

Final Report – INAI Update Tree Core Curatorial Work and Basic Analysis
Grant Agreement # 13-018W

The Morton Arboretum
4100 Illinois Rte. 53
Lisle, IL 60302

September 2012-December 2012

Robert T. Fahey
(630) 719-2419
rfahey@mortonarb.org

Project Objective

The recent effort to update the statewide Illinois Natural Areas Inventory (INAI) has resulted in a collection of tree cores that were originally used to help estimate tree canopy age in the field. These cores contain valuable information about the growth and historical development of tree canopies at sites soon to be added to the INAI. This project focused on curating these tree cores, preparing them for analysis, obtaining ring counts and growth rates over time, and archiving the cores and resulting data. This information will add scientific value to the recently completed INAI Update.

Introduction

The original INAI was conducted from 1975 to 1978, with the intent to designate potential natural areas (PNA) of Illinois that, because of their ecological significance and scarcity, needed to be restored and protected. The INAI has continued to evolve over the past 30 years and, with new funding, recently manifested into the INAI Update. Initiated in 2007, the INAI Update deployed new technologies and ecological concepts to reevaluate past and analyze new PNA's.

As a component of the INAI Update and original INAI vegetative analysis, the Forest Ecology Laboratory at The Morton Arboretum in Lisle, Illinois analyzed and curated 191 tree cores from both the original INAI and INAI Update, which were obtained in counties mostly in Region 5 with some samples from counties in Region 1. With the use of the Dendrochronology Laboratory equipment, an analysis of the tree cores produced age approximations, ring counts and growth rates for an array of tree species: *Quercus spp.*, *Juniperus sp.*, *Gleditsia sp.*, *Taxodium sp.*, *Carya spp.*, and *Acer sp.* Extrapolating this data will assist in determining site indices, growth patterns, tree establishment years, and temporal fluctuations in site conditions. This data will be made available on The Morton Arboretum's website.

Materials and Methods

The tree cores were glued to wooden mounts, air-dried and sanded with progressively finer-grained sandpaper. Ring-widths were measured under magnification of a binocular microscope to the nearest

0.001 mm with a Velmex Unislide slide-stage micrometer interfaced with a computer and MeasureJ2X program.

Results

The range in the number of rings counted per core spans 21 to 234 across 191 cores with an average ring count of 94.79. The earliest measured growth ring dates back to 1775 (*Quercus stellata*) while the average earliest measured-year across all 191 cores was 1908. The survey site with the earliest, average tree-ring year (site with two or more trees sampled) measured was Jackson024 with three trees with an average tree-ring year of 1844. This date is influenced by the outlier of the *Q. stellata* from 1775. With this outlier and the other similar to it (*Q. stellata* – 1784) removed from consideration, the earliest average date of a site with two or more trees sampled is Gallatin030 with an average date of 1849.5.

Quercus alba (39.89%), *Quercus stellata* (21.81%), *Quercus velutina* (9.04%) and *Quercus rubra* (6.91%) make up 77.7% of all the species sampled. 34 cores were collected in 1976, 154 were collected between 2008 and 2011 and 3 cores had unspecified collection dates. 3 cores were collected from counties in Region 1 (Lake Co. and Jo Daviess Co.) while the remaining 188 were collected from counties in Region 5. Johnson Co. (39), Union Co. (23), and Jackson Co. (23) had the most samples collected by county.

18 samples were unreadable for various reasons. For some, the sample was in multiple pieces, the orders of which were indiscernible while others had indecipherable growth rings on account of improper mounting, decay, or wood type.

Discussion

Additional analysis of these cores will focus on determining the response of trees in Illinois Natural Areas to climatic fluctuations over the past 100+ years. Growth over time will be correlated with climate data and resistance of tree growth to drought will be assessed based on this information.

