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BIOMASS OPTIONS FOR GRU – PART II

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PRESENTED TO GRU STRATEGIC PLANNING GROUP

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BIOMASS OPTIONS FOR GRU – PART II

A. INTRODUCTION
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A. Introduction and Abstract:

The first Biomass Options for GRU was written in January of 1998, by A. Green, T. Cunilio and S. Peres for the Energy Advisory Committee of the City of Gainesville. The report provided a guide to the energy crop resource base, the technologies possible for use by GRU and the local professionals involved in the national and local arenas of biomass energy. "Biomass Options for GRU – Part II" provides GRU a new dimension – detailed analysis of biomass supplies – as well as a critique of some assumptions made in its own study done in 1997 titled "Biomass as an Energy Supply Alternative." In the present analysis the authors conclude that: 1) Under the present climate regime experienced in north-central Florida, there is a sustainable, may we say "ubiquitous, supply of all types of **waste wood** amounting to a minimum of **1,424 tons per day**. 2) The average energy content of green wood is 5,250 Btu/lbs, of dried wood is 8,000 Btu/lb. Air dried wood waste and woody biomass are not to be considered green and as hogged fuel wood will come in at no higher than 25% moisture. 3) The land base within a 25-mile radius of Deerhaven described below is enormous – 1.26 million total acres - and can be subdivided into four management types: planted pine, upland hardwood, oak-pine and natural pine. The four types in this area embrace approximately 580,600 acres. Each day within the 25-mile radius, 77 acres are harvested leaving 504 tons per day of residue. On planted pine acreage, there are another 480 tons per day in the ground in the form of 35-40% moisture stumps. Together these logging residue sources total **984 tons per day.** 4) There is a continuous stream of **clean** waste wood from the a) urban and tree trimming and wood businesses working throughout the region, b) from clearing and construction and, c) and from the public sector including GRU. These categories represent **440 tons per day,** 75% of which is dry matter. 5) Dedicated, short-rotation woody biomass crops could be grown under contract with the utility. If only twenty-five percent of Alachua County cropland were brought into production **722 t/day** of air-dried biomass would result. 6) **The total forestry residue, tree waste and biomass potential is a conservative 2,146 tons per day or 783,290 tons per year.** If the region is to continue mass development, waste wood biomass will always be there as a byproduct. Given the characteristics of the locally available waste wood and energy crops further described below, an appropriate design for its conversion to electricity should be made feasible. We recommend: 1) A system where private companies harvest and sell suitably chipped, waste wood and that an unloading facility for both large and small trucks be installed; 2) That moisture content of said chips be measured at the plant gate and a fair price be paid based upon Btu per dried ton with drying to be done at the plant using waste heat; and 3) That such a price will range from $12.60/ton to $22/ton.

B. Waste wood from Forestry Activities

In Alachua County and its neighbors there are 988,800 acres of planted pine forests according to the District Forestry office. Three large forestry products facilities in our region process wood. A pulpwood plant in Palatka receives 3,000 tons per day; a plywood plant in Hawthorne receives 1,000 tons/day, and a chippin' saw mill in Cross City receives about 750 tons/day. Some of this supply comes from as far away as Polk County. In Alachua County alone there are over 100,000 acres of planted pine. For this survey, an average harvest cycle of 22 years and an average yield of 100 total tons per acre for that age stand is the estimate in our calculation of residues for this planted pine. Harvest residues have been defined by Tillman in 1978 as 10-15% of wood (10 - 15 t/acre residue) harvested and by Post in 2003 as 10 to 25 tons per acre depending on whether stumps are included. The moisture in the residues, given the fact that much of the wood will have been air dried during and after logging, has been found to be no more than 25%. We will use then a very conservative 7.5 tons per acre of residue at 75% dry matter and a heating value of 9,000 Btu per pound, if dried, for the acreage considered in planted pine and for the calculations in the data below. This material includes the tops of whole pine logs, usually 4 inches at the base, with no leaves. (See photos at the end of this chapter.) These residues are easily gathered by the skidders and are normally burned or allowed to decay. On one commercial plantation, a third row thinning of 12-year old trees yielded piles containing 1200 tons from the estimated 200 acres or 6 tons residue per acre.(pictures # 6 & 7 under Upland Hardwood.) The Tables that follow present the residue data for four management types in Alachua County and for those portions of the surrounding 8 counties that fall within the boundary. A map is included with this survey and shows the "service area" for Deerhaven as a 25 mile radius nine county area. The footnote for each Table describes how the residues are calculated. This is not an exact science but is based on the real world of forest production, and mensuration. **The 25-mile radius from Deerehaven total acreage is 1.25 million acres with Alachua County measuring 617,600 acres of that total. For purposes of simplicity, we are going to assume that the Alachua County residue tonnage can easily be doubled for each management type to arrive at a total value for the entire "service area." This assumption is based on having measured the acreage for each neighboring county within the 25-mile radius, totaling it and taking a conservative percentage (40%) which equals the total known timberland acreage in Alachua County.**

There are also 72,800 acres of upland hardwoods in Alachua County. Doubling this acreage yields 245,600 acres assumed being in upland hardwoods for the entire "service area.". Hardwoods present a different picture from pine land, however. Hardwoods - laurel oak, magnolia, hickory and sweet gum among others - are more difficult to harvest making the yield of residue per acre higher than for the planted pineland. The air-dried wood will contain more dry matter than pine wood but fewer Btu's/pound (8,000/lb. on a dry weight basis). Table 2 presents the data for this sub-category.

There are also 18,900 acres of Oak-Pine forest in all ownerships in Alachua County. By doubling this acreage to 37,800 a conservative estimate for the rest of the GRU "service area" is obtained. Oak-Pine tracts are harvested for their large diameter trees on a cycle of only 10 years as owners need income. The production per acre is

about 1 cord per acre per year (1 cord = 2.5 tons). The residue percent per acre is as high as that of the upland hardwood forests when logged (20%).

Finally there are said to be by the FL Dept. of Forestry's estimates 27,100 acres of Natural Pine in Alachua County. This number doubled represents what we believe to be a conservative estimate of the total acres in Natural Pine for the 25-mile service area or 54,200. The natural pine savannas are a thing of the past in Alachua County there being less than 10,000 left and 2% left statewide. This is because controlled burning is practiced by very few property owners any more. Natural pine stands, therefore, are easily confused with Oak-Pine forests as there is a lot of hardwood to be found in this type. They produce the least growth per acre per year (0.5 cords) and are harvested about as infrequently as the upland hardwood type (15 yrs.)..

Seasonal availability of all four types is almost a moot point as logging takes place on our basically sandy soils year round. For GRU fuel wood, the material will be either loaded as "hogged fuel wood" by the logging company in the woods and hauled to a central handling facility, or, if the tract of land is large, the material can be chipped by a mobile tub grinder owned by the fuel wood supplier. The chipped and shredded material will represent, for the most part, air dried wood with 25% moisture or less. The 77 acres harvested per day and the 504 above ground tons per day available in the region allows a 4 week-long air drying period if demand from this one source can be kept at 300 tons per day. Following size reduction, chips stacked in piles in the open repel water quite well. Therefore it will not be necessary to build a cover for this material. A cover will be needed for the wood that is process-heat-dried and that will depend on the daily needs of the gasifier.

At the end of Chapter "E" are pictures of an unloading system used by Jefferson Power in north FL. JP is owned by Mitchell Larkins and produces 5-8 MW for Progress Energy from a stationary grate system. They unload 6-7 20 ton trucks per day using the lift and front-end load the chipped material into the feeder system of the plant. There is a shed over this loading area. They do see the need however for drying these chips.

TABLE 1: PLANTED PINE LOGGING RESIDUE FROM SERVICE AREA

	COUNTY	PLANTED IN PINE (acres)	ACRES HARVESTED (per day*)	FOREST RESIDUE TONS PER DAY	Mbtu per ton# per day
1.	ALACHUA	121,500	15	113	2,042
2.	Other 8 Counties+	121,500	15	113	2,042
3.	**Total**	**243,000 acres**	**30 acres**	**226 tons**	**4,084**
4.	Stumps at 16 tons/acre		30	480 tons	
5.	**TOTAL (with stumps)**		**30**	**706 tons**	**12,708**

- This calculation is made by dividing the total planted acres in Alachua county by 22 (harvest cycle). The result is divided by 365 days to obtain the acres per day harvested. The quotient is multiplied by yield or 100 tons/acre. Seven and a half (7.5%) percent of this product is the air-dried weight or residue per acre per day. As stated above in bold, a doubling of Ala. Co.'s acres is carried out for all 4 management types.

Based upon 9000 Btu per lb.

+ The breakdown by county: Bradford: 163,200 acres, Clay: 57,800, Columbia: 122,400, Gilchrist: 128,650, Levy: 81,600, Marion: 57,800, Putnam: 49,300, Union: 154,350. Total approx. acres 815,100. Of this total we estimate that approx. 121,500 acres will be in woodlands of all types or 15%.

