Edge Forest Community Analysis

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ABSTRACT

The objective of the project was to map out a forest community, and find out the differences in tree comminutes on different soil types given by USDA soil map.

INTRODUCTION

The research was done on the Field Research Station. It is covered with a evergreen/deciduous forest and prairie. Before it was the Field Research Station, it was a farm owned by the Heinke Family. The reason for mapping out tree communities was to set a base for future reference and projects on to what trees had grown in the specific areas. The reason why to find differences in soil types was to see if the soil type indicated in the USDA map had affected the types of trees growing on them.

Method

The Field Research station is located on a 400-acre plot of land. The need for such a small area of trees was critical for time use. The need to concentrate on the forest edge was to be sure that the tree communities were in the same successional stage, and the same climate. Each tree species was identified using various books (refer to identification trees list). The DBH (diameter breast height) was recorded with each tree. The trees were recorded using a GPS unit. Writing the waypoint number with the tree species and DBH correlated the GPS unit and tree information.

The Waypoints were brought into the computer using Waypoint + 1.7.07. Each tree was then projected using Wisconsin Geodisc 3.0 parameters onto a map using a program named Archview. The tree species and DBH were then added to the Waypoint. The trees were then put on an USDA Soil map (refer to All Trees Output). The Quadrat-s were digitally cut from an Archview in 1000 sq. meter Quadrat-s on different soil types (refer to Quadrat-s Output).

The program Microsoft Excel and software of “ANOVA Two Factor without Replication” was used for statistically analyzing the data collected with 95% confidence level. The ANOVA statistical analysis was needed since the source of variance included a wide variety of the same types of trees to be tested; also it included more than one Quadrat to be tested. Therefore the Quadrat-s were analyzed by according variations of tree structure and numbers of trees in the Quadrat-s. The differences in Quadrat-s were found out by taking F-value found and comparing to the Critical F-value for Quadrat-s, if it was larger the Quadrat-s would be statistically different. The differences between Quadrat-s were found by using a LCD (or Least Significant Difference), if the averages were differed more than the LCD, then they were significantly different.

Identification Tree List

Aceraceae
- Rubrum (Red maple)

Betulaceae
- Carpinus Caroliniana (American Hornbeam/ Blue Beech)
- Alnus Rugosa (Speckled Alder/ Tag Alder)
- Papyrifera (Paper Birch)

Fagaceae
- Quercus Velutina (Black Oak)
- Quercus Macrocarpa (Bur Oak)
- Quercus Bicolor (Swamp White Oak)
- Quercus Alba (White Oak)

Hippocastanaceae
- Aesculus Hippocastanum (Horse Chestnut)

Juglandanceae
- Juglans Nigra (Black Walnut)

