

Suffolk County Department of Parks http://www.suffolkcountyny.gov/departments/parks/parks/cathedralpinescountypark.aspx(Accessed August, 2016)

Tvelia, S., 2015, The Potential Impact Origin of Long Island's Carolina Bays and their Connection to the Younger Dryas Impact Hypothesis https://www.dropbox.com/s/xbm8x1aab7qzl2o/Tvelia-Spring2015.pdf?dl=0

United States Department of Agriculture https://www.na.fs.fed.us/spfo/pubs/silvics_manual/Volume_1/pinus/rigida.htm (Accessed August, 2016)

Appendix A

Table 1:Data for all samples collected. Blue shade indicates charcoal was found.

Sample Name	Date	Latitude	Longitude	Time	Ecology	Mass (g)	Pebbles (g)	% by Mass Pebbles	Sand (mL)	Silt (mL)	Clay (mL)	Sand %	Silt %	Clay %	Classification	Charcoal
Prosser Pines 1	21-Jul	40.871198 N	72.934623 W	11:20 a.m.	Pitch pines	168	4	2.38	12	0.5	0.5	92.31	3.85	3.85	Sand	
Prosser Pines 2	21-Jul	40.8693229 N	72.9337558 W	11:41 a.m.	Pitch pines	164	1	0.61	11	5	0	68.75	31.25	0.00	Sandy Loam	
Prosser Pines 3	21-Jul	40.8721673 N	72.9336559 W	11:57 a.m.	Pitch pines	171	3	1.75	12.5	1.5	1	83.33	10.00	6.67	Loamy Sand	
Prosser Pines 4	21-Jul	40.8725739 N	72.9333971 W	12:16 p.m.	Pitch pines	178	3	1.69	13	1	1	86.67	6.67	6.67	Loamy Sand	
Little League 1	22-Jul	40.94460 N	72.995945 W	10:48 a.m.	deciduous	94	5	5.32	7.5	7.5	0	50.00	50.00	0.00	Sandy Loam	
Moms House	24-Jul	40.90162 N	72.987421 W	3:48 p.m.	developed	211	10	4.74	14.5	0.5	0	96.67	3.33	0.00	Sand	
Federal Lane Hills	26-Jul	40.90463 N	72.99957 W	11:07 a.m.	developed	85	11	12.94	9	3.5	0.5	69.23	26.92	3.85	Sandy Loam	
Rocky Point Nature Preserve 1	26-Jul	40.943237 N	72.94828 W	11:40 a.m.	pine barrens	86	5	5.81	10	5	0	66.67	33.33	0.00	SANDY Loam	
Rocky Point Nature Preserve 2	26-Jul	40.94298 N	72.94939 W	11:48 a.m.	pine barrens	39	4	10.26	10	3	0.25	75.47	22.64	1.89	Sandy Loam	
Rocky Point Nature Preserve 3	26-Jul	40.94357 N	72.95062 W	11:55 a.m.	pine barrens	45	1	2.22	11	3	0.25	77.19	21.05	1.75	Loamy Sand	
Rocky Point Nature Preserve 4	26-Jul	40.94438 N	72.94868 W	12:13 p.m.	pine barrens	76	9	11.84	6	4	0.25	58.54	39.02	2.44	SANDY Loam	
Rocky Point Nature Preserve 5	30-Jul	40.90824 N	72.92128 W	11:56 a.m.	pine barrens	120	5	4.17	12.5	2.5	0.25	81.97	16.39	1.64	Loamy Sand	Y
Rocky Point Nature Preserve 6	30-Jul	40.90883 N	72.92093 W	12:02 p.m.	pine barrens	134	8	5.97	13	2	0	86.67	13.33	0.00	Sand	Y
Rocky Point Nature Preserve 7	30-Jul	40.90932 N	72.92057 W	12:06 p.m.	pine barrens	163	6	3.68	13	1.5	0.25	88.14	10.17	1.69	Sand	Y
Rocky Point Nature Preserve 8	30-Jul	40.91014 N	72.91955 W	12:15 p.m.	pine barrens	135	4	2.96	13	1.5	0.5	86.67	10.00	3.33	Sand	
Rocky Point Nature Preserve 9	30-Jul	40.91123 N	72.91888 W	12:23 p.m.	pine barrens	123	4	3.25	9	3	0.25	73.47	24.49	2.04	Loamy SAND	Y
Rocky Point Nature Preserve 10	30-Jul	40.90805 N	72.92076 W	12:39 p.m.	pine barrens	170	5	2.94	14	0.5	0.25	94.92	3.39	1.69	Sand	Y
Rocky Point	30-	40.907	72.9201	12:44	pine	168	11	6.5	15	0.5	0.5	93.	3.1	3.1	Sand	Y