TABLE 2: UPLAND HARDWOOD LOGGING RESIDUE FROM SERVICE AREA

COUNTY	HARDWOOD ACRES	ACRES HARVESTED PER DAY	FOREST RESIDUE TONS /DAY	MBtu per ton# per day
1. ALACHUA	72,800	13.3	99	1782
2. OTHER 8 Counties	72,800	13.3	99	1782
3. **TOTAL**	**145,600 acres**	**26.6 acres**	**198 tons**	**3564**

- This calculation is made by dividing the hardwood acres in Alachua County by 15 yrs. (harvest cycle) to obtain the acres harvested per year. The result is divided by 365 to obtain the acres harvested per day. This quotient is then multiplied by yield or 2.5 ton/acre. Twenty percent (20%) of the yield over the harvest cycle is the air-dried weight or residue per acre per day. For the other 8 counties the Ala. Co. total is again used.

Based upon 8000 Btu/lb.

TABLE 3: OAK-PINE LOGGING RESIDUE FROM SERVICE AREA

COUNTY	OAK-PINE ACRES	ACRES HARVESTED PER DAY	FOREST RESIDUE TONS PER DAY	MBtu per ton#
1. ALACHUA	18,900	5.2	26	468
2. OTHER 8 Counties	18,900	5.2	26	468
3. **TOTAL**	**37,800 acres**	**10.4 acres**	**52 tons**	**936**

- This calculation is made by dividing the Oak-Pine acres by 10 yrs (harvest cycle) to obtain acres harvested per year. The result is divided by 365 to obtain acres harvested per day. The quotient is multiplied by the yield per acre which in this case is 1 cord or 2.5 tons/acre/yr. Twenty percent (20%) of the yield is the air dried residue per acre per day.

#Based upon 8,500 Btu/lb.

TABLE 4: NATURAL PINE LOGGING RESIDUE FROM SERVICE AREA

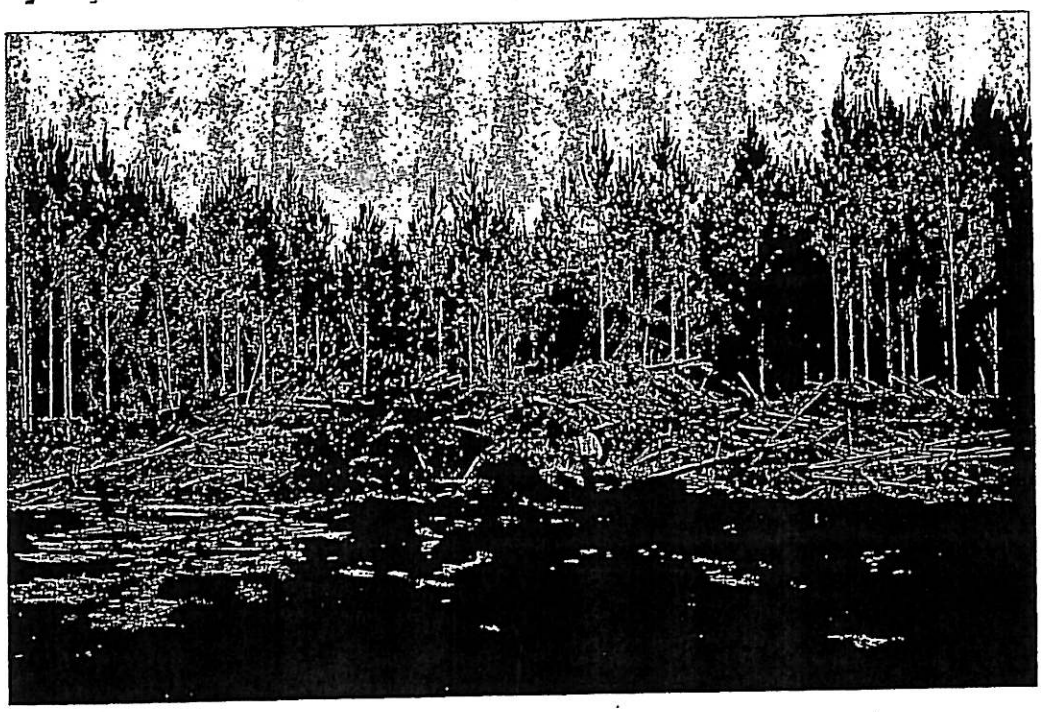
COUNTY	NATURAL PINE ACRES	ACRES HARVESTED PER DAY	FOREST RESIDUE* TONS PER DAY	Mbtu# per ton per day
1. ALACHUA	27,100	5.0	14.1	253
2. OTHER 8 Counties	27,100	5.0	14.1	253
3. TOTAL	**34,200 acres**	**10.0 acres**	**28.2 tons**	**506**

- Calculation based on an average cycle of 15 yrs., average growth of only 0.5 cord per acre per year (1.25 t/a/yr.) and a yield residue of 15%.

Based upon 9000 Btu/lb.