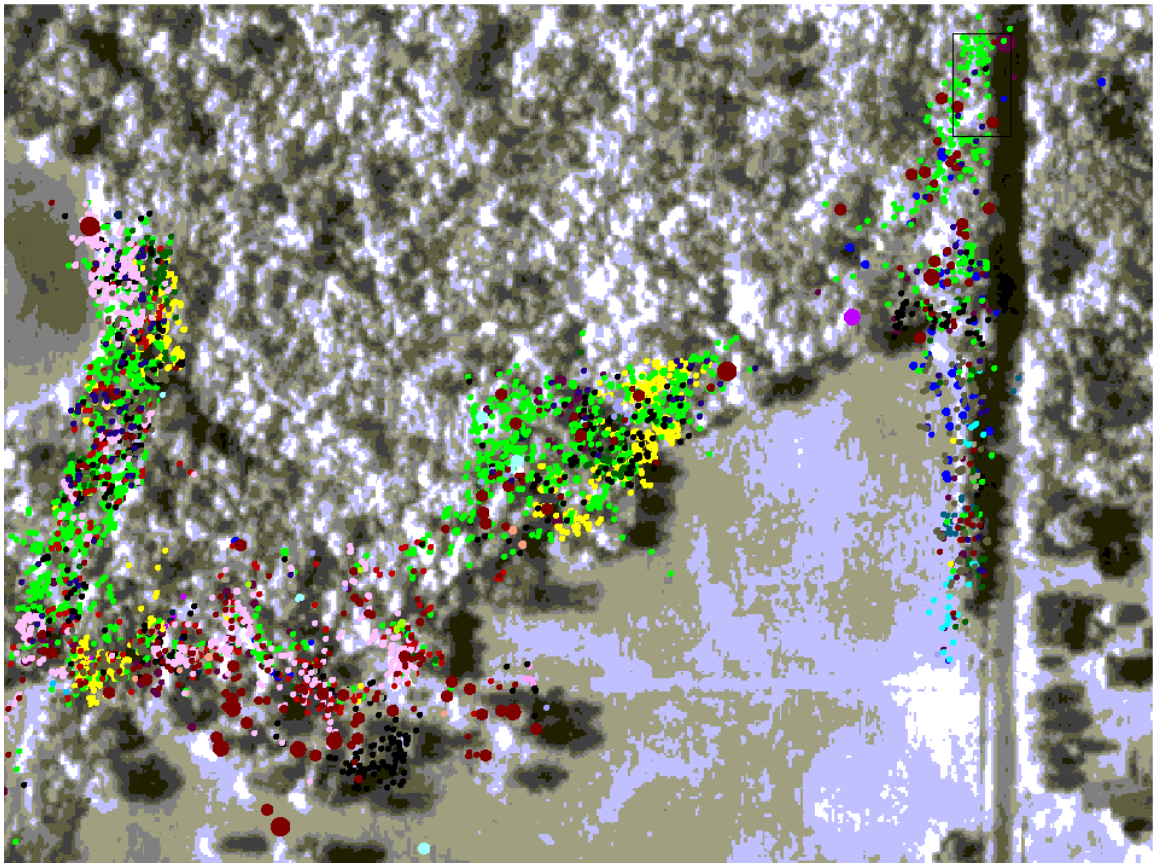
Pinaceae
- Abies Balsamea (Balsam Fir)
- Mariana (Black Spruce)
- Strobus (Eastern White Pine)
- Banksiana (Jack Pine)
- Resinosa (Red Pine)

Salicaceae
- Discolor (Pussy Willow)
- Populus Tremuloides (Quaking Aspen)
- Populus Alba (White Poplar)

Rosaceae
- Prunus Serotina (Black Cherry)
- Prunus Virginiana (Common Choke Cherry)
- Crataegus Crus-Galli (Long Spur Hawthorn/ Cockspur Hawthorn)
- Prunus Pensylvanica (Pin Cherry)

Ulmaceae
- Americana (American Elm)

All Tree Output



All trees recorded displayed over area map.

Quadrat Output
(Refer to All Trees Output)

Each Quadrat displayed over USDA soil map

Quadrat Table 1

(Refer to Quadrat Output)

Quadrat 1	Black Cherry	Black Oak	Black Spruce	Blue Beech	Paper Birch	Pin Cherry	Quaking Aspen	Red Maple	Swamp White Oak	Tag Alder	White Pine	Total Trees in Story
Saplings	7	0	6	199	42	4	7	34	2	37	0	338
												9 species
Density of Saplings	2.071005917	0	1.775147929	58.87573964	12.42603550	1.183431953	2.071005917	10.05917160	0.5917159763	10.94674556	0	100
Middle Story	4	1	1	48	14	13	33	63	0	39	0	216
												9 species
Density Of Middle Story	1.843317972	0.460829493	0.460829493	22.11981567	6.451612903	5.990783410	15.20737327	29.03225806	0	17.97235023	0	99.53917051
Overstory	0	2	5	1	8	0	6	14	0	0	1	37
												7 species
Density Of Overstory	0	5.405405405	13.51351351	2.702702703	21.62162162	0	16.21621622	37.83783784	0	0	2.702702703	100
Total trees	11	3	12	248	64	17	46	112	2	76	1	592
												11 species
Min DBH	Sapling	32	Sapling	Sapling	Sapling	Sapling	Sapling	Sapling	Sapling	Sapling	80	
Avg. DBH	19.25	33	40.16666667	15.18367347	32.27272727		24.05	25.75324675	0	15.51282051	80	
Max DBH	27	38	63	59	105	30	38	110	0	25	80	
True Density	1.854974705	0.505902192	2.023608769	41.82124789	10.7925801	2.866779089	7.757166948	18.88701518	0.337268128	12.81618887	0.168634064	

AtD2- Arland sandy loam, 12 to 20 percent slopes, eroded. This moderately steep soil is on the sides of low ridges (USDA soils).

