Compost Effect on Wood Quality of Eucalyptus SRWCs

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Presentation Outline

1. Short Rotation Woody Crops (SRWC)

2. SRWC Responses to Compost

3. Potential Compost Applications

4. Compost and Wood Moisture Content

5. Conclusions

Short Rotation Woody Crop Systems

1. **Fast Growing Species** – **Eucalyptus grandis (Eg), E. amplifolia (Ea), Populus deltoides (Cottonwood, Pd), Corymbia torelliana (Ct)**

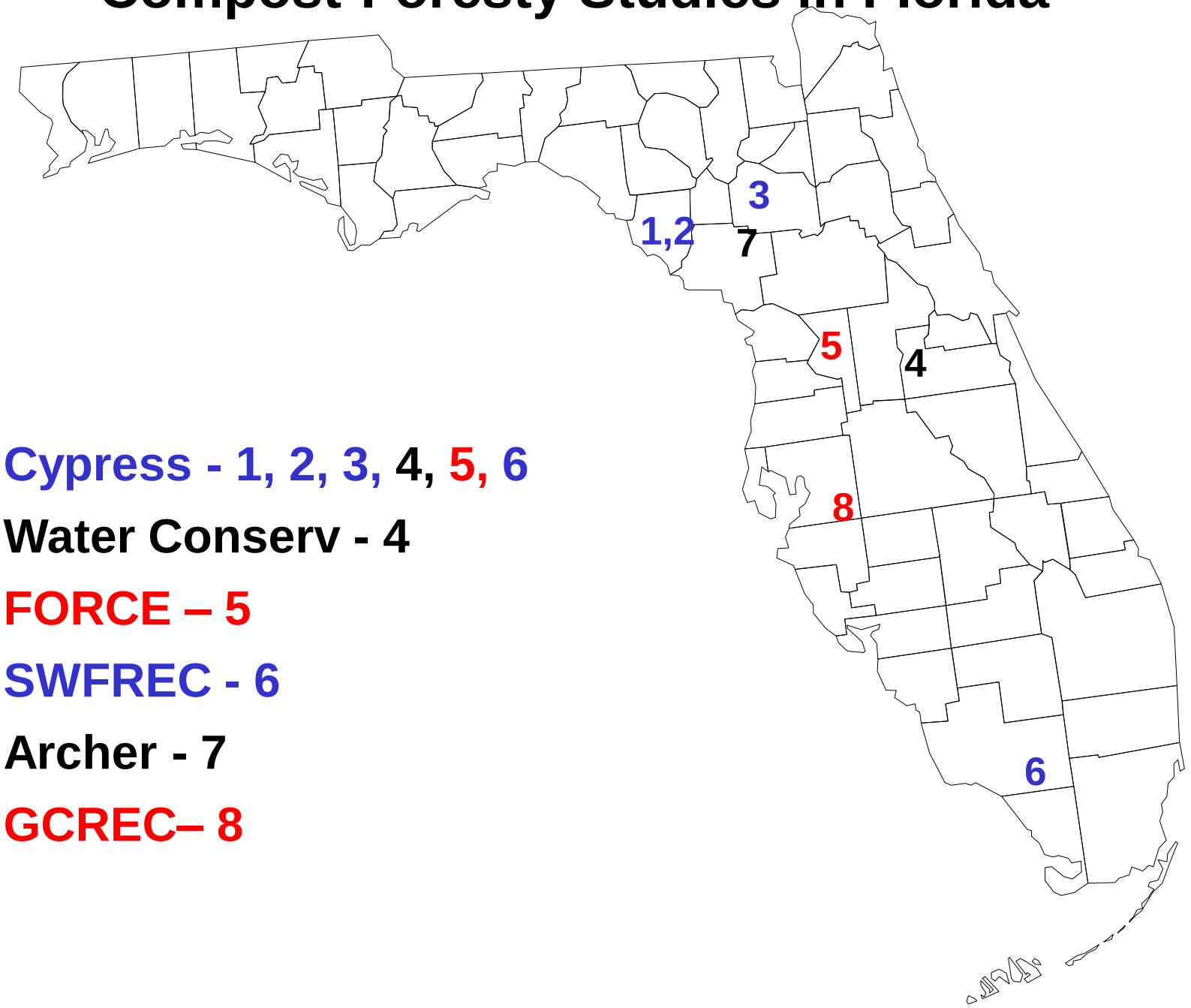
2. **Close Spacing** – **up to 10,000 trees/ha**

3. **Intensive Culture** – **Soil amendments, Vegetation Contol**

4. **Short Rotation** - **<10 years**

5. **Coppice Regeneration** – **2-3 cycles**

Compost-Foresty Studies in Florida



Cypress - 1, 2, 3, 4, 5, 6

Water Conserv - 4

FORCE – 5

SWFREC - 6

Archer - 7

GCREC– 8

Cottonwood at Winter Garden

E. grandis at Winter Garden

Florida Organics Recycling Center for Excellence

FORCE Compost Study

-2 Plantings: 2002-03, 2003-04

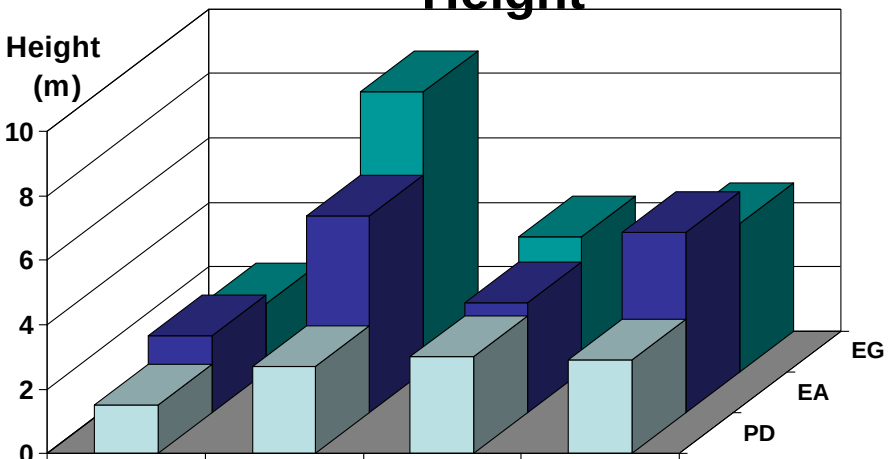
-4 Species: 8 Pd, 8 Eg, 8 Ea, 19 Td

-6 Cultures: Control, 2 Compost Rates and 2 Times, Irrigation, Compost+Irrigation, Irrigation+Fertilizer