Survey Site	Species	Rings Measured
Alexander010	Q. alba	93
Alexander011	Q. alba	72
Alexander013	Q. alba	93
Alexander013	Q. alba	75
Alexander013	Q. velutina	118
Alexander013	Q. velutina	62
Alexander015	Q. alba	89
Alexander019	Q. alba	97
Alexander019	Q. rubra	59
Alexander001	Q. michauxii	82
Alexander001	Q. palustris	65
Alexander001	Q. pagoda	81
Alexander020	Q. alba	95
Alexander020	Q. rubra	74
Alexander024	Q. velutina	73
Alexander006	Q. alba	108
Alexander006	Q. alba	108
Alexander009	Q. alba	81
Edwards004	Q. bicolor	54
Edwards004	Q. pagoda	93
Franklin022	Q. alba	127
Franklin022	Q. palustris	38
Franklin022	Q. velutina	63
Franklin005	Q. bicolor	71
Franklin005	Q. palustris	48
Franklin005	Q. stellata	74
Gallatin001	Q. rubra	100
Gallatin023	Q. velutina	59
Gallatin024	Q. alba	98
Gallatin024	Q. velutina	89
Gallatin024	Q. velutina	62
Gallatin030	Q. stellata	135
Gallatin030	Q. stellata	184
Hamilton002	Q. alba	104
Hamilton002	Q. alba	107
Hamilton002	Q. stellata	108
Hamilton005	Q. alba	70
Hamilton005	Q. alba	83
Hamilton005	Q. alba	71
Hamilton009	Q. alba	130
Hardin013	Q. alba	57
Hardin009	Q. alba	120
Hardin Co #49 - Keeling Hill	Q. marilandica	54
Hardin Co #49 - Keeling Hill	Q. marilandica	124
Hardin Co #50 - Keeling Hill	Q. marilandica	92

Survey Site	Species	Rings Measured
Hardin Co #50 - Keeling Hill	<i>Q. velutina</i>	64
Hardin Co #50 - Keeling Hill	<i>Q. velutina</i>	63
Hardin Co #7 - Russell Cemetery Glade	<i>Q. stellata</i>	87
Hardin Co #7 - Russell Cemetery Glade	<i>Q. stellata</i>	121
Hardin Co #7 - Russell Cemetery Glade	<i>Juniperus virginiana</i>	89
Jackson014	<i>Q. bicolor</i>	94
Jackson024	<i>Q. alba</i>	143
Jackson024	<i>Q. alba</i>	117
Jackson024	<i>Q. stellata</i>	234
Jackson029	<i>Q. alba</i>	142
Jackson029	<i>Q. alba</i>	77
Jackson002	<i>Q. alba</i>	109
Jackson042	<i>Q. stellata</i>	169
Jackson042	<i>Q. velutina</i>	61
Jackson043	<i>Q. alba</i>	116
Jackson044	<i>Q. alba</i>	127
Jackson044	<i>Q. alba</i>	110
Jackson052	<i>Q. stellata</i>	165
Jackson056	<i>Q. alba</i>	95
Jackson056	<i>Q. alba</i>	135
Jackson005	<i>Q. alba</i>	140
Jackson005	<i>Q. rubra</i>	62
Jackson063	<i>Q. velutina</i>	58
Jackson064	<i>Q. alba</i>	82
Jackson064	<i>Q. stellata</i>	174
Jackson064	<i>Q. stellata</i>	159
Jackson068	<i>Q. alba</i>	125
Jackson071	<i>Q. stellata</i>	99
Jackson071	<i>Q. stellata</i>	126
Johnson Co #10 - Thomas Cemetery Site	<i>Q. rubra</i>	21
Johnson Co #10 - Thomas Cemetery Site	<i>Q. velutina</i>	37
Johnson Co #15 - Indian Point	<i>Q. stellata</i>	90
Johnson Co #15 - Indian Point	<i>Q. stellata</i>	145
Johnson018	<i>Q. alba</i>	77
Johnson Co #22 - Lower Cache R. Swamp	<i>Gleditsia aquatica</i>	32
Johnson Co #22 - Lower Cache R. Swamp	<i>Q. lyrata</i>	25
Johnson Co #22 - Lower Cache R. Swamp	<i>Taxodium distichum</i> - 3	104
Johnson Co #22 - Lower Cache R. Swamp	<i>Taxodium distichum</i> - 4	85
Johnson Co #23 - Odum tract	<i>Juniperus virginiana</i>	110
Johnson Co #23 - Odum tract	<i>Juniperus virginiana</i>	84
Johnson Co #23 - Odum tract	<i>Q. stellata</i>	59
Johnson Co #23 - Odum tract	<i>Q. stellata</i>	70
Johnson025	<i>Q. alba</i>	127
Johnson028	<i>Q. pagoda</i>	48
Johnson028	<i>Q. shumardii</i>	38