Type	Highest
Sapling Layer	Blue Beech
Density of Saplings	Blue Beech
Middle Story	Red Maple
Density of Middle Story	Red Maple
Overstory	Red Maple
Density of Overstory	Red Maple
Total Trees	Blue Beech
Min DBH	White Pine
Avg. DBH	White Pine
Max DBH	Paper Birch
True Density	Red Maple

Quadrat Table 2

(Refer to Quadrat Output)

Quadrat 2	Black Cherry	Black Oak	Choke Cherry	Long Spur Hawthorn	Paper Birch	Quaking Aspen	Red Maple	Tag Alder	White Pine	Total Trees in Story
Saplings	1	1	8	0	6	1	17	122	1	157 8 species
Density of Saplings	0.632911392	0.632911392	5.063291139	0	3.797468354	0.632911392	10.75949367	77.21518987	0.632911392	99.36708861
Middle Story	3	0	1	1	18	2	74	77	1	177 8 species
Density of Middle Story	1.694915254	0	0.564971751	0.564971751	10.16949153	1.129943503	41.80790960	43.50282486	0.564971751	100
Overstory	0	3	0	0	5	1	12	1	0	22 5 species
Density of Overstory	0	13.63636364	0	0	22.72727273	4.545454545	54.54545455	4.545454545	0	100
Total trees	4	4	9	1	29	4	103	200	2	356 9 species
Min DBH	Sapling	Sapling	Sapling	12	Sapling	Sapling	Sapling	Sapling	Sapling	
Avg. DBH	15.25	98	12	12	23		22.32258065	15.10869565	11	
Max DBH	18	148	12	12	40	65	105	32	18	
True Density	1.120448179	1.120448179	2.521008403	0.280112045	8.123249300	1.120448179	28.85154062	56.02240896	0.560224090	

PdB- Planibo loamy sand, 2 to 6 percent slopes. This gently sloping soil is on rigdetops on sandstone uplands and on sandstone hills near sandy stream terraces and outwash plains (USDA soils).

Type	Highest
Saplings	Tag Alder
Density of Saplings	Tag Alder
Middle Story	Tag Alder
Density of Middle Story	Tag Alder
Overstory	Red Maple
Density of Overstory	Red Maple
Total Trees	Tag Alder
Min DBH	Long Spur Haw.
Avg. DBH	Black Oak
Max DBH	Black Oak
True Density	Tag Alder

Quadrat Table 3

(Refer to Quadrat Output)

Quadrate 3	Black Oak	Blue Beech	Long Spur Hawthorn	Paper Birch	Pin Cherry	Quaking Aspen	Red Maple	Red Pine	Tag Alder	White Pine	Total Trees in Story
Saplings	3	22	0	2	6	4	11	0	0	0	48
											6 Species
Density of Saplings	6.122448 98	44.89795 918	0	4.081632 653	12.24489 796	8.1632653 06	22.44897 959	0	0	0	97.95918367
Middle Story	3	17	1	1	14	1	12	2	1	0	52
											9 species
Density of Middle Story	5.769230 769	32.69230 769	1.923076923	1.923076 923	26.92307 692	1.9230769 23	23.07692 308	3.846153 84	1.923076 923	0	100
Overstory	5	0	0	2	1	0	3	3	0	9	23
											6 species
Density of Overstory	21.73913 043	0	0	8.695652 174	4.347826 087	0	13.04347 826	13.04347 82	0	39.13043 478	100
total trees	11	39	1	6	21	5	26	5	1	9	124
											10 species
Min	Sapling	Sapling	16	Sapling	Sapling	Sapling	Sapling	Sapling	18	31	
Avg. dbh	67.88888 889	15.16666 667	16	29	22.5625		20	48.2	18	80.33333 333	
Max	139	23	16	43	57	22	57	90	18	113	
True Density	8.8	31.2	0.8	4.8	16.8	4	20.8	4	0.8	7.2	

MdB- Menahga sand, 1 to 6 percent slopes. This gently sloping soil is on stream benches and outwash plains (USDA soils).