-2 Spacings: 2002 – 1 Row@10x3', 2 Rows@10x3x2.5',
2004 – 1 Row@14x3', 2 Rows@14x3x2.5'

2002 FORCE at 38 months

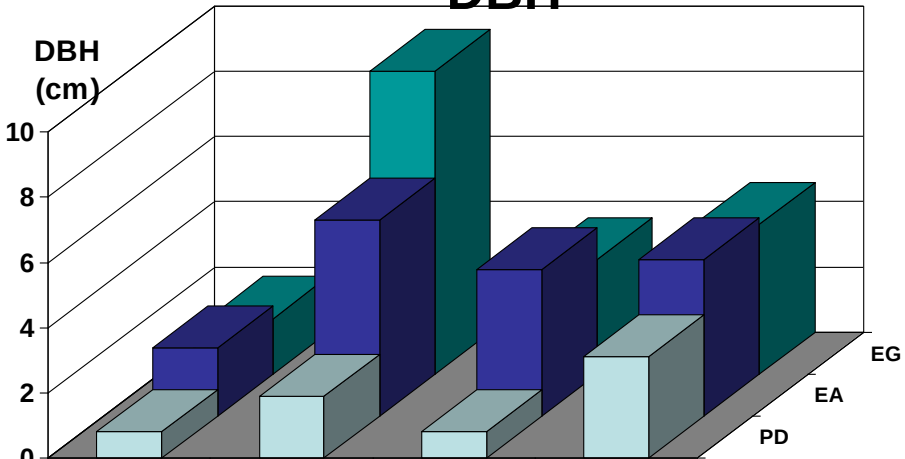
Height



	0	C	I	C+I
PD	1.5	2.7	3	2.9
EA	2.4	6.1	3.4	5.6
EG	2.1	8.7	4.2	4.6

Treatment

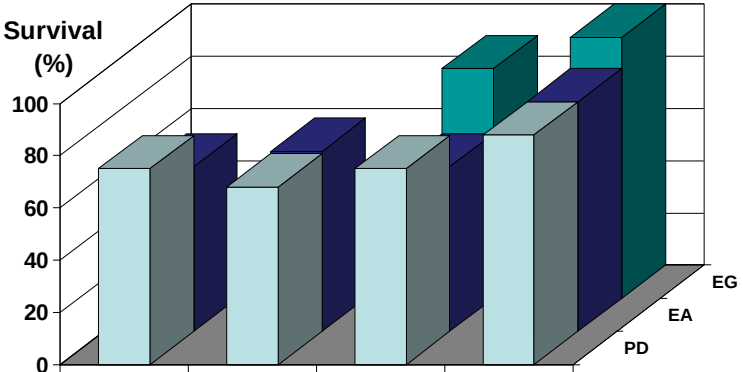
DBH



	0	C	I	C+I
PD	0.8	1.9	0.8	3.1
EA	2.1	6	4.5	4.8
EG	1.7	9.3	3.5	4.6

Treatment

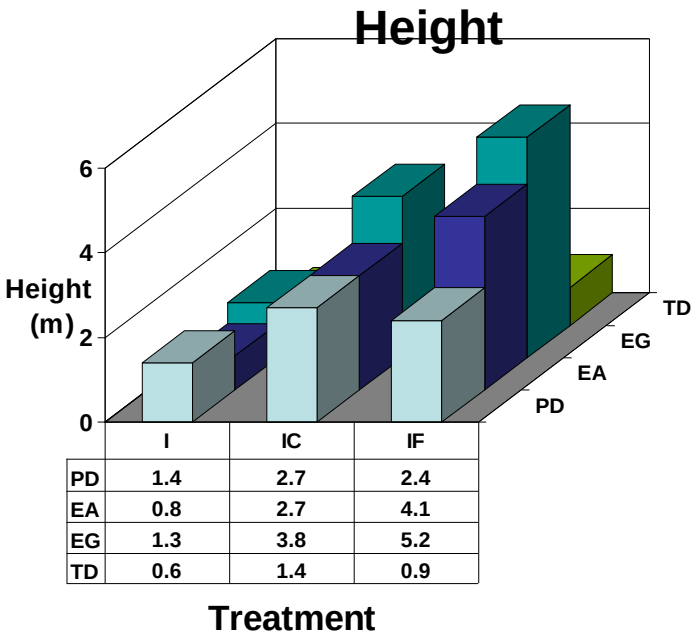
Survival



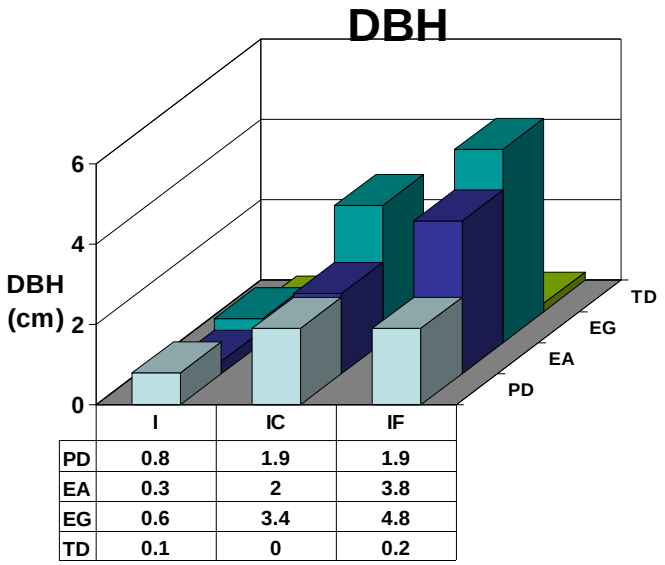
	0	C	I	C+I
PD	75	68	75	88
EA	63	69	63	88
EG	13	13	88	100