WOOD RESIDUE FROM FORESTRY ACTIVITIES

1. PLANTED PINE



1. CONTAINER CORPORATION CLEAR CUT SLASH PINE - RESIDUE DON POST IN FOREGROUND

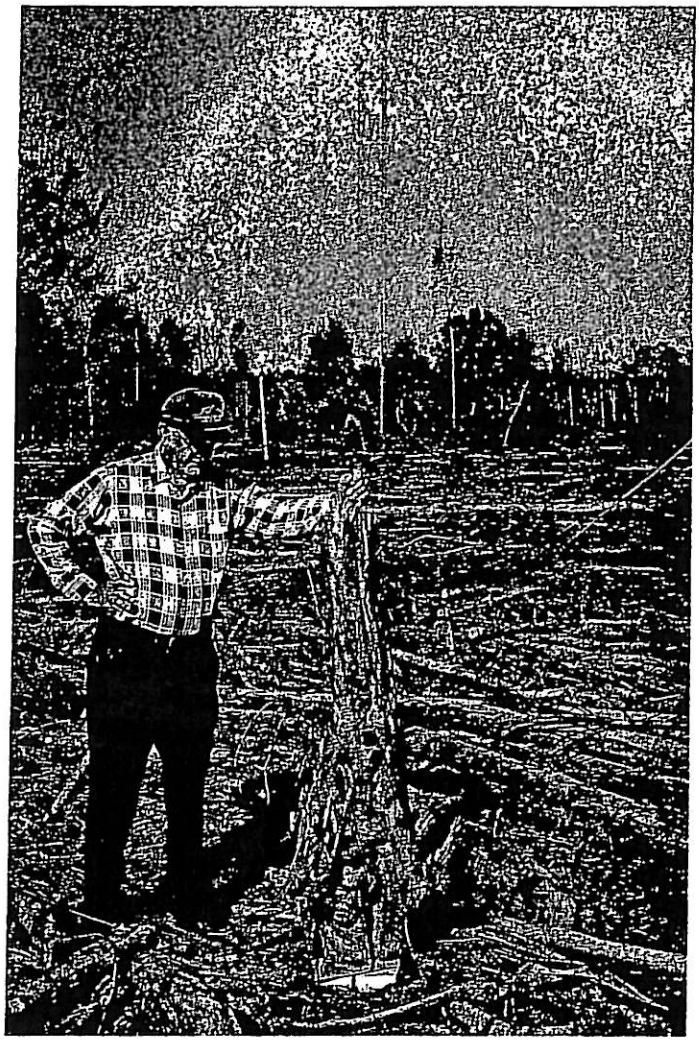
2. FORTY ACRES CLEAR CUT SITE WITH SLASH PINE RESIDUE DON POST IN FOREGROUND

3. LONCALA INC.PROPERTY IN ALACHUA CO. SHOWING 12 YR.-OLD PULP LOGS AND RESIDUE

4. 22 YR.-OLD SLASH PINE TOPS AT 7.5 TONS PER ACRE DON POST SHOWN

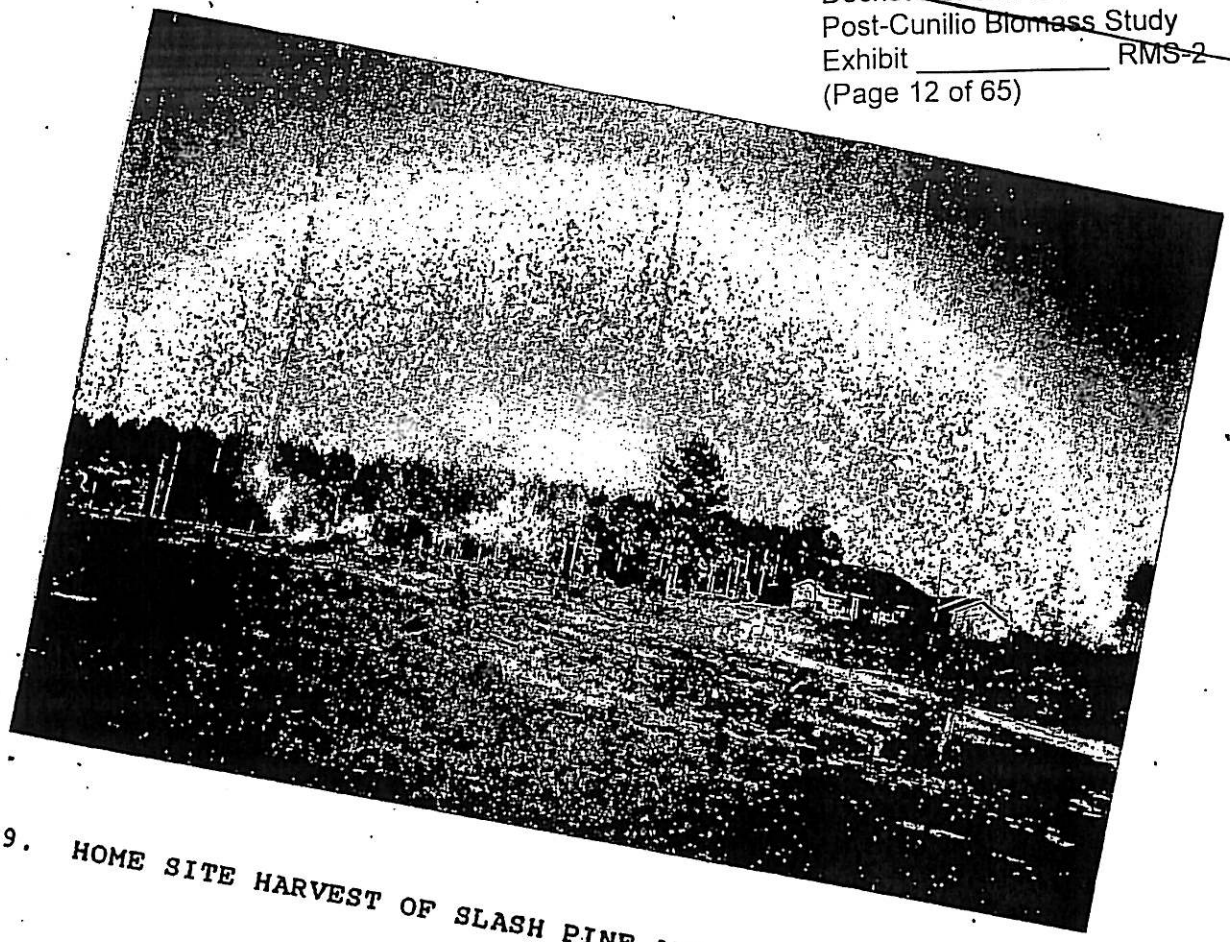
5. FORTY-ACRE CLEAR CUT SLASH PINE SITE IN ALA. CO. SHOWING RESIDUE AT 7.5 T/A

6. SLASH PINE RESIDUE STILL REMAINING AFTER CLEAN-UP



7. TYPICAL STUMP OF 22-YR. OLD SLASH PINE TREE WEIGHING BETWEEN 70 AND 100 LBS. GREEN DON POST SHOWN ON HIS LAND

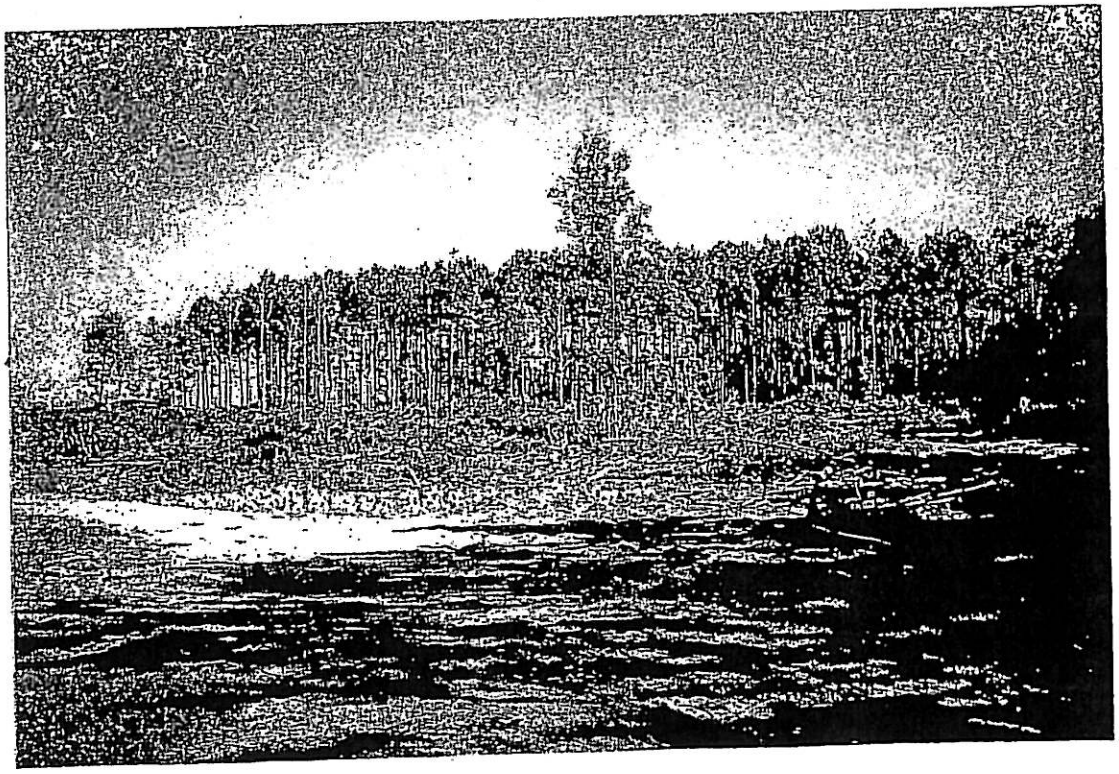
8. ROW OF STUMPS SHOWN ON 40-ACRE CLEAR CUT SITE
DON POST - OWNER



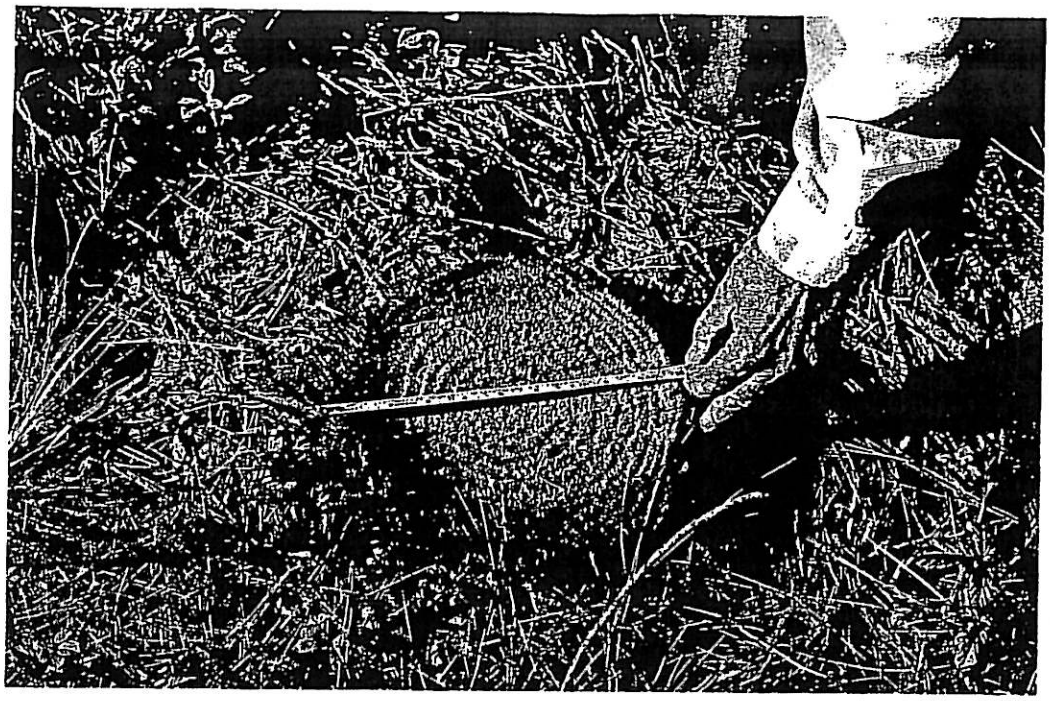
9. HOME SITE HARVEST OF SLASH PINE AND BURNING OF RESIDUE