Type	Highest
Saplings	Blue Beech
Density of Sapling	Blue Beech
Middle Story	Blue Beech
Density of Middle Story	Blue Beech
Overstory	White Pine
Density of Overstory	White Pine
Total Trees	Blue Beech
Min DBH	White Pine
Avg. DBH	White Pine
Max DBH	Black Oak
True Density	Blue Beech

Quadrat Table 4

(Refer to Quadrat Output)

Quadrat 4	Black Cherry	Black Oak	Choke Cherry	Paper Birch	Red Maple	Red Pine	White Pine	Total Trees in Story
Saplings	1	0	1	0	9	0	0	11 3 species
Density of Saplings	9.090909091	0	9.090909091	0	81.81818182	0	0	100
Middle Story	1	1	0	1	25	1	1	30 6 species
Density of Middle Story	3.333333333	3.33333333	0	3.333333333	83.33333333	3.33333333	3.333333333	100
Overstory	0	2	0	0	12	0	1	15 3 species
Density of Overstory	0	13.3333333	0	0	80	0	6.666666667	100
Total trees	2	3	1	1	46	1	2	56 7 species
Min DBH	Sapling	15	Sapling	33	Sapling	22	83	
Avg. DBH	10.5	117.666666	7	33	26.975		198	
Max DBH	11	190	7	33	64	22	313	
True Density	3.571428571	5.35714285	1.785714286	1.785714286	82.14285714	1.78571428	3.571428571	

Eo- Elm lake loamy sand (0 to 10 percent slopes). This nearly level soil is along drainageways and in depressions on sandstone uplands (USDA soils).

Type	Highest
Saplings	Red Maple
Density of Saplings	Red Maple
Middle Story	Red Maple
Density of Middle Story	Red Maple
Overstory	Red Maple
Density of Overstory	Red Maple
Total Trees	Red Maple
Min DBH	White Pine
Avg. DBH	White Pine
Max DBH	White Pine
True Density	Red Maple

Quadrat Table 5

(Refer to Quadrat Output)

Quadrat 5	Black Cherry	Black Oak	Black Spruce	Choke Cherry	Paper Birch	Quaking Aspen	Red Maple	Red Pine	White Pine	Total Trees in Story
Saplings	0	4	1	1	3	0	11	0	1	21 6 species
Density of Saplings	0	18.181818 18	4.54545454 5	4.54545454 5	13.636363 64	0	50	0	4.5454545 45	95.4545454
Middle Story	3	3	1	2	9	1	21	2	1	43 9 species
Density of Middle Story	6.97674418 6	6.9767441 86	2.32558139 5	4.65116279 1	20.930232 56	2.325581395	48.837209 3	4.6511627 9	2.3255813 95	100
Overstory	2	5	0	0	6	1	11	9	2	36 7 species
Density of Overstory	5.55555555 6	13.888888 89	0	0	16.666666 67	2.777777778	30.555555 56	25	5.5555555 56	100
Total trees	5	12	2	4	18	2	44	11	4	102 9 species
Min DBH	17	Sapling	Sapling	Sapling	Sapling	18	Sapling	15	Sapling	
Avg. DBH	26	97.444444 44	27	12.3333333 3	27.1875		25.714285 71	70.545454 5	28	
Max DBH	38	237	27	15	43	72	56	102	37	
True Density	4.90196078 4	11.764705 88	1.96078431 4	3.92156862 7	17.647058 82	1.960784314	43.137254 9	10.784313 7	3.9215686 27	

AtD2- Arland sandy loam, 12 to 20 percent slopes, eroded. This moderately steep soil is on the sides of low ridges (USDA soils).