Survey Site	Species	Rings Measured
Johnson028	Taxodium distichum	59
Johnson003 - Faulkner Tract	Carya laciniosa	67
Johnson003 - Faulkner Tract	Q. pagoda	73
Johnson031	Q. alba	103
Johnson033	Q. alba	92
Johnson033	Q. stellata	111
Johnson033	Q. stellata	104
Johnson037	Q. alba	111
Johnson003 - Faulkner Tract	?	43
Johnson003	Q. michauxii	60
Johnson007	Q. michauxii	60
Johnson043	Q. rubra	91
Johnson048	Q. stellata	117
Johnson048	Q. stellata	109
Johnson056	Q. alba	93
Johnson060	Q. alba	85
Johnson061	Q. alba	75
Johnson062	Q. velutina	110
Johnson064	Q. alba	97
Johnson064	Q. alba	92
Johnson006	Q. rubra	29
Johnson Co #6 - Wise ridge	Q. stellata	73
Johnson Co #6 - Wise ridge	Q. velutina	35
Johnson008	Q. alba	47
Lake Co #82 - Blair Woods	Q. macrocarpa	98
Lake Co #82 - Blair Woods	Q. rubra	67
Masac Co #18 - Fort Massac Area	Acer saccharinum	29
Masac Co #18 - Fort Massac Area	Carya illinoensis	41
Masac Co #18 - Fort Massac Area	Q. falcata var. pagodaefolia (Q. pagoda)	40
Masac Co #18 - Fort Massac Area	Q. palustris	32
Masac Co #18 - Fort Massac Area	Q. rubra	39
Masac Co #18 - Fort Massac Area	Taxodium distichum	30
Masac Co #18 - Fort Massac Area	Taxodium distichum	40
Massac Co #25 - Lewis Estate South	Q. michauxii	49
Perry020	Q. stellata	141
Perry023	Q. palustris	43
Pope110	Q. stellata	65
Pope110	Q. stellata	107
Pope045	Q. alba	85
Pope045	Q. stellata	103
Pope004	Q. alba	125
Pope051	Q. stellata	104
Provo Cemetery Barrens	Q. prinus	121
Pulaski015	Q. pagoda	71
Pulaski018	Q. pagoda	88

Survey Site	Species	Rings Measured
Pulaski018	Q. lyrata	44
Pulaski007	Q. shumardii	116
Pleasant Valley	Q. stellata	119
Richland013	Q. alba	99
Richland006	Q. alba	148
Saline010	Q. alba	105
Saline010	Q. stellata	100
Saline010	Q. stellata	108
Saline011	Q. stellata	57
Saline018	Q. stellata	132
Saline023	Q. alba	122
Saline032	Q. alba	167
Saline032	Q. alba	153
Saline032	Q. alba	157
Saline032	Q. rubra	113
Saline032	Q. stellata	139
Saline034	Q. alba	112
Saline034	Q. stellata	112
Saline035	Q. rubra	91
Saline035	Q. stellata	225
Saline039	Q. stellata	160
Saline Co #5 - Cave Hill	Juniperus virginiana	84
Saline Co #5 - Cave Hill	Q. stellata	145
Johnson Co #22 - Lower Cache R. Swamp	Site Totals	28.5
Union010	Q. alba	157
Union010	Q. alba	114
Union010	Q. stellata	95
Union010	Q. stellata	91
Union011	Q. alba	156
Union020	Q. alba	118
Union020	Q. alba	101
Union020	Q. alba	112
Union022	Q. alba	92
Union003	Q. alba	97
Union003	Q. alba	73
Union040	Q. michauxii	126
Union040	Q. pagoda	83
Union044	Q. alba	180
Union046	Q. alba	99
Union047	Q. alba	91
Union047	Q. alba	109
Union050	Q. alba	132
Union058	Q. alba	87
Union058	Q. rubra	57
Union005	Q. alba	88