10. CONTAINER CORPORATION THINNING OPERATION OF 12 YR. OLD SLASH PINE - THIRD ROW THINNING

11. GREEN LIMBS ARE REMOVED WITH A "DELIMBER" FRAME



12. TYPICAL UNCOLLECTED RESIDUE SITUATION FOLLOWING LOGGING



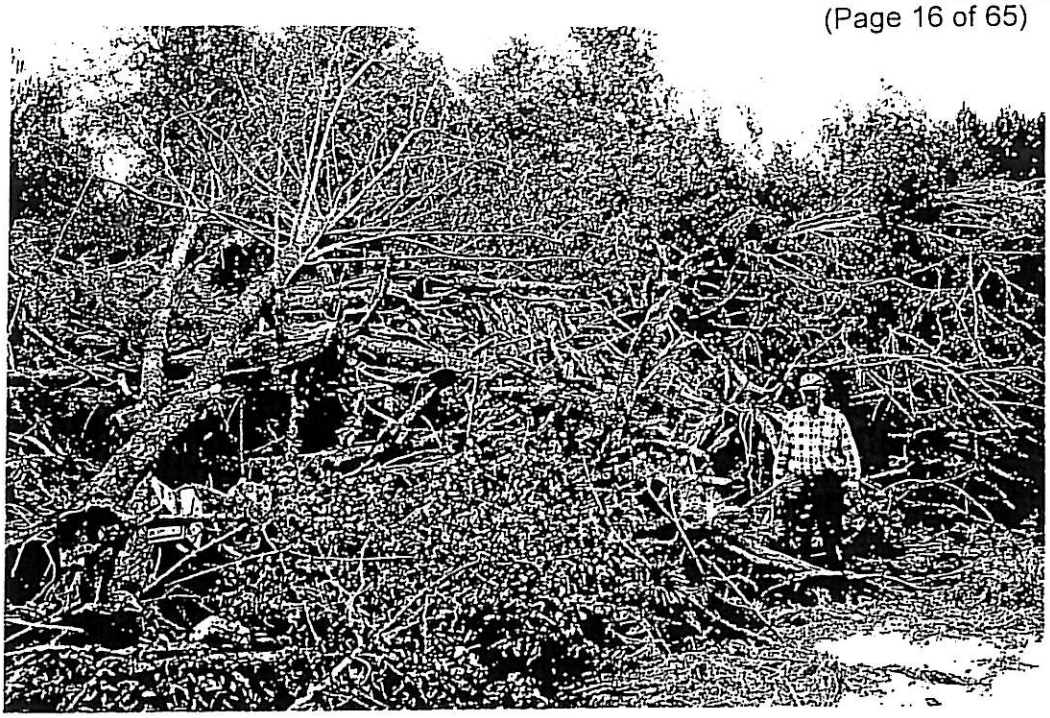
13. CONTAINER CORP. 12-YR. OLD STUMP LEFT AFTER THINNING

14. V-BLADE PLANTED SEEDLINGS SHOWING RESIDUE IN "ALLEY"

2. UPLAND HARDWOOD

1. FENCE LINE CLEARING ON LONCALA CORP. LAND - RESIDUE WITH NO PLACE TO GO

2. NO PLACE TO GO RESIDUE FROM LONCAL FENCE CLEARING ALMOST ALL HARDWOODS

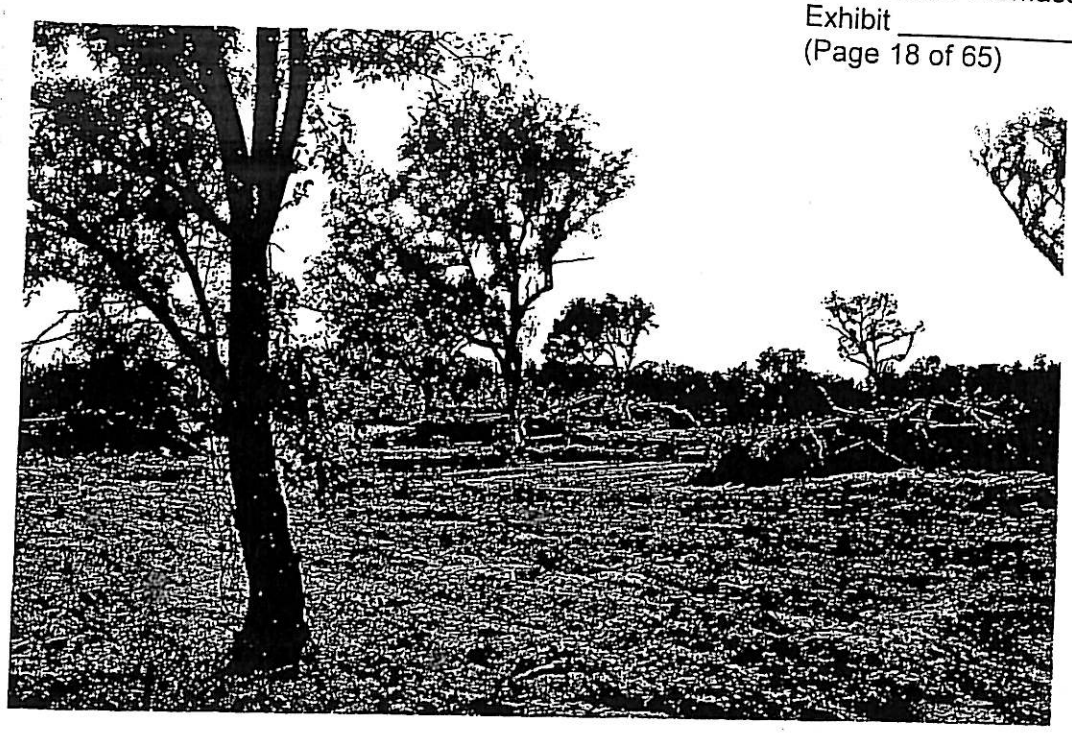


3. LONCALA CORP. HARDWOOD RESIDUE IN PINE FOLLOWING THIRD ROW THINNING - DON POST SHOWN

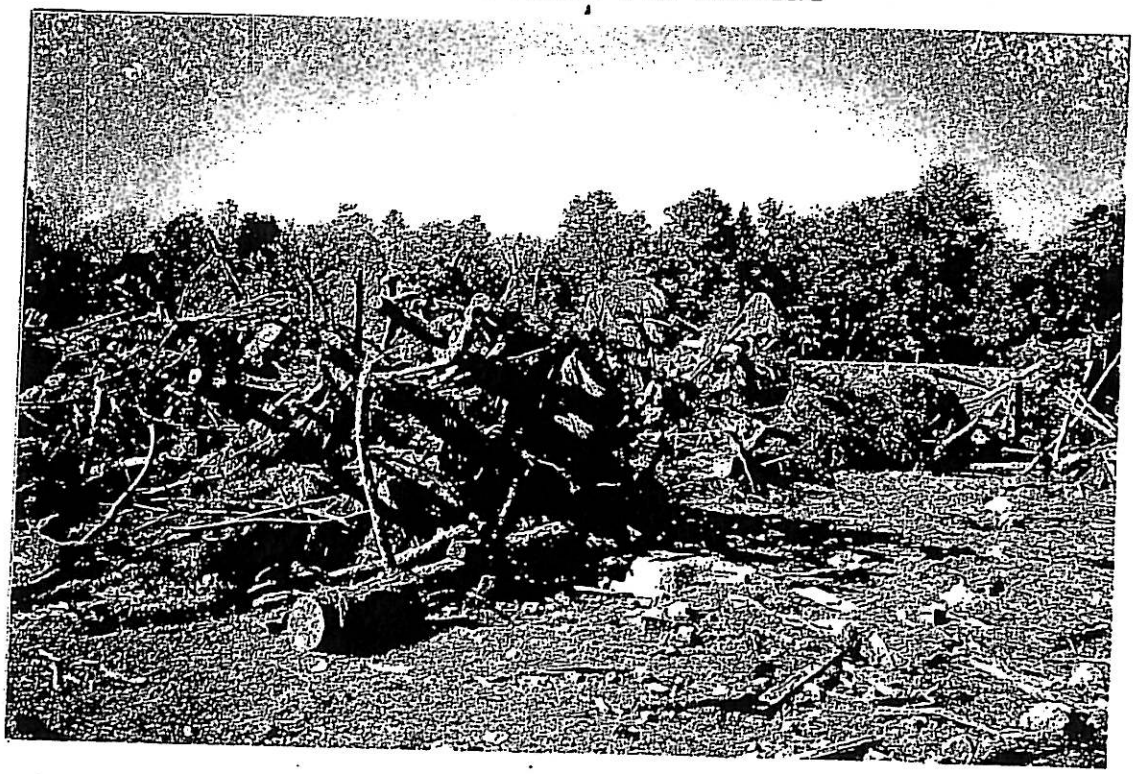
4. LONCALA CORP. HARDWOODS FROM WITHIN PLANTED PINE

5. MORE HARDWOODS CUT OUT OF PLANTED PINE BY LONCALA

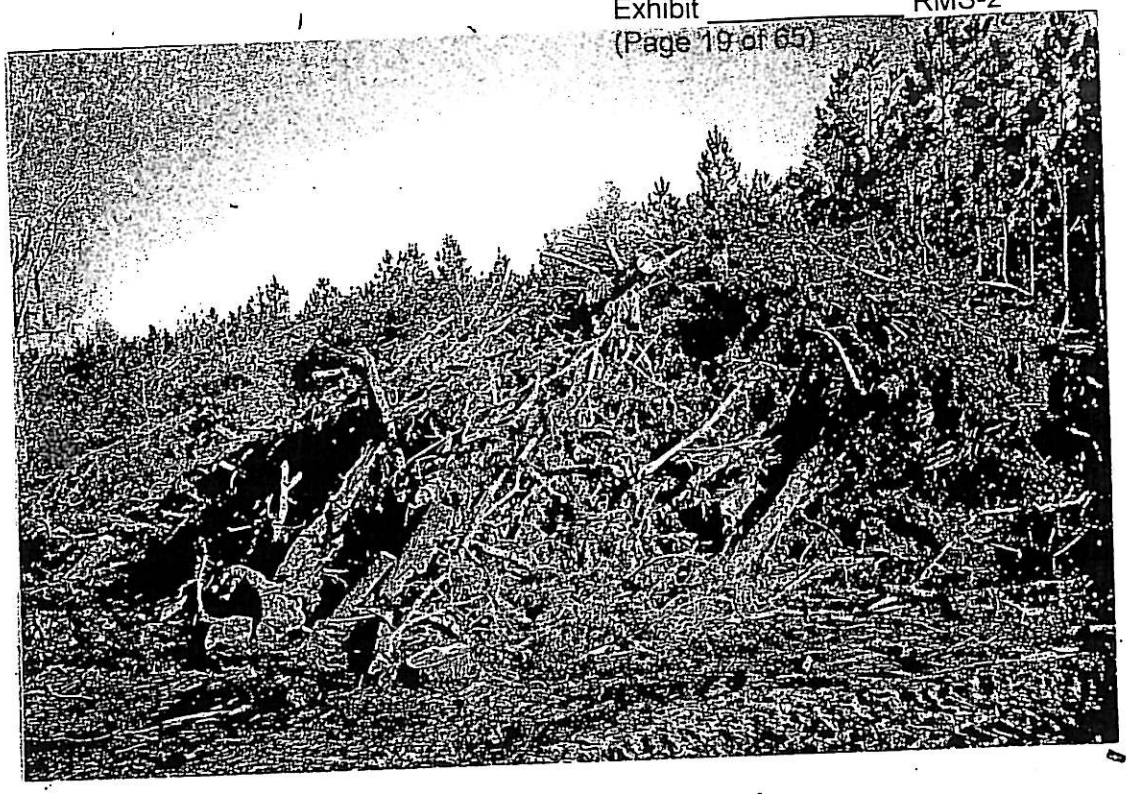
6. HWY 47 CLEAR CUT SITE SHOWING HARDWOOD RESIDUE APPROX. 100 TONS OR 4 LOADS/PILE SHOWN WITH DON POST