Type	Highest
Saplings	Red Maple
Density of Saplings	Red Maple
Middle Story	Red Maple
Density of Middle Story	Red Maple
Overstory	Red Maple
Density of Overstory	Red Maple
Total Trees	Red Maple
Min DBH	Quaking Aspen
Avg. DBH	Black Oak
Max DBH	Black Oak
True Density	Red Maple

ANOVA Table 1

(Refer to Quadrat Tables 1-5)

Total Trees

ANOVA

Source of Variation	SS	df	MS	F	P-value
Rows	14565.48571	4	3641.371429	2.58238802	0.047757633
Columns	36640.74286	13	2818.518681	1.99883725	0.03957324
Error	73324.11429	52	1410.079121		
Total	124530.3429	69			

RESULTS

LCD for Quadrat		Group 1	Average	Group 2	Average	Group 3	Average
30.6567754		Quadrat 3	8.928571429	Quadrat 2	25.5	Quadrat 1	42.35714286
		Quadrat 4	4				
There is a statistical difference		Quadrat 5	7.357142857				
between quadrat overall							
Group 1 < Group 3							
Group 3 > Group 1							

LCD for species	Group 1	Average	Group 2	Average	Group 3	Average	Group 4	Average	Group 5	Average	Group 6	Average	Group 7	Average
51.29859704	Long Spur Hawthorn	0.4	Black Cherry	4.4	Black Oak	6.6	Paper Birch	23.6	Tag Alder	55.4	Blue Beech	57.4	Red Maple	66.8
	Swamp White Oak	0.4			Pin Cherry	7.6								

There is a statistical difference	Black Spruce	2.8			Quaking Aspen	11.6
between species overall	Choke Cherry	2.8				
	Red Pine	3.4				
Group 1 < Group 5 +	White Pine	3.6				
Group 2 < Group 6+						
Group 3 < Group 7						
Group 5 > Group 1						
Group 6 > Group 2 -						
Group 7 > Group 3 -						

ANOVA Table 2

(Refer to Quadrat Tables 1-5)

True Density

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	1.81899E-12	4	4.54747E-13	3.23475E-15	1	2.549761291
Columns	6891.691604	13	530.1301233	3.770966861	2.98436E-04	1.91345606
Error	7310.264829	52	140.5820159			
Total	14201.95643	69				

RESULTS

LCD for Quadrates		Group 1	Average
9.679872		Quadrat 1	7.142857143
There is no statistical difference		Quadrat 2	7.142857143
between quadrat		Quadrat 3	7.142857143
		Quadrat 4	7.142857143
		Quadrat 5	7.142857143

Species		Group 1	Average	Group 2	Average
LCD for species		Black Cherry	2.280244078	Red Maple	39.09016907
16.19752393		Black Oak	5.486795733		
		Black Spruce	0.793071268		
There is a statistical difference		Blue Beech	14.60424958		
between species overall		Choke Cherry	1.638043567		
		Long Spur Hawthorn	0.216022409		

Group 1 < Group 2		Paper Birch	8.595454368
		Pin Cherry	3.933355818
		Quaking Aspen	2.997599353
		Red Pine	3.293065187
		Tag Alder	13.92771957
		Swamp White Oak	0.067453626
		White Pine	3.076756374

ANOVA Table 3

(Refer to Quadrat Tables 1-5)

Overstory Density

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	9.09495E-13	4	2.27374E-13	2.36283E-15	1	2.549761291
Columns	8691.808513	13	668.6006548	6.947989883	1.57934E-07	1.91345606
Error	5003.926983	52	96.22936505			
Total	13695.7355	69				

RESULTS

LCD for Quadrates		Group 1	Average
8.008635746		Quadrat 1	7.142857143
		Quadrat 2	7.142857143
There is no statistical difference		Quadrat 3	7.142857143
quadrat overall		Quadrat 4	7.142857143
		Quadrat 5	7.142857143

LCD for species		Group 1	Average	Group 2	Average	Group 3	Average	Group 4	Average
13.40101079		Choke Cherry	0	Black Cherry	1.111111111	Black Oak	13.60062434	Red Maple	43.19646524
		Long Spur Hawthorn	0	Black Spruce	2.702702703	Paper Birch	13.94224264		
There is a statistical difference		Swamp White Oak	0	Blue Beech	0.540540541				
between species overall				Pin Cherry	0.869565217				
				Quaking Aspen	4.707889708				