Survey Site	Species	Rings Measured
Union060	Q. alba	115
Union060	Q. stellata	138
Union006	Q. velutina	108
Williamson027	Q. palustris	39
Williamson027	Q. stellata	139
Williamson005	Q. alba	89
Williamson006	Q. velutina	89
Williamson007	Q. rubra	41
Williamson007	Q. velutina	88
Williamson009	Q. alba	66
Williamson009	Q. alba	109

MORTON ARBORETUM
 4100 ILLINOIS RT 53
 LISLE, IL 60532

Employee Time Cards

As of Thursday, January 17, 2013
 Employee# 1781
 11/11/2012 - 12/15/2012

Employee Number		Name		Department					Total			
Code	Date	Day	Action	Start	Stop	Code	Hours	Reg	OT1	OT2	Paid	Unpaid
1781			David Carter									
	11/19/2012	Mon	Work	8:00 AM	1:00 PM	603001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	603001	0.00					
			Work	1:30 PM	4:00 PM	603001	2.50	2.50				
	11/20/2012	Tue	Work	8:00 AM	1:00 PM	603001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	603001	0.00					
			Work	1:30 PM	4:00 PM	603001	2.50	2.50				
	11/21/2012	Wed	Work	8:00 AM	1:00 PM	603001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	603001	0.00					
			Work	1:30 PM	4:00 PM	603001	2.50	2.50				
	11/22/2012	Thu	Holiday			005029	7.50	7.50			7.50	
	11/23/2012	Fri	Holiday			005029	7.50	7.50			7.50	
	11/26/2012	Mon	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	11/27/2012	Tue	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	11/28/2012	Wed	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	11/29/2012	Thu	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	11/30/2012	Fri	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/03/2012	Mon	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/04/2012	Tue	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/05/2012	Wed	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/06/2012	Thu	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/07/2012	Fri	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				
	12/10/2012	Mon	Sick			005029	7.50	7.50			7.50	
	12/11/2012	Tue	Work	8:00 AM	1:00 PM	641001	5.00	5.00			7.50	0.50
			Lunch	1:00 PM	1:30 PM	641001	0.00					
			Work	1:30 PM	4:00 PM	641001	2.50	2.50				

12/12/2012	Wed	Work	8:00 AM	1:00 PM	005029	5.00	5.00		7.50	0.50
		Lunch	1:00 PM	1:30 PM	005029	0.00				
		Work	1:30 PM	4:00 PM	005029	2.50	2.50			
12/13/2012	Thu	Work	8:00 AM	1:00 PM	005029	5.00	5.00		7.50	0.50
		Lunch	1:00 PM	1:30 PM	005029	0.00				
		Work	1:30 PM	4:00 PM	005029	2.50	2.50			
12/14/2012	Fri	Work	8:00 AM	1:00 PM	005029	5.00	5.00		7.50	0.50
		Lunch	1:00 PM	1:30 PM	005029	0.00				
		Work	1:30 PM	4:00 PM	005029	2.50	2.50			

Totals	150.00	0.00	0.00	150.00	8.50
---------------	--------	------	------	--------	------

Department Summary

Forest Ecology FT	005029	45.00
Res Wildlife Preservation FT	641001	82.50
Vegetation Analysis FT	603001	22.50

Pay Type Summary

Work	127.50	0.00	0.00	127.50	8.50
Holiday	15.00	0.00	0.00	15.00	0.00
Sick	7.50	0.00	0.00	7.50	0.00

Total Department Summary

Name	Code	Hours
Forest Ecology FT	005029	45.00
Res Wildlife Preservation FT	641001	82.50
Vegetation Analysis FT	603001	22.50

Total Pay Type Summary

Pay Type	Reg	OT1	OT2	Total	
				Paid	Unpaid
Work	127.50	0.00	0.00	127.50	8.50
Holiday	15.00	0.00	0.00	15.00	0.00
Sick	7.50	0.00	0.00	7.50	0.00

GL Details

MORTON ARBORETUM (B1420)

Check Date	ID		CC1	Hours	Rate	Amount
12/14/2012	1781	David Carter	Wildlife Preservation FT	37.5	18.05	676.89
12/28/2012	1781		Wildlife Preservation FT	45	18.05	812.26
						1489.15

Shift