Treatment

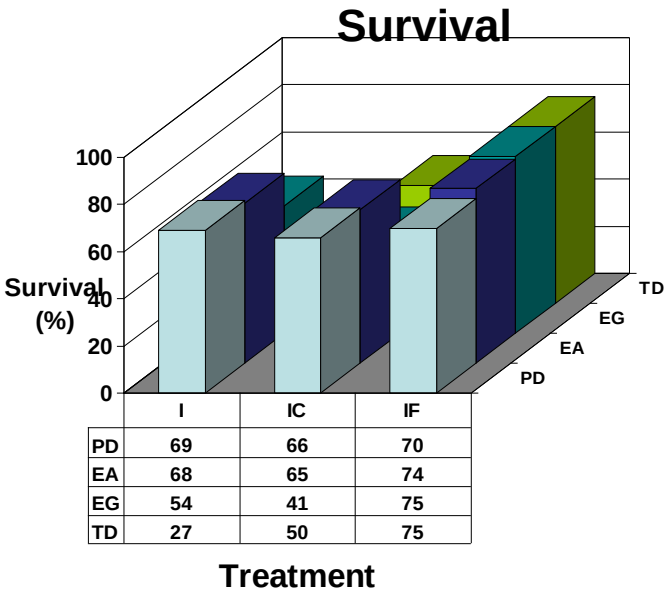
2004 FORCE at 13 months



	I	IC	IF
PD	1.4	2.7	2.4
EA	0.8	2.7	4.1
EG	1.3	3.8	5.2
TD	0.6	1.4	0.9

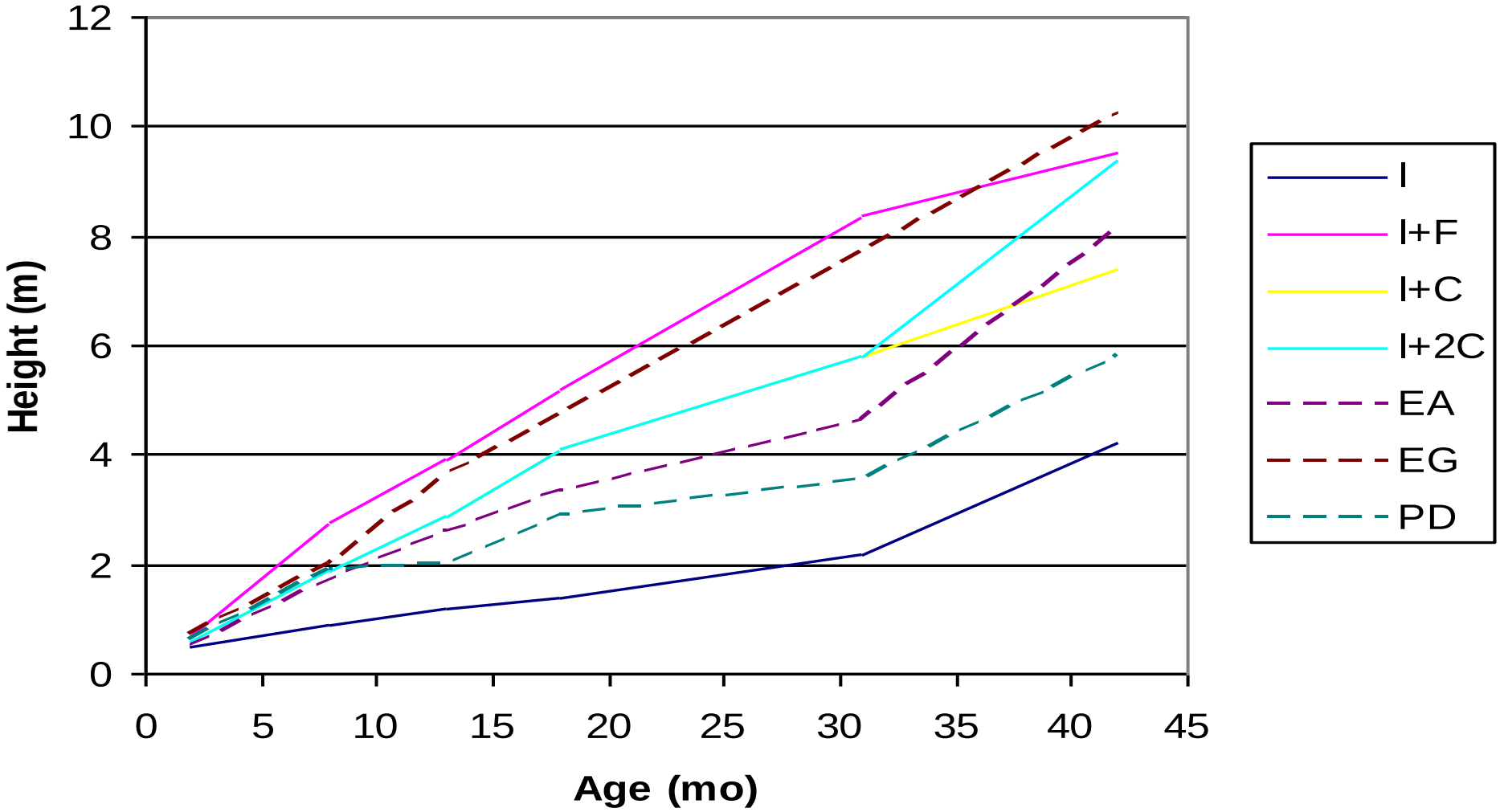


	I	IC	IF
PD	0.8	1.9	1.9
EA	0.3	2	3.8
EG	0.6	3.4	4.8
TD	0.1	0	0.2

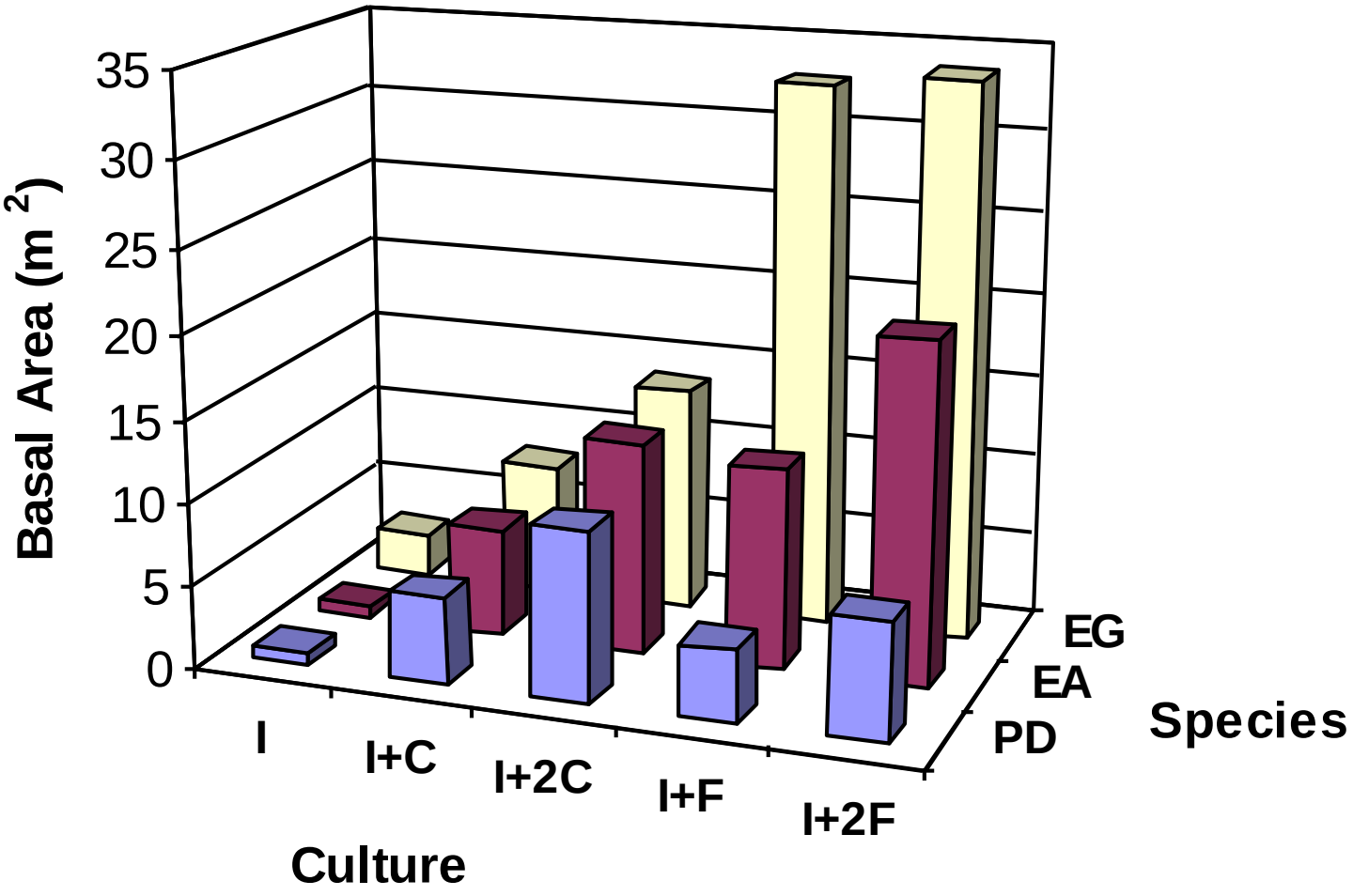


	I	IC	IF
PD	69	66	70
EA	68	65	74
EG	54	41	75
TD	27	50	75