				Red Pine	7.608695652
Group 1 < Group 3+				Tag Alder	0.909090909
Group 2 < Group 4				White Pine	10.81107194
Group 3 < Group 4					
Group 3 > Group 1					
Group 4 > Group 2 -					

ANOVA Table 4

(Refer to Quadrat Tables 1-5)

Middle Story Density ANOVA

Source of Variation	SS	df	MS	F	P-value
Rows	1.81899E-12	4	4.54747E-13	4.17546E-15	1
Columns	8865.238237	13	681.9414029	6.261546482	6.94723E-07
Error	5663.2899	52	108.9094212		
Total	14528.52814	69			

RESULTS

LCD for Quadrates		Group 1	Average
8.519958043		Quadrat 1	7.142857143
		Quadrat 2	7.142857143
There is no statistical difference		Quadrat 3	7.142857143
between Quadrats overall		Quadrat 4	7.142857143
		Quadrat 5	7.142857143

LCD for species		Group 1	Average	Group 2	Average
14.25661664		Black Cherry	2.769662149	Red Maple	45.21752668
		Black Oak	3.308027556		
There is a statistical difference		Black Spruce	0.557282178		
between species overall		Blue Beech	10.96242467		

		Choke Cherry	1.043226908
Group 1 < Group 2		Long Spur Hawthorn	0.497609735
		Paper Birch	8.561549449
		Pin Cherry	6.582772067
		Quaking Aspen	4.209360917
		Red Pine	2.366129994
		Tag Alder	12.6796504
		Swamp White Oak	0
		White Pine	1.244777296

ANOVA Table 5

(Refer to Quadrat Tables 1-5)

Sapling Density

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	-9.09495E-13	4	-2.27374E-13	-9.52931E-16	1	2.549761291
Columns	7309.5391	13	562.2722385	2.356501473	0.014648227	1.91345606
Error	12407.44244	52	238.6046624			
Total	19716.98154	69				

RESULTS

LCD for Quadrats		Group 1	Average
12.61084518		Quadrat 1	7.142857143
		Quadrat 2	7.142857143
There is no statistical difference		Quadrat 3	7.142857143
between quadrat overall		Quadrat 4	7.142857143
		Quadrat 5	7.142857143

LCD for species		Group 1	Average	Group 2	Average	Group 3	Average
21.10198012		Black Cherry	2.35896528	Blue Beech	20.75473977	Red Maple	36.4610017
		Black Oak	4.987435711	Tag Alder	17.63238709		
There is a statistical difference		Black Spruce	1.264120495				
between species overall		Choke Cherry	3.739930955				

		Long Spur Hawthorn	0
Group 1 < Group 3		Paper Birch	6.788300029
		Pin Cherry	2.685665982
		Quaking Aspen	2.173436523
Group 3 > Group 1		Red Pine	0
		Swamp White Oak	0.118343195
		White Pine	1.035673188

ANOVA Table 6

(Refer to Quadrat Tables 1-5)

Overstory

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	26.08571429	4	6.521428571	1.292778564	0.28494315	2.549761291
Columns	515.9	13	39.68461538	7.866899031	2.43360E-0	1.91345606
Error	262.3142857	52	5.044505495			
Total	804.3	69				

RESULTS

LCD for Quadrates		Group 1	Average
1.833639816		Quadrat 1	2.642857143
		Quadrat 2	1.571428571
There is no statistical difference		Quadrat 3	1.642857143
between quadrat overall		Quadrat 4	1.071428571
		Quadrat 5	2.571428571