Nature Preserve 11	Jul	87 N	3 W	p.m.	barrens			5				75	3	3		
Rocky Point Nature Preserve 12	30-Jul	40.90776 N	72.91973 W	12:48 p.m.	pine barrens	211	6	2.84	13	0.25	0.5	94.55	1.82	3.64	Sand	
Southaven 1	31-Jul	40.80675 N	72.89978 W	12:09 p.m.	pine barrens	106	8	7.55	9	4	0.25	67.92	30.19	1.89	Sandy Loam	Y
Rocky Point Nature Preserve 13	2-Aug	40.942278 N	72.948072 W	10:53 a.m.	pine barrens	67	11	16.42	7.5	5	0.25	58.82	39.22	1.96	Sandy Loam	Y
Rocky Point Nature Preserve 14	2-Aug	40.942466 N	72.948795 W	11:02 a.m.	pine barrens	112	19	16.96	8	5	0.25	60.38	37.74	1.89	Sandy Loam	Y
Rocky Point Nature Preserve 15	2-Aug	40.941585 N	72.949152 W	11:16 a.m.	pine barrens	219	38	17.35	7	5.5	0.25	54.90	43.14	1.96	Sandy Loam	Y
Rocky Point Nature Preserve 16	2-Aug	40.941003 N	72.950061 W	11:29 a.m.	pine barrens	263	29	11.03	10	4	0.5	68.97	27.59	3.45	Sandy Loam	
Rocky Point Nature Preserve 17	2-Aug	40.939759 N	72.947269 W	11:41 a.m.	pine barrens	159	3	1.89	12.5	1.5	0.25	87.72	10.53	1.75	SAND	Y
Rocky Point Nature Preserve 18	2-Aug	40.937215 N	72.947027 W	11:56 a.m.	pine barrens	146	27	18.49	9	6	0.25	59.02	39.34	1.64	SANDY LOAM	
Rocky Point Nature Preserve 19	2-Aug	40.937382 N	72.946961 W	12:04 a.m.	pine barrens	154	26	16.88	10	4.5	0.25	67.80	30.51	1.69	Sandy Loam	Y
Rocky Point Nature Preserve 20	2-Aug	40.937079 N	72.946454 W	12:11 p.m.	pine barrens	207	27	13.04	12.5	1.5	0.25	87.72	10.53	1.75	SAND	
Rocky Point Nature Preserve 21	2-Aug	40.935663 N	72.945918 W	12:28 p.m.	pine barrens	235	19	8.09	12	1	0.25	90.57	7.55	1.89	SAND	Y
Rocky Point Nature Preserve 22	2-Aug	40.934184 N	72.945585 W	12:40 p.m.	pine barrens	183	20	10.93	11	2	0.25	83.02	15.09	1.89	Loamy Sand	Y
Road Side 1	5-Aug	40.92708 N	72.94103 W	9:42 a.m.	pine barrens	217	61	28.11	14.5	0.5	0.25	95.08	3.28	1.64	SAND	
Road Side 2	5-Aug	40.92011 N	72.94131 W	9:55 a.m.	pine barrens	145	10	6.90	12.5	4	0.25	74.63	23.88	1.49	Loamy Sand	Y
Road Side 3	5-Aug	40.91256 N	72.94117 W	10:07 a.m.	pine barrens	182	7	3.85	13	4.5	0.25	73.24	25.35	1.41	Loamy Sand	
Road Side 4	5-Aug	40.91138 N	72.94199 W	10:15 a.m.	pine barrens	105	2	1.90	7.5	6.5	0.5	51.72	44.83	3.45	Sandy Loam	Y
Cathedral Pines 5	4-Aug	40.86499 N	72.93924 W	11:37 a.m.	Pitch pines	72	6	8.33	15	1	0	93.75	6.25	0.00	SAND	
Cathedral Pines 6	4-Aug	40.86510 N	72.94013 W	11:43 a.m.	Pitch pines	106	8	7.55	12.5	2.5	0.25	81.97	16.39	1.64	Loamy Sand	
Cathedral Pines 7	4-Aug	40.87173 N	72.94030 W	12:52 p.m.	Pitch pines	196	36	18.37	12.5	2.5	0.25	81.97	16.39	1.64	Loamy Sand	
Cathedral Pines 8	4-Aug	40.87014 N	72.94107 W	12: 42 p.m.	Pitch pines	86	1	1.16	12.5	2.5	0.1	82.78	16.56	0.66	Loamy Sand	
Cathedral Pines 9	4-Aug	40.86378 N	72.94189 W	12:06 p.m.	Pitch pines	100	1	1.00	11	1.5	0.5	84.62	11.54	3.85	Loamy Sand	