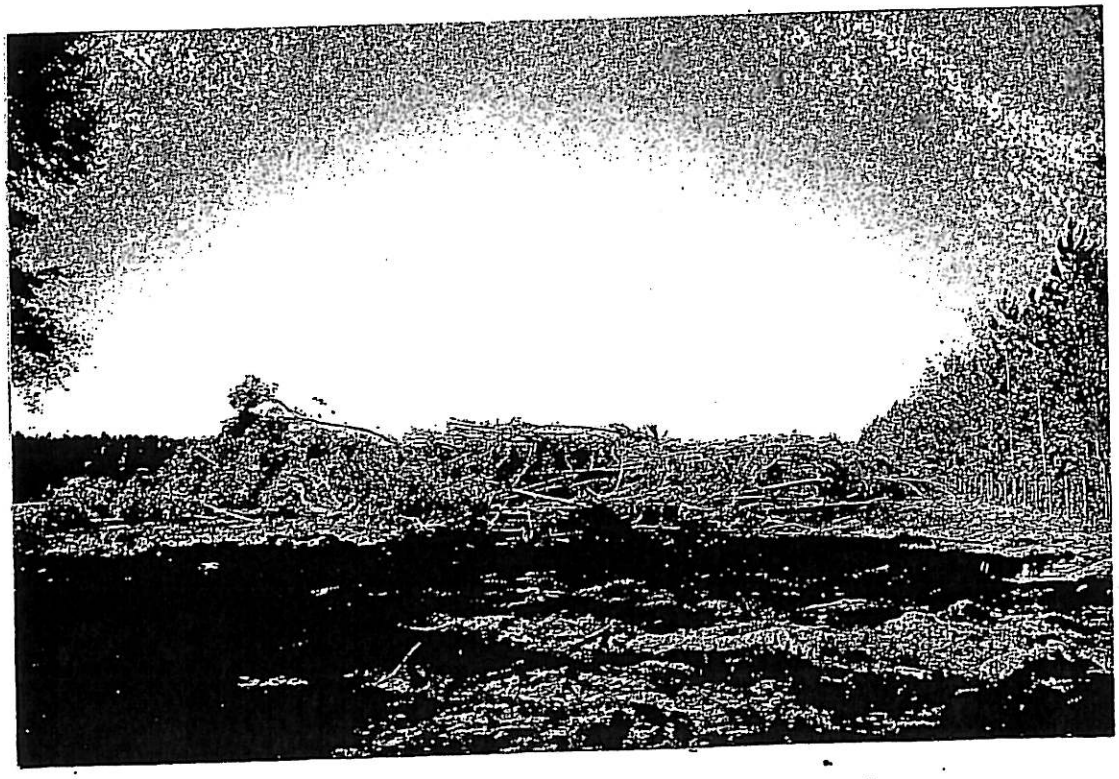
7. HWY 47 IN WESTERN ALACHUA CO. SHOWING A FEW OF THE 24 PILES AT 100 TONS PER PILE OF HARDWOOD RESIDUE BEING PREPARED FOR BURNING



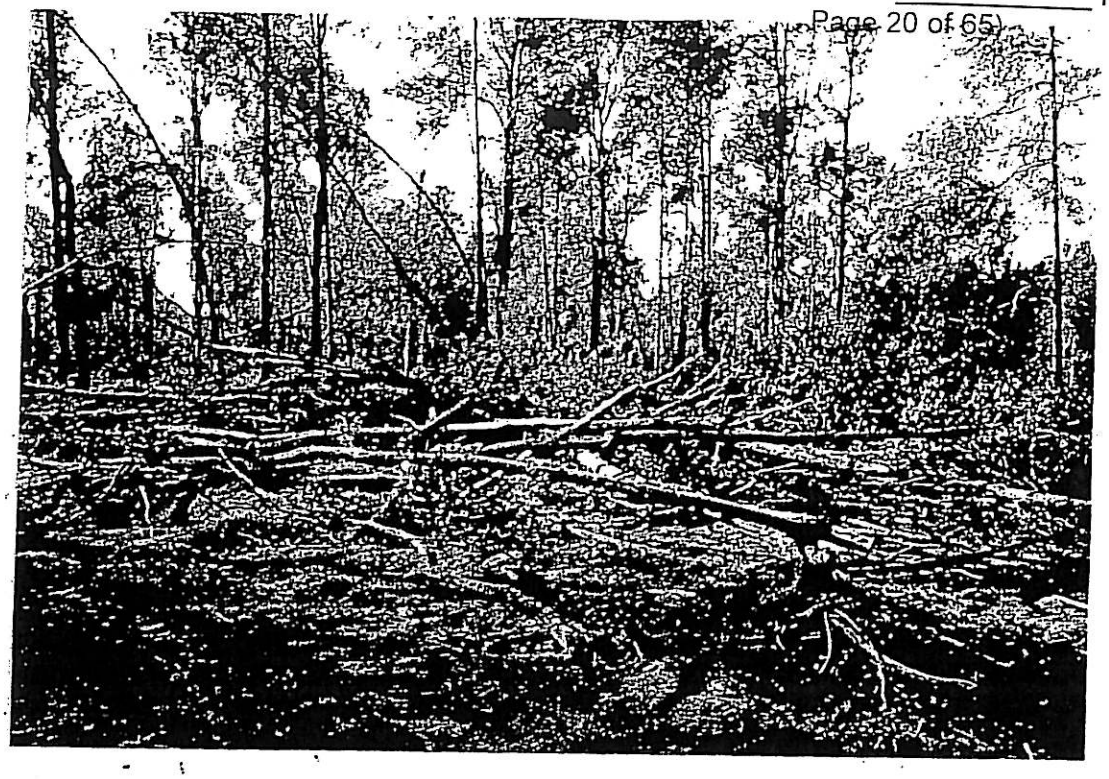
8. WASTE WOOD AT LOG LANDING IN ARCHER, FL



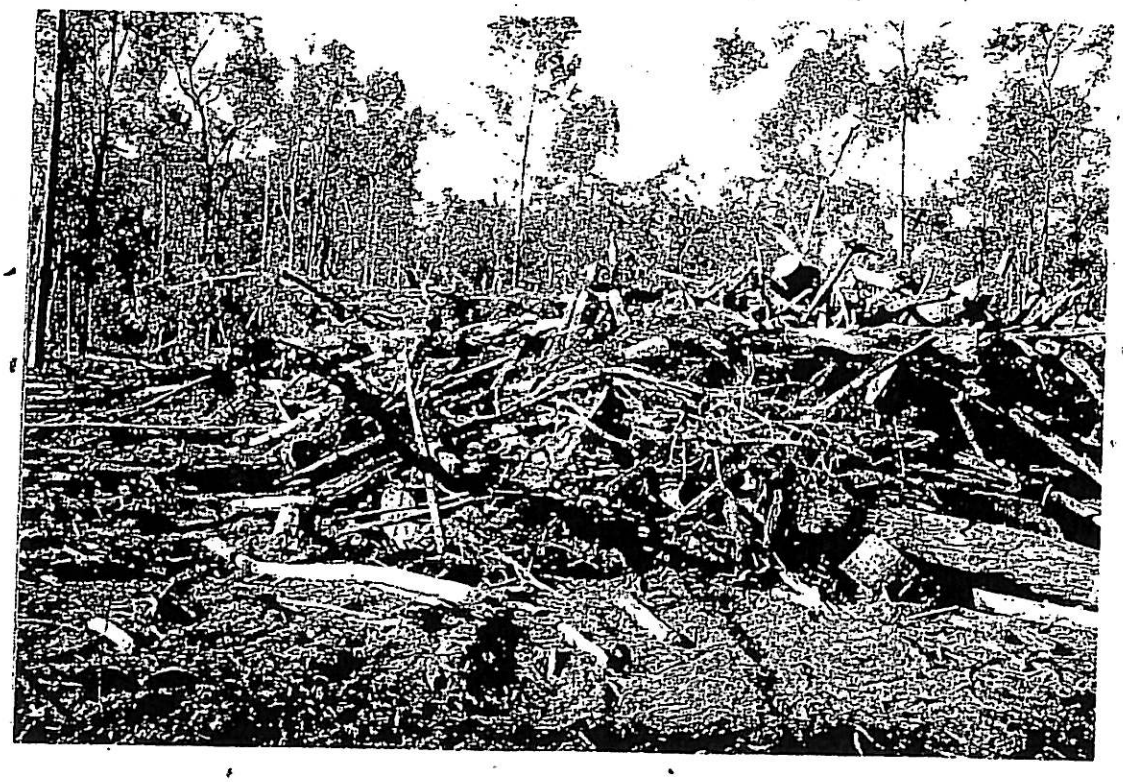
9. LOGGING RESIDUE IN PINE-HARDWOOD STAND NEAR BRONSON, FL



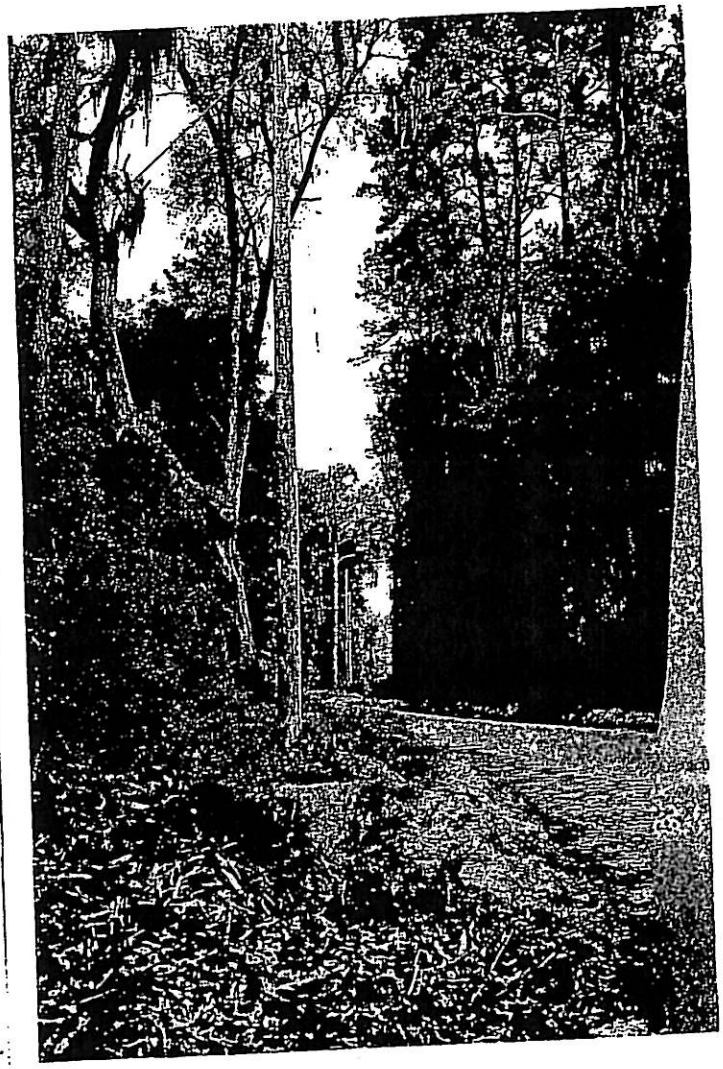
10. HARDWOOD RESIDUE PUSHED UP FOR BURNING NEAR ARCHER, FL (DAVIS LAND)



11. LOGGING SLASH IN MIXED HARDWOOD-PINE STAND NEAR HIGH SPRINGS, FL

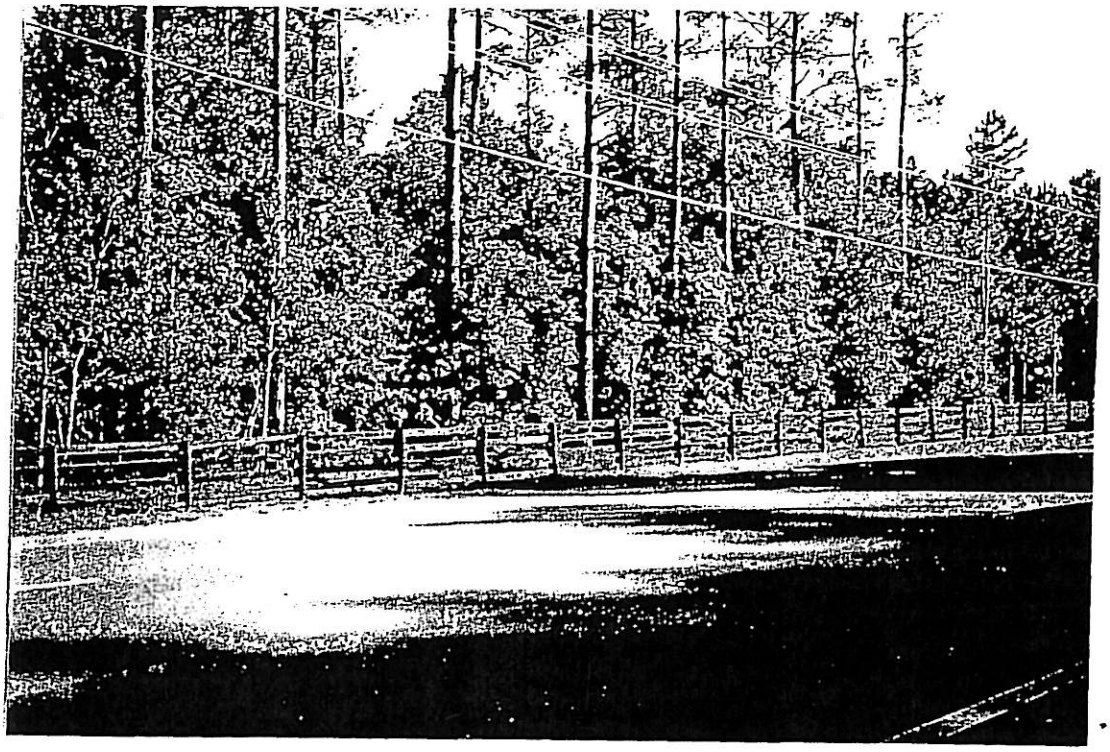


12. PILED LOGGING RESIDUE NEAR ALACHUA, FL IN MIXED HARDWOOD-PINE ISLANDS



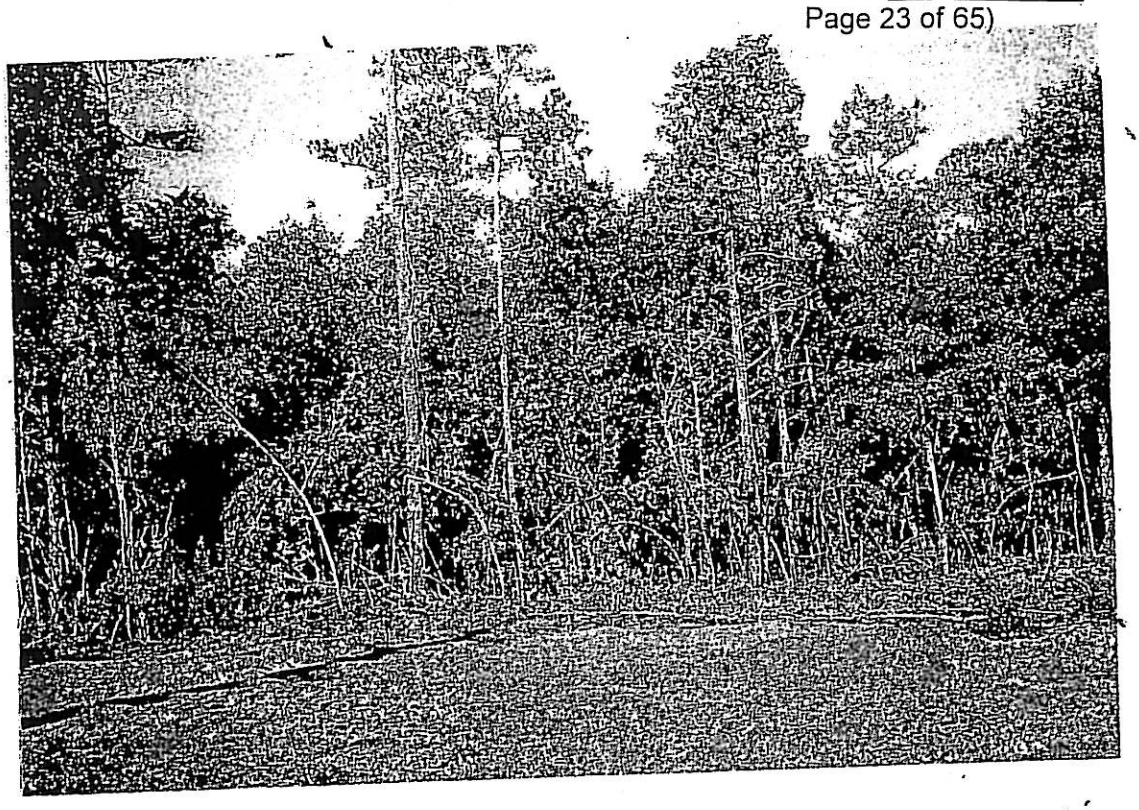
13. LINE CLEARING ALONG ALA. CO. ROAD SHOWING DUMPED CHIPS

3. OAK – PINE



1. UNDERSTORY STAND OF HARDWOOD IN THINNED PINE PLANTATION

2. OAK-PINE WOODS ALONG 25A IN MARION COUNTY PLANTATION



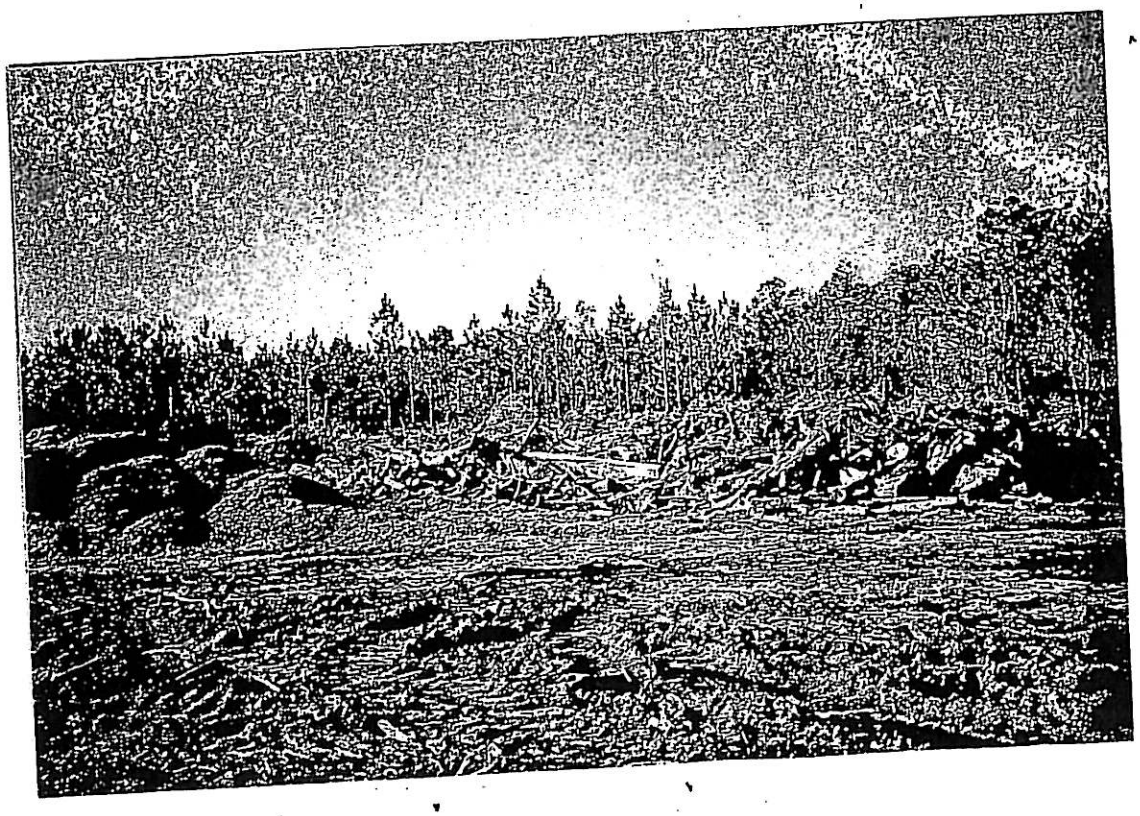
3. OAK-PINE IN WESTERN ALACHUA CO.

4. MORE OAK-PINE IN ALACHUA CO.

5. SLASH PINE HARVEST SITE WITH DEAD OAKS FOLLOWING HERBICIDING

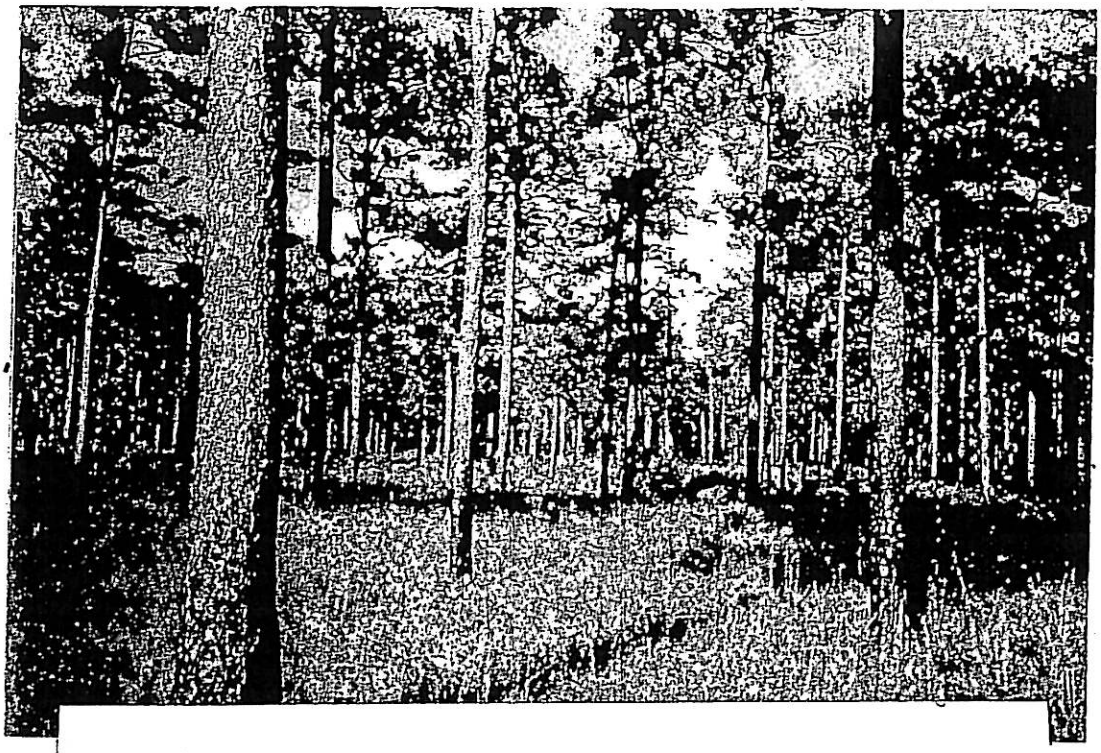
6. LONCALA CORP. SITE SHOWING DEAD OAKS HERBICIDED AFTER LOGGING OUT PINE

7. OAK RESIDUE FROM PINE PLANTATION IN ALA. CO.



8. WOOD WASTE FROM NORTH OCALA NEAR PINE

4. NATURAL PINE



1. 150-YEAR OLD NATURAL PINE STAND IN ALACHUA CO.
THAT IS CONTROL BURNED ALMOST YEARLY
ON THE ORIGINAL 40-ACRE HOMESTEAD SITE
OWNED BY ORRIN MARCHANT

2. YOUNG PINE PLANTATION IN BACKGROUND WITH
OLDER (150-YEAR OLD) NATURAL PINE
LONGLEAF = SOUTHERN YELLOW
Pinus palustris
NEWBERRY, ALA. CO., ORRIN MARCHANT, OWNER

C. TREE TRIMMING WASTE WOOD

There are over 30 tree trimming businesses listed in the Gainesville phone book from A-1 Tree to Walt's Tree. We spoke with most of them to get an idea of how much urban tree wood was being moved and to where it goes. Then we visited what we refer to as the 4 primary outfits: 1) ABC Tree Service owned by Bill Smith (367-0088) out near Newberry. It is the second largest tree service company in the area that services both urban forests and the urban-wildland interface. 2) Southern Fuelwood is a hybrid company; it recycles wood waste from various suppliers and it manufactures numerous (7) major products and has capability of doing tree service work as well. It does not produce fuel chips at the present time. It is owned by Pat Post (472-4324). 3) Gaston's Tree Service is owned by Bill Gaston (378-9133) and is the largest outfit of its kind in the area. They are outside of Gainesville and have a compost yard north of Ocala. They own trucks whose crews service the urban forest and who recycle this clean wood debris into compost and mulch. They charge a tipping fee of $18.50 per ton after the first 1,100 lbs. ($10 minimum to 1100 lbs.) but charge much less to regular customers. Bill's company also sells fuel wood to Georgia Pacific. The site is often too wet for heavy trucks, however. 4) Ocala Tree Debris (OTD) is a family-owned company just north of Ocala. Augie and Doug Kinsey are the principles (352.629-9911). OTD may handle as much debris as Southern Fuelwood and ABC but it produces fewer products. It does produce fuel chips for GP from mainly hardwood using a unique system to collect wood debris from non-company suppliers charging them no fee. They are able to produce a 4"-6" air-dried chip on two 6 acre lots using a mobile chipper.

This critical sector includes in a peripheral way some of the larger nurseries and lawn care companies whose production includes the smaller brush and branch material collected daily. This material is usually taken to Wood Resource Recovery.

Below in Table 3 are presented the quantities and where possible the prices of this clean waste wood. Number 5, urban yard waste, is not included in the total since it often contains grass clippings mixed with the brush and is thus deemed too wet. Over half of the 23.7 tons comes from the city curbside pick-up and is trucked to Watson Dairy pictured in #12 in Chapter "C>"

This key sector of the wood fuel economy demonstrates numerous permutations making it necessary to state the following:

1. The central players – Ocala, Southern Fuelwood and Wood Resource Recovery – receive wood from many sources. Some of these sources like ABC have chippers and chipper trucks. Asplund itself has 5-7 chipper trucks. Most of these chipper trucks are 25 – 30 yarders.
2. These smaller chipped loads can go straight to the gasifier and if they can unload fast and **get paid enough at the gate to make a profit**. A system to receive these smaller trucks probably will be needed.
3. Fuel wood is available now from Ocala Tree Debris. Southern Fuel Wood is interested in knowing what size chips will be needed before they invest in a chipper. These people will be coming to the 12/15 meeting downtown to express their enthusiasm. We are concerned that Wqod Resource Recovery will be able to operate during wet weather because of their site.
4. The large handlers of bulky wood may one day be able to pay suppliers.

TABLE 5 : GAINESVILLE URBAN AND SUBURBAN CLEAN TREE DEBRIS

PRIMARY COMPANY	TONS PER DAY	CONDITION	PRICE
1. ABC TREE SERVICE	35 t/day	10 t in chips; 25 t in bulk	?
2. GASTON'S	60 t/day	mulch, fuel wood, compost	$10/ton
3. OCALA TREE DEBRIS	140 t/day	fuel wood 4-6" screen	$10 fob
4. SOUTHERN FUEL WOOD	20 t/day	hardwoods, waste from manufacturing	?
(5. URBAN YARD WASTE	23.7 t/day	curb side pick-up not chipped	no charge)
6. **TOTALS**	**255 t/day (The Urban Yard Waste is not included in this total for reasons explained above.)**		

WOOD RESIDUE FROM TREE SERVICE BUSINESSES

Docket No. 090451-EI
Post-Cunilio Biomass Study
Exhibit _____ RMS-2
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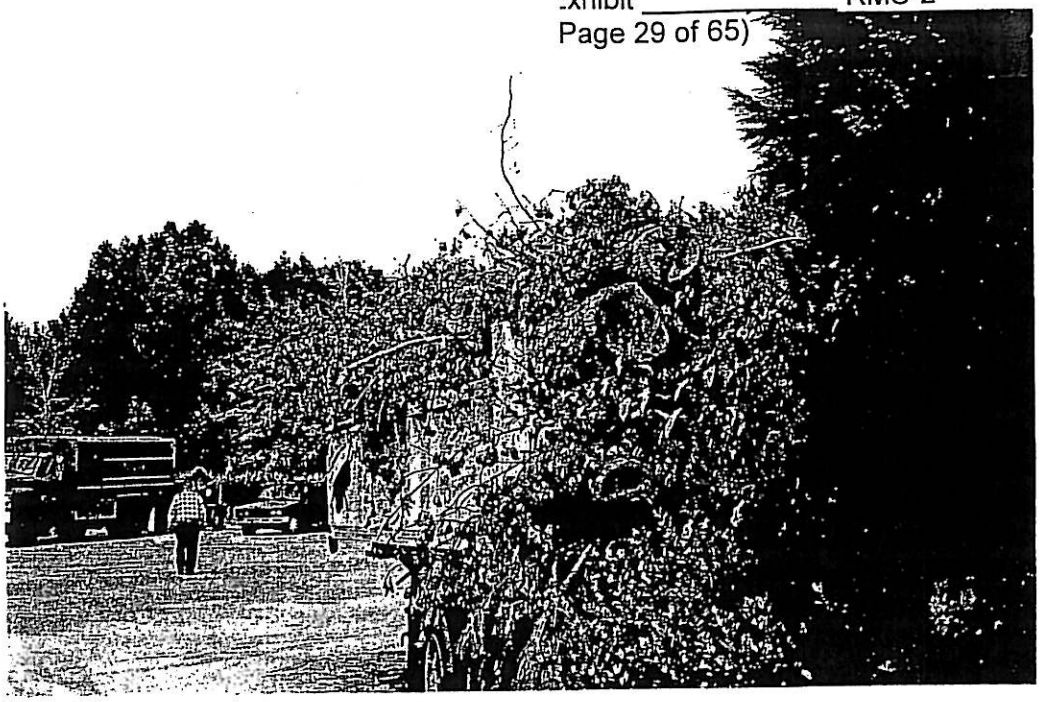
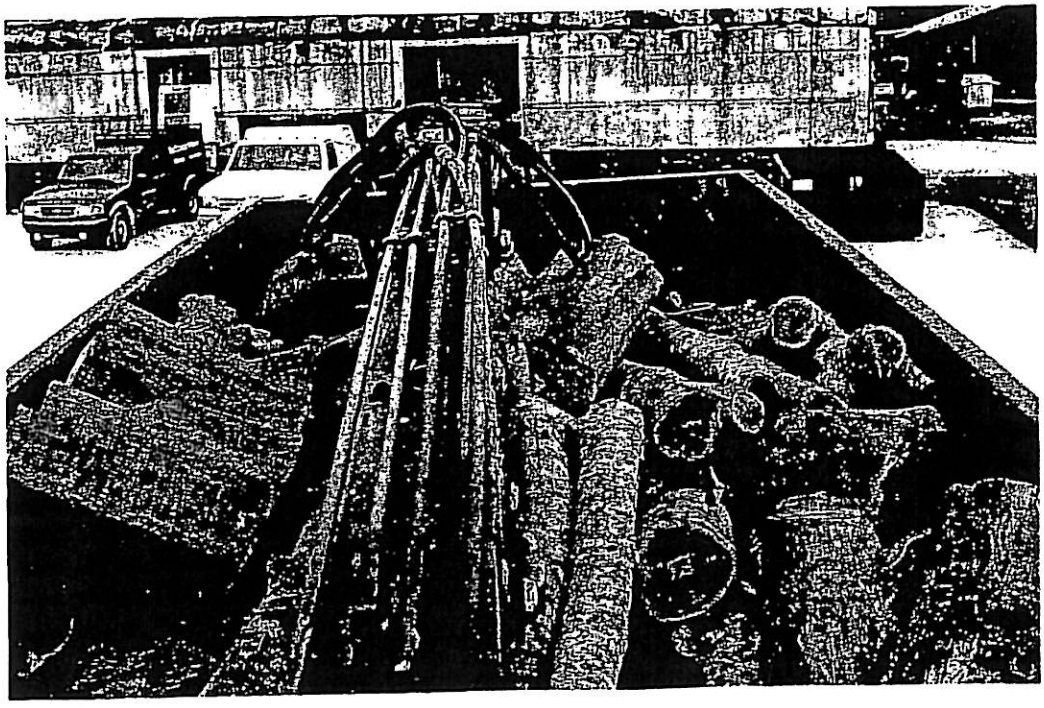
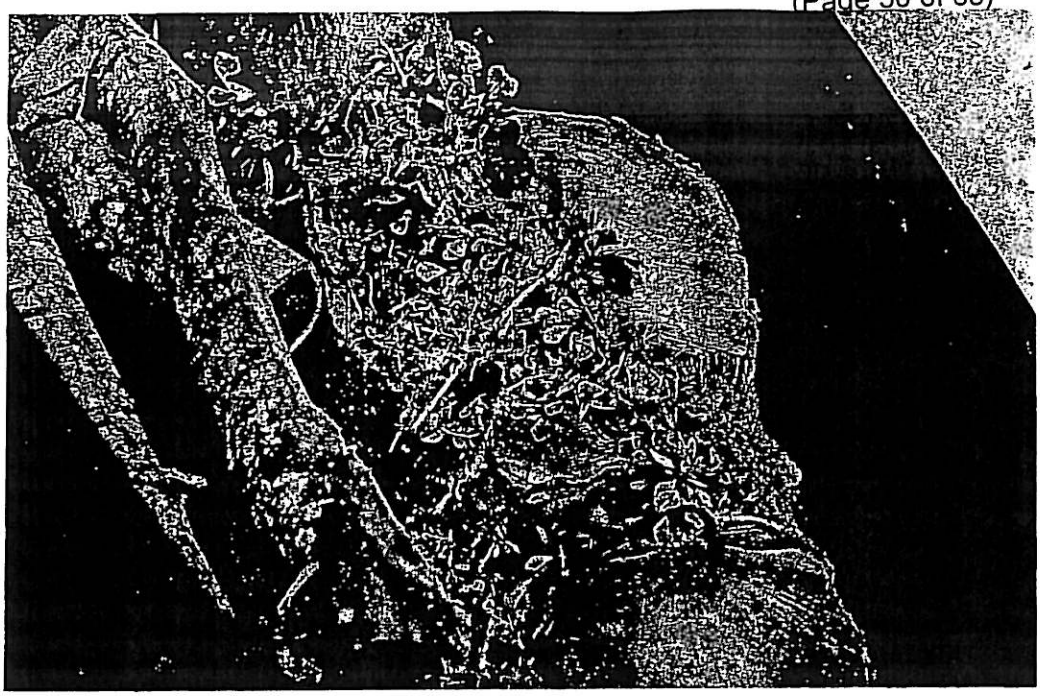


1. "NO WHERE TO GO" LOADED TRUCK NEAR GAINESVILLE



2. ABC TREE SERVICE 40 YD. TRUCK AT SOUTHERN FUELWOOD - 35 TONS PER DAY



3. ABC 40 YD. TRUCK WITH HARDWOOD FROM GAIONESVILLE