LCD for species		Group 1	Average	Group 2	Average	Group 3	Average	Group 4	Average	Group 5	Average	Group 6	Average
3.068266275		Choke Cherry	0	Black Cherry	0.4	Quaking Aspen	1.6	Black Oak	3.4	Paper Birch	4.2	Red Maple	10.4
		Long Spur Hawthorn	0	Black Spruce	1	Red Pine	2.4						
There is a statistical difference		Swamp White Oak	0		White Pine	2.6							

between species overall		Blue Beech	0.2
		Pin Cherry	0.2
Group 1 < Group 4 +		Tag Alder	0.2
Group 2< Group 5 +			
Group 3 < Group 6			
Group 4 > Group 1			
Group 5 > Group 2 -			
Group 5 < Group 6			
Group 6 > Group 5 -			

ANOVA Table 7

(Refer to Quadrat Tables 1-5)

Middle Layer

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	2142.771429	4	535.6928571	3.19346280	0.02027538	2.54976129
Columns	8191.385714	13	630.1065934	3.75629792	3.10314E-0	1.91345606
Error	8722.828571	52	167.7467033			
Total	19056.98571	69				

RESULTS

LCD for Quadrates		Group 1	Average	Group 2	Average	Group 3	Average
10.5738155		Quadrat 3	3.714285714	Quadrat 2	12.6428571	Quadrat 1	15.5
		Quadrat 4	2.142857143				
There is a statistical difference		Quadrat 5	3.071428571				
between quadrat overall							
Group 1 < Group 3							
Group 3 > Group 3							

LCD for species		Group 1	Average	Group 2	Average	Group 3	Average	Group 4	Average
17.69337751		Black Cherry	2.2	Blue Beech	13	Tag Alder	23.4	Red Maple	39
		Black Oak	1.6	Paper Birch	8.6				
There is a statistical difference		Black Spruce	0.4	Quaking Aspen	7.6				
between species overall		Choke Cherry	0.6						
		Long Spur Hawthorn	0.4						

Group 1 < Group 3 +		Pin Cherry	5.4
Group 2 < Group 4		Red Pine	1
Group 3 > Group 1		Swamp White Oak	0
Group 4 > Group 2		White Pine	0.6

ANOVA Table 8

(Refer to Quadrat Tables 1-5)

Sapling trees

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Rows	5385.514286	4	1346.378571	1.84347589	0.13453782	2.549761291
Columns	12167.77143	13	935.9824176	1.28155710	0.25390946	1.91345606
Error	37978.08571	52	730.3478022			
Total	55531.37143	69				

RESULTS

LCD for Quadrates		Group 1	Average
22.06325551		Quadrat 1	24.14285714
		Quadrat 2	11.28571429
There is no statistical difference		Quadrat 3	3.5
between quadrat overall		Quadrat 4	0.785714286
		Quadrat 5	1.571428571
LCD for species		Group 1	Average
36.91888788		Black Cherry	1.8
		Black Oak	1.6
There is no statistical difference		Black Spruce	1.4

between species overall		Blue Beech	44.2
		Choke Cherry	2
		Long Spur Hawthorn	0
		Paper Birch	10.6
		Pin Cherry	2
		Quaking Aspen	2.4
		Red Maple	17
		Red Pine	0
		Tag Alder	31.8
		Swamp White Oak	0.4
		White Pine	0.4

Discussion

Quadrat 1 vs. Quadrat 2

There were no statistical differences between Quadrat 1 and Quadrat 2 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer and as a whole.

Quadrat 1 vs. Quadrat 3

Quadrat 1 and Quadrat 3 differed in ANOVA Table 1, and ANOVA Table 7. Therefore this means that the differences in the soil types of Quadrat 1 and Quadrat 3 have produced differing amounts of trees in the Quadrat-s as a whole and the Middle Story. Statistically Quadrat 1 had produced more trees.

Quadrat 1 vs. Quadrat 4

Quadrat 1 and Quadrat 4 differed in ANOVA Table 1, and ANOVA Table 7. Therefore this means that the differences in the soil types of Quadrat 1 and Quadrat 4 have produced differing amounts of trees in the Quadrat-s as a whole and the Middle Story. Statistically Quadrat 1 had produced more trees.

Quadrat 1 vs. Quadrat 5

Quadrat 1 and Quadrat 5 differed in ANOVA Table 1, and ANOVA Table 7. Therefore this means that the differences in the soil types of Quadrat 1 and Quadrat 5 have produced differing amounts of trees in the Quadrat-s as a whole and the Middle Story. Statistically Quadrat 1 had produced more trees.