Cathedral Pines 10	4-Aug	40.86892 N	72.94105 W	12:36 p.m.	Pitch pines	91	1	1.10	11	4	0.25	72.13	26.23	1.64	Loamy Sand	
Road Side 5	8-Aug	40.05524 N	72.955404 W	10:54 a.m.	pine barrens	88	13	14.77	10	5	0.25	65.57	32.79	1.64	Sandy Loam	
Road Side 6	8-Aug	40.906420 N	72.939247 W	11:02 a.m.	pine barrens	215	10	4.65	12	3	0.25	78.69	19.67	1.64	Loamy Sand	
Road Side 7	8-Aug	40.908328 N	72.925483 W	11:07 a.m.	pine barrens	112	7	6.25	12	3	0.25	78.69	19.67	1.64	Loamy Sand	
Road Side 8	8-Aug	40.906843 N	72.914674 W	11:13 A.M.	pine barrens	186	6	3.23	13	1	0.5	89.66	6.90	3.45	SAND	Y
Road Side 9	8-Aug	40.908011 N	72.929516 W	11:22 A.M.	pine barrens	206	13	6.31	13	2.5	0.25	82.54	15.87	1.59	Loamy Sand	Y
Road Side 10	8-Aug	40.906738 N	72.38213 W	11:27 A.M.	pine barrens	154	14	9.09	12.5	3	0.25	79.37	19.05	1.59	Loamy Sand	
Road Side 11	8-Aug	40.908451 N	72.48857 W	11:33 A.M.	pine barrens	124	2	1.61	10	3	0.25	75.47	22.64	1.89	Loamy Sand	Y
Road Side 12	8-Aug	40.904436 N	72.958531 W	11:41 A.M.	pine barrens	193	4	2.07	12	3	0.25	78.69	19.67	1.64	Loamy Sand	
Road Side 13	8-Aug	40.905263 N	72.962224 W	11:45 A.M.	pine barrens	179	22	12.29	10	7	0.25	57.97	40.58	1.45	Sandy Loam	
Road Side 14	8-Aug	40.908498 N	72.989648 W	11:57 a.m.	OAK	168	30	17.86	11	3.5	0.25	74.58	23.73	1.69	Sandy Loam	