Average Tree Height through 42 months for Four Cultures (across Species) and Three Species (across Cultures)



Stand Basal Area at 42 months by Five Cultures and Three Species

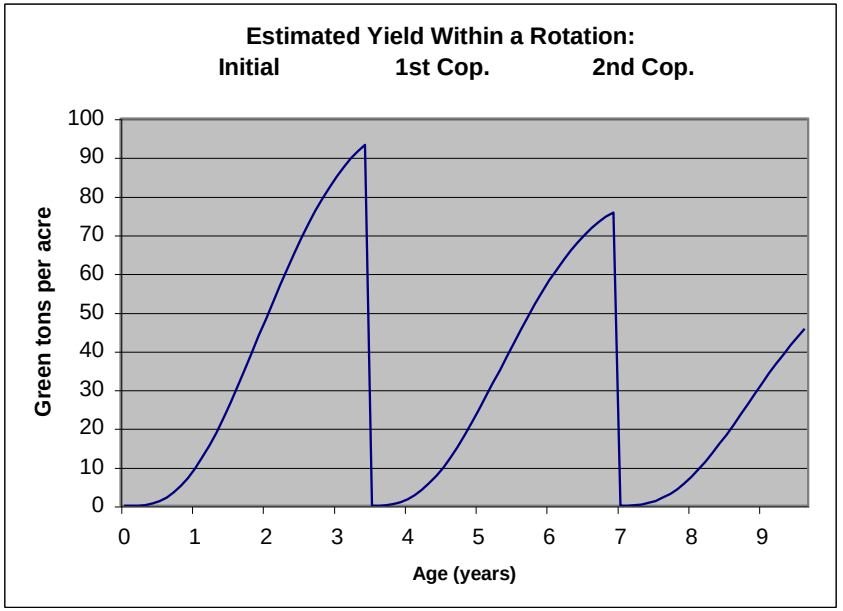


SRWC Decision Support System:

Land Expectation Value (LEV), Equal Annual Equivalent (EAE), Internal Rate of Return (IRR), and Net Present Value (NPV) Calculator

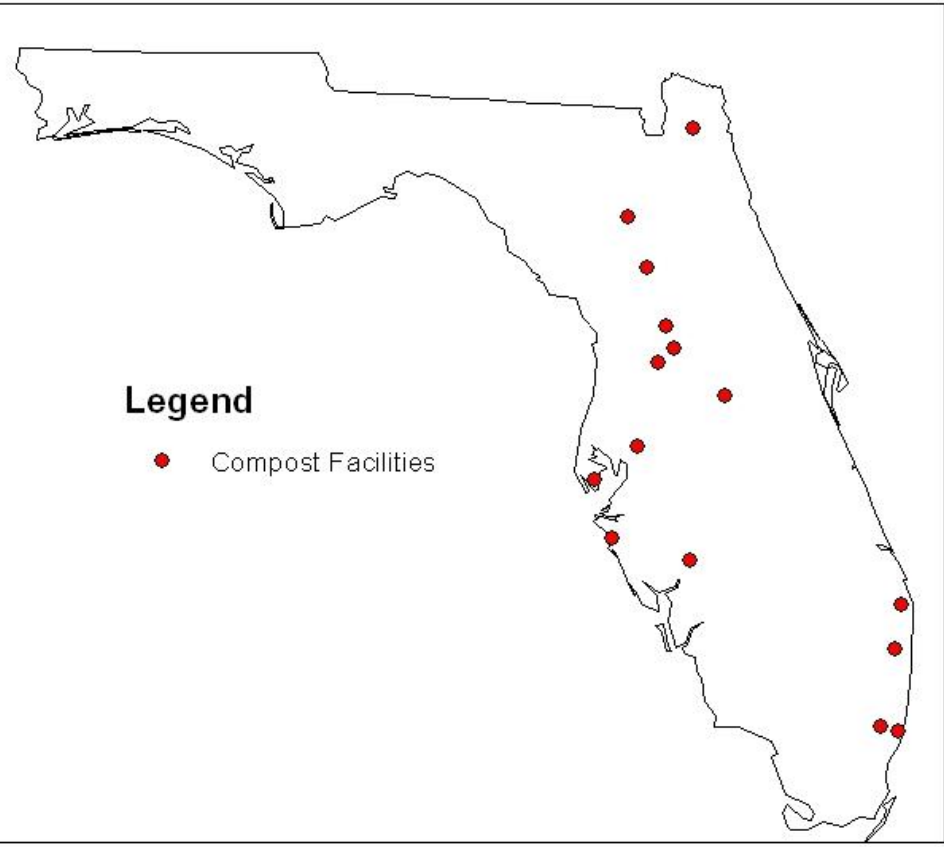
INPUTS	
Stumpage Price, Incentives, Capital Cost	
Stumpage price ($ green ton^{-1})	$10
Renweable Energy Porfolio Incentive ($ green ton^{-1})	
Other Incentives ($ green ton^{-1})	
Total stumpage value ($ green ton^{-1})	$10
Capital cost (annual interest rate)	5.0%
Start-up Costs	
Herbicide ($ acre^{-1})	$200
Site Prep ($ acre^{-1})	$0
Disk ($ acre^{-1})	$90
Bed ($ acre^{-1})	$0
Total:	**$290**
Costs at the Beginning of Each Rotation	
Fertilize ($ acre^{-1})	$725
Propagule price (per tree)	$0.11
Trees per acre (1,700-3,400)	3,400
Cost of Trees ($ acre^{-1})	$374
Planting cost ($ acre^{-1})	$150
Total	**$1,249**
Costs at the Beginning of Each Coppice	
Weed control ($ acre^{-1})	$40
Annual Costs	
Annual maintenance/administration ($ acre^{-1})	$10
General Parameters	
Inside bark or total above-ground biomass	Total above-ground biomass
Expansion factor for branches and leaves	1.7
Number of coppices per rotation	4
Age of first harvest	3.4
Harvest age of first coppice	3.5
Harvest age of second coppice	3.4
Harvest age of third coppice	3.3
Total Rotation Length	13.6
Initial harvest yield (as % of first harvest)	100%
First coppice yield (as % of first harvest)	80%
Second coppice yield (as % of first harvest)	60%
Third harvest yield (as % of first harvest)	40%

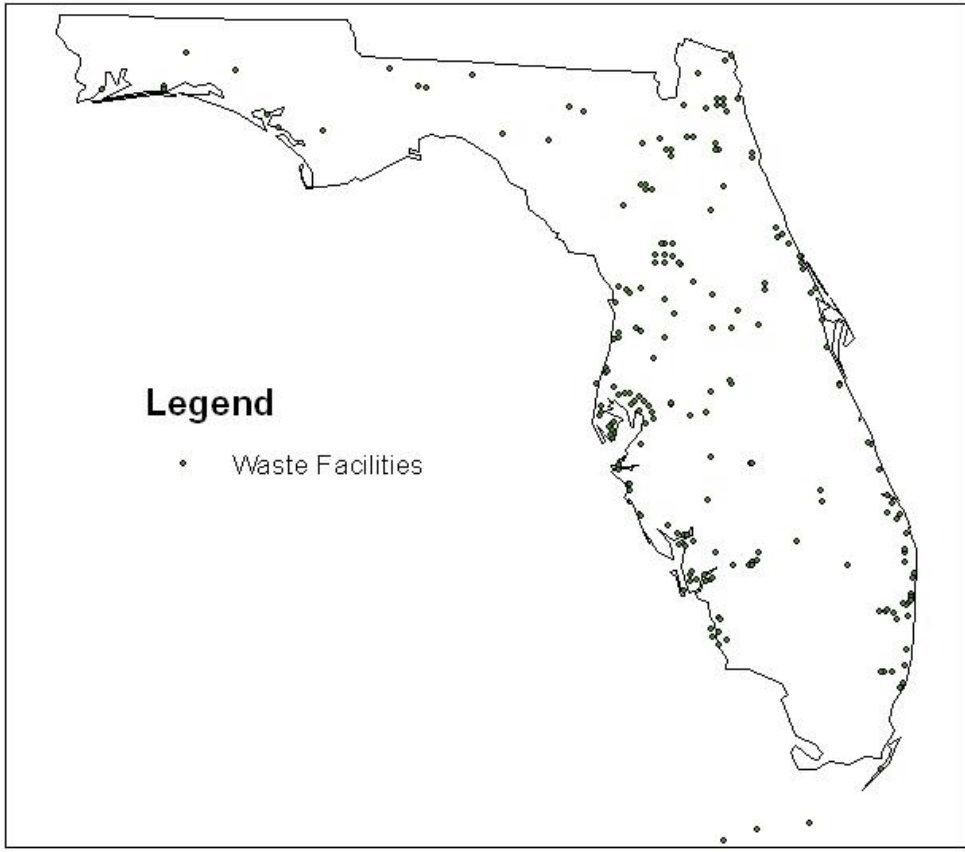
OUTPUTS	
LEV ($ acre^{-1})	**$534**
EAE ($ acre^{-1})	**$27**
IRR	**7.2%**
NPV benefits ($ acre^{-1})	$3,734
NPV costs ($ acre^{-1})	$3,201
Benefit/cost ratio	**1.17**
NPV after 1st Rotation ($ acre^{-1})	**$120**
NPV after 2nd Rotation ($ acre^{-1})	**$353**
NPV after 3rd Rotation ($ acre^{-1})	**$470**
NPV after 4th Rotation ($ acre^{-1})	**$530**
NPV after 5th Rotation ($ acre^{-1})	**$560**



Yields (green tons acre^{-1}) by harvest age within a rotation	
Initial harvest at 3.4 years of age	93.2
First coppice at 3.5 years of age	75.7
Second coppice at 3.4 years of age	55.9
Third coppice at 3.3 years of age	36.6

15 Compost Production (left) and 218 Yard Waste Processing (right) Facilities in Florida

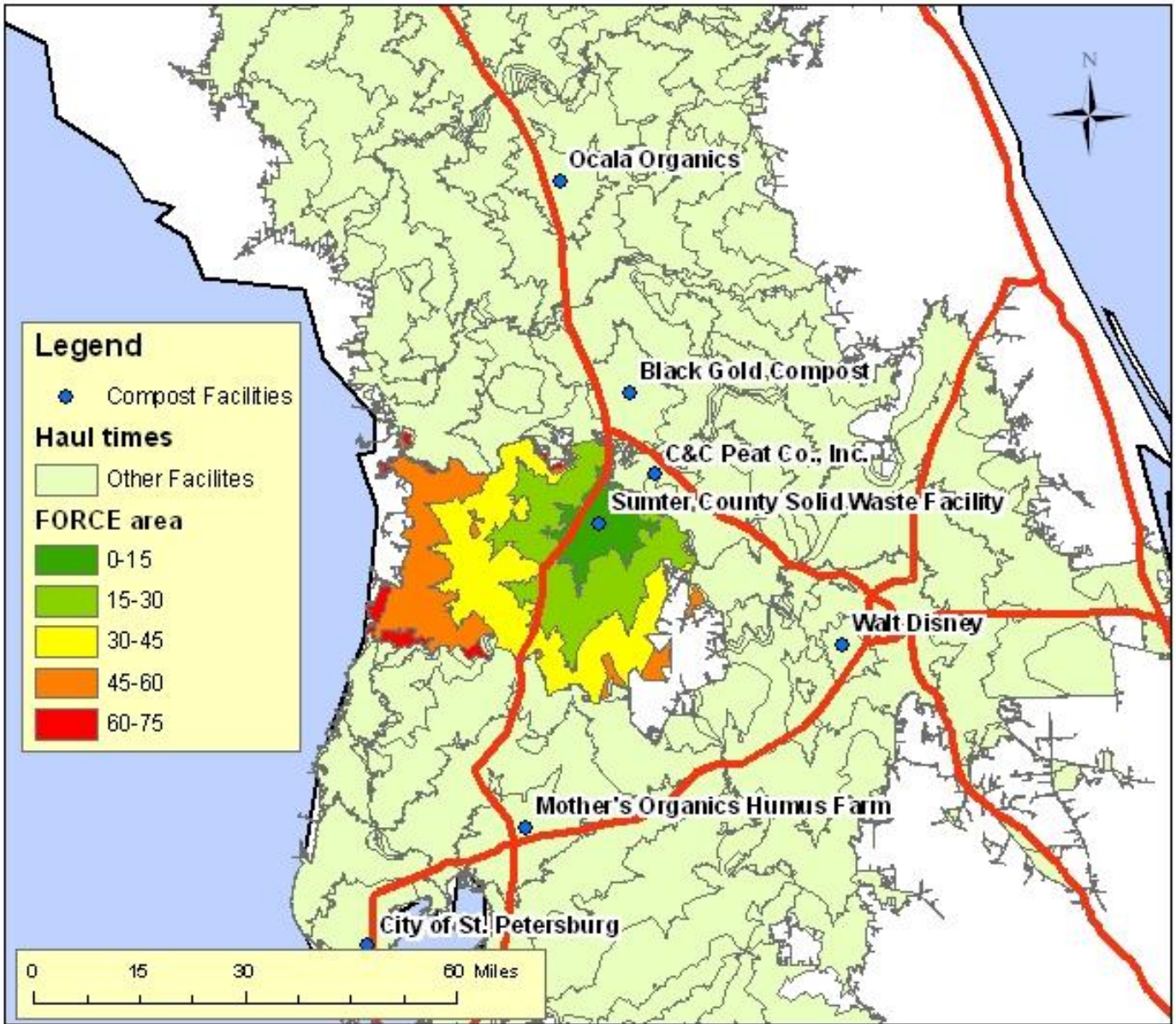




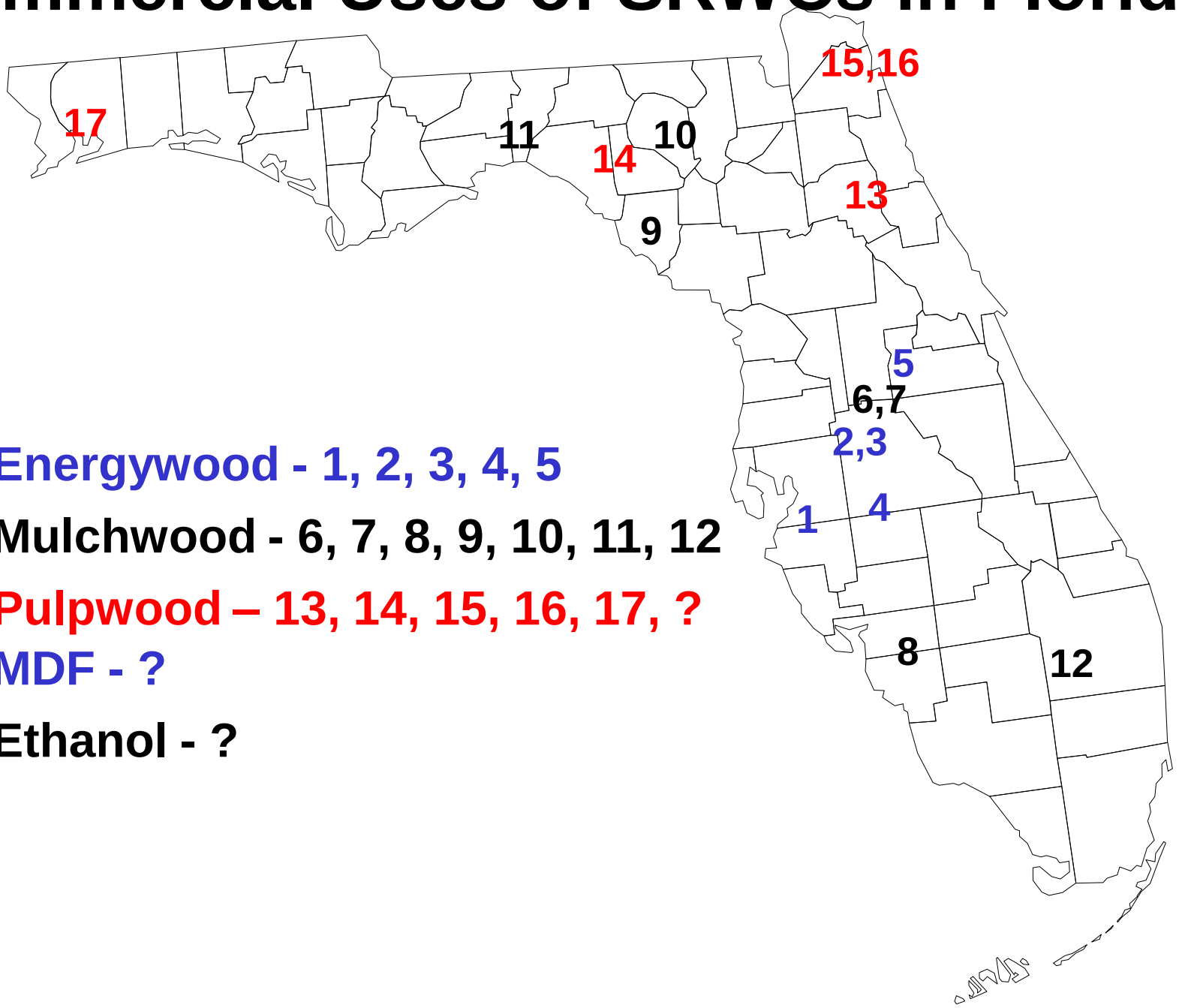
Agriculture and Forest Acres for SRWCs by Time from 15 Compost Production Facilities

Facility Location	Time from Facility (minutes)			
	0-15	15-30	30-45	45-60
Miami	1,378	227	-	-
West Palm Beach	2,431	22,600	94,066	101,696
Lake Buena Vista	10,924	37,230	124,908	150,087
Sarasota	3,048	42,623	94,984	64,247
Nocatee	49,372	132,874	207,339	229,263
Jacksonville	9,531	45,409	219,833	326,468
N. St. Petersburg	134	297	689	1,961
Sumterville	47,286	82,071	78,849	22,805
Oxford	10,615	5,670	706	246
Delray Beach	34,824	70,071	38,488	32,186
Okahumpka	16,400	54,162	39,688	38,662
Hialeah Gardens	2,394	1,654	0	7,721
Seffner	20,192	97,478	177,530	86,243
Reddick	52,354	156,199	209,953	79,186
Gainesville	33,770	196,819	358,797	416,031
Total	**294,652**	**945,384**	**1,645,831**	**1,556,804**

0-15, 15-30, 30-45, 45-60, and 60-75 Minute Hauls from Compost Facilities in Central FL



Commercial Uses of SRWCs in Florida



Energywood - 1, 2, 3, 4, 5

Mulchwood - 6, 7, 8, 9, 10, 11, 12

Pulpwood – 13, 14, 15, 16, 17, ?

MDF - ?

Ethanol - ?

Wood Quality Methods

Spring Sample

Tree ID	Spec.	Type	Height (m)	DBH (cm)
20-42	EG	Tree	25.9	29.6
20-104	EG	Tree	23.8	27.5
20-58	EG	Log	24.5	21.2
20-47	EG	Tree	21.3	21.1
20-100	EG	Log	13.1	19.2
20-41	EG	Log	12.1	10.4

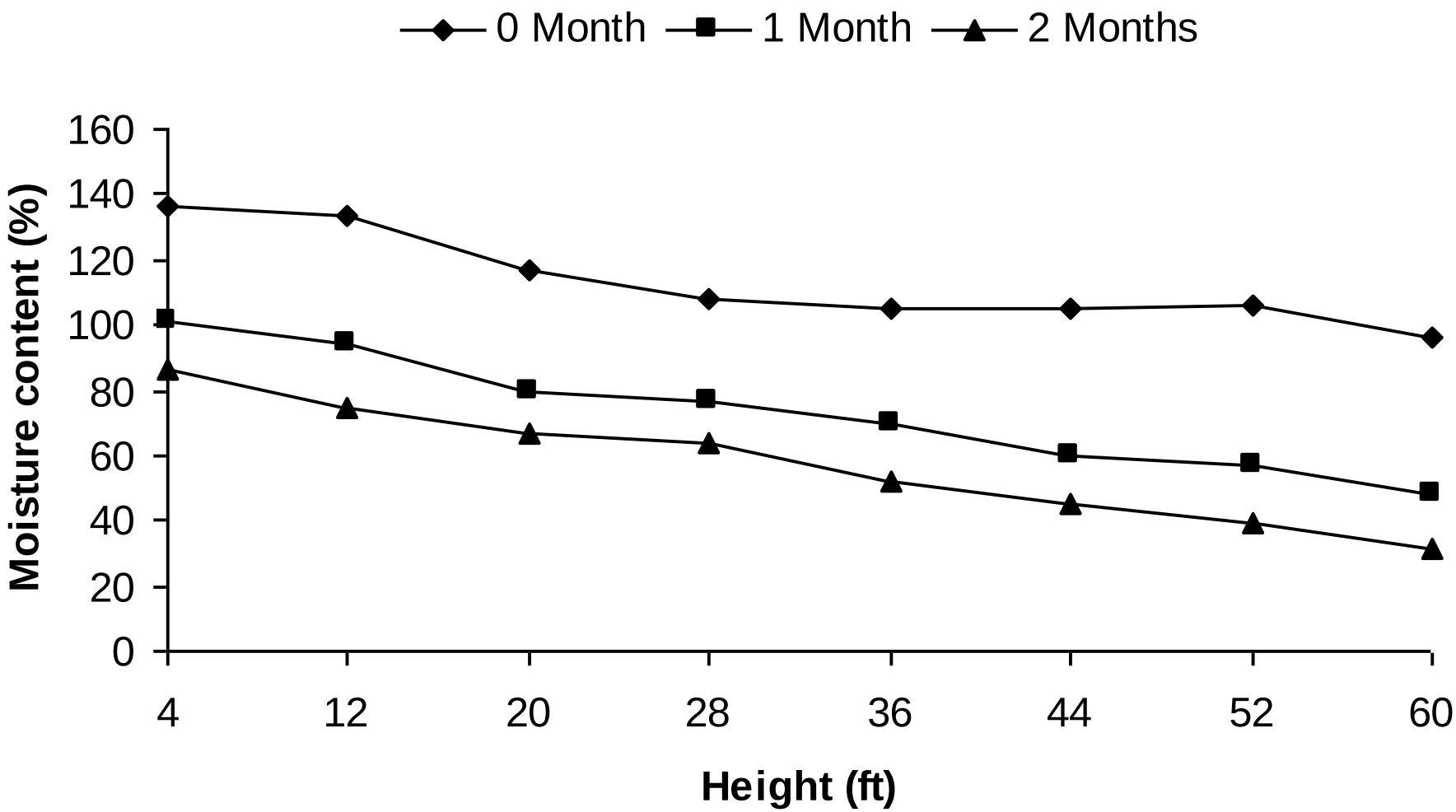
Summer Sample

Tree ID	Spec.	Type	Height (m)	DBH (cm)
13-44	EG	Tree	26.3	25.7
13-45	EG	Log	24.3	25.5
20-53	EG	Log	25.5	22.3
16-171E	EG	Tree	21.2	21.6
20-113	EG	Log	19.5	13.9
20-162	EG	Tree	14.6	13.1

Sampling Methods

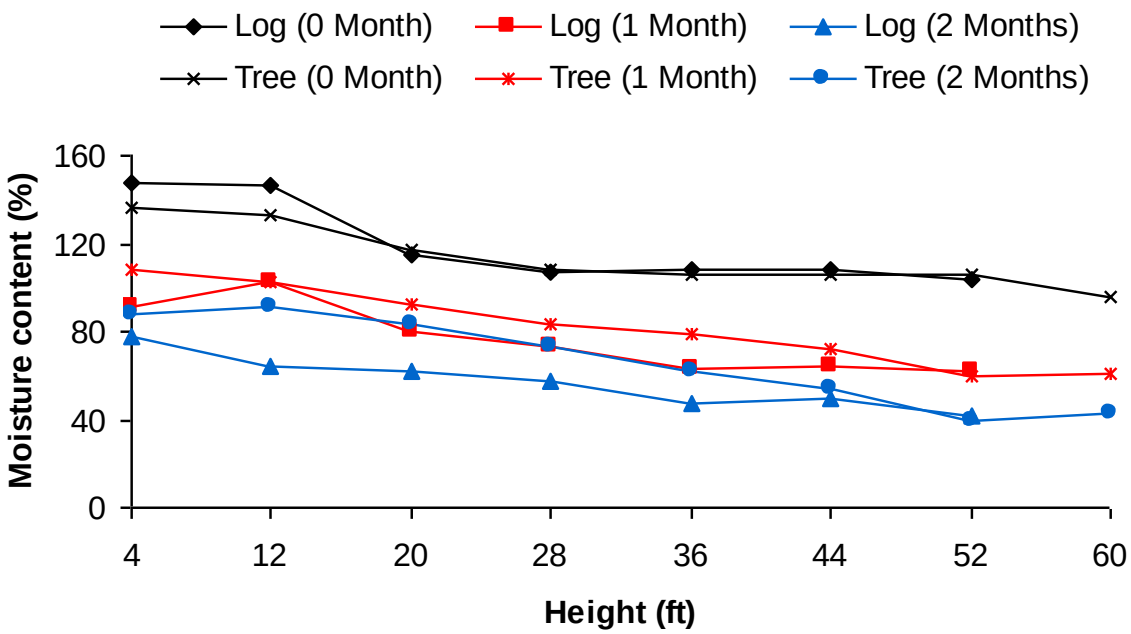
Season	Months after Harvest		
	0	1	2
Spring	2/10/2010	3/10/2010	4/13/2010
Summer	5/12/2010	6/15/2010	7/13/2010

E. Grandis Wood Moisture Content 0, 1, and 2 months after Harvest

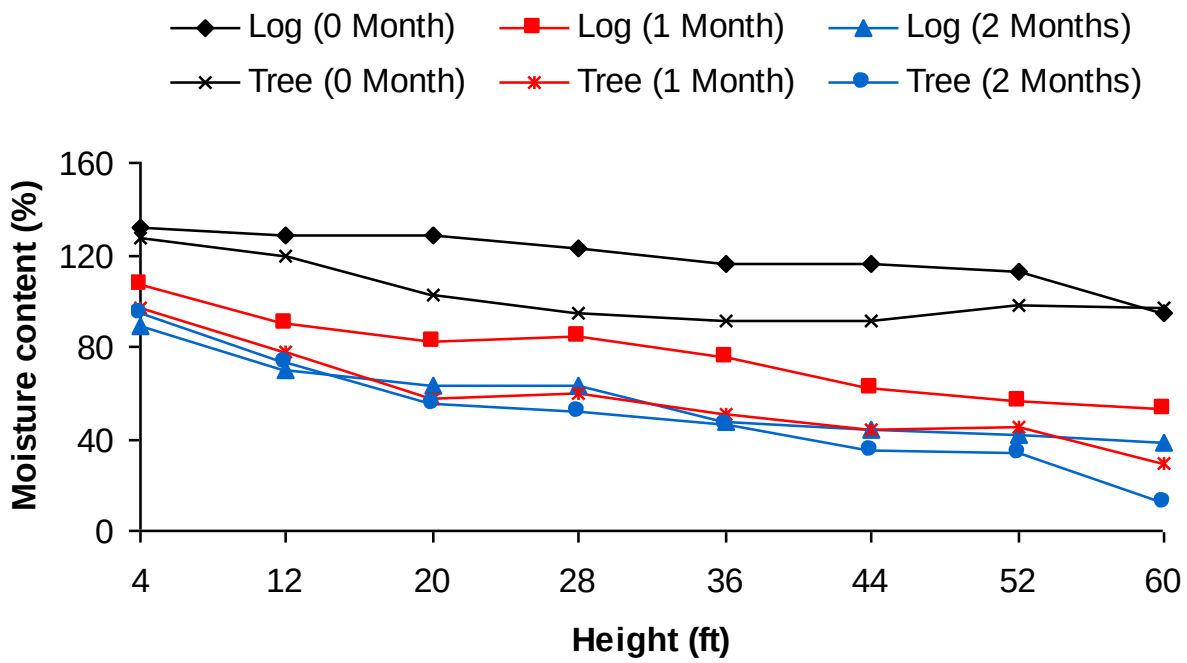


Seasonal Effect of Field Drying on Wood Quality

Spring



Summer



Conclusions

Compost is An Effective Soil Amendment for **PD**, **EG**, and **EA** SRWCs in Florida

SRWC Uses - Energy, Pulp, and Mulch, Windbreaks, Phytoremediation, Mined Land Reclamation, and Carbon Sequestration

Using Compost for SRWCs on Potentially 1,000,000 Acres in Florida Has Economic Limits

Compost Does Not Appear to Affect Wood Quality

Field Drying Improves Wood Quality By Reducing Moisture Content