Quadrat 2 vs. Quadrat 3

There were no statistical differences between Quadrat 2 and Quadrat 3 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Quadrat 2 vs. Quadrat 4

There were no statistical differences between Quadrat 2 and Quadrat 4 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Quadrat 2 vs. Quadrat 5

There were no statistical differences between Quadrat 2 and Quadrat 5 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Quadrat 3 vs. Quadrat 4

There were no statistical differences between Quadrat 3 and Quadrat 4 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Quadrat 3 vs. Quadrat 5

There were no statistical differences between Quadrat 3 and Quadrat 5 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Quadrat 4 vs. Quadrat 5

There were no statistical differences between Quadrat 4 and Quadrat 5 (ANOVA Tables 1-8). Therefore the soil types were similar enough to support the same amount of trees in each layer, and as a whole.

Looking on the other side

As a side product of this project, it was able to tell many things about the associations between species on the Field Research Station. Unfortunately, I was not able to tell the associations on the different soil types but the information is interesting none the less.

Red Maple shows that it is mostly the dominant tree overall. It is represented in all the Quadrates (Quadrat Tables 1-5). This would show that the tree of Red Maple doesn't discriminate over the soil types. This could mean that Red Maple has a distinctive advantage over the all other trees in all soil types mentioned. Maybe the presence or absences of other trees in the Quadrates give the Red Maple multiple niches to spread. Also when recording the information, the Red Maple grew in clumps, which would indicate that it gets its advantage through the growth of a larger tree, then the death, and the growth of suckers on the stump. Another research theory would be to see how many trees actually grow in clump compared to the number of trees that are their own identity.

Blue Beech when it showed up in a Quadrat, it had strictly dominated the sapling layer making it the highest Sapling in those Quadrates (1,2). On all of the other Quadrates it was not even present. How could this species dominate these Quadrates and not even show up in all other Quadrates? Blue Beech does spread through suckers in the ground. Maybe when a tree is established in the understory, then it would send it suckers out and make more trees. Another thing that supports this is that would not a tree that is the overstory make seeds to spread to the forest floor, but Blue Beech is not found in the overstory. Therefore it is safe to say that Blue Beech does get its advantage from spreading through suckers.

Tag Alder showed up when the soil type had been sufficiently moist, therefore we could conclude that Tag Alder is found only where it is moist. Also the growth of clumps comes into play, maybe since the Tag Alder grows in large clumps give the advantage to the tree. The same hypothesis would have to applied to Tag Alder as suggested to Red Maple.

Paper Birch, White Pine, and Black Oak occur in all Quadrates (Quadrat Tables 1-5). Why does not they make into a dominate tree? One suggestion would be that when Paper Birch, White Pine, Black Oak occurs in large clumps, that would invite insects that prey on the trees. That could be disproved in the case of Black Oak, simply for the fact that Black Oak grows large DBH (Quadrat Tables 1-5). So another reason would be that the saplings are not good competitors for space, but when they reach the overstory, then they are a overstory tree for a large period of time.

The Group of Black Cherry, Black Spruce, Choke Cherry, Long Spur Hawthorn, Pin Cherry, Quaking Aspen, Red Pine, and Swamp White Oak only occur in specific Quadrates (Quadrat Tables 1-5). Therefore they are either opportunists (occur when there is a spot

that no other competitor occur in), or that they only occur in clumps and that their saplings cannot compete with that of Tag Alder, Blue Beech, and Red Maple.

CONCLUSION

Through this research, it has set down the basis of differences between the soil types. Maybe the tree structures will change in the future. Through the information saved we can compare how the soil further change the tree structures through there growth. This can be measure on comparing the same places that the trees were recorded. Also we could conclude how the tree communities change through time.

On a personal note, this was my first research project it proved more than a normal person could handle, my suggestion for the future is that if somebody were to do this in the future, I would get together a group of people to handle a project of this magnitude.

Research was done By Brad Dotson, Altoona High School, Field Research 101, 2001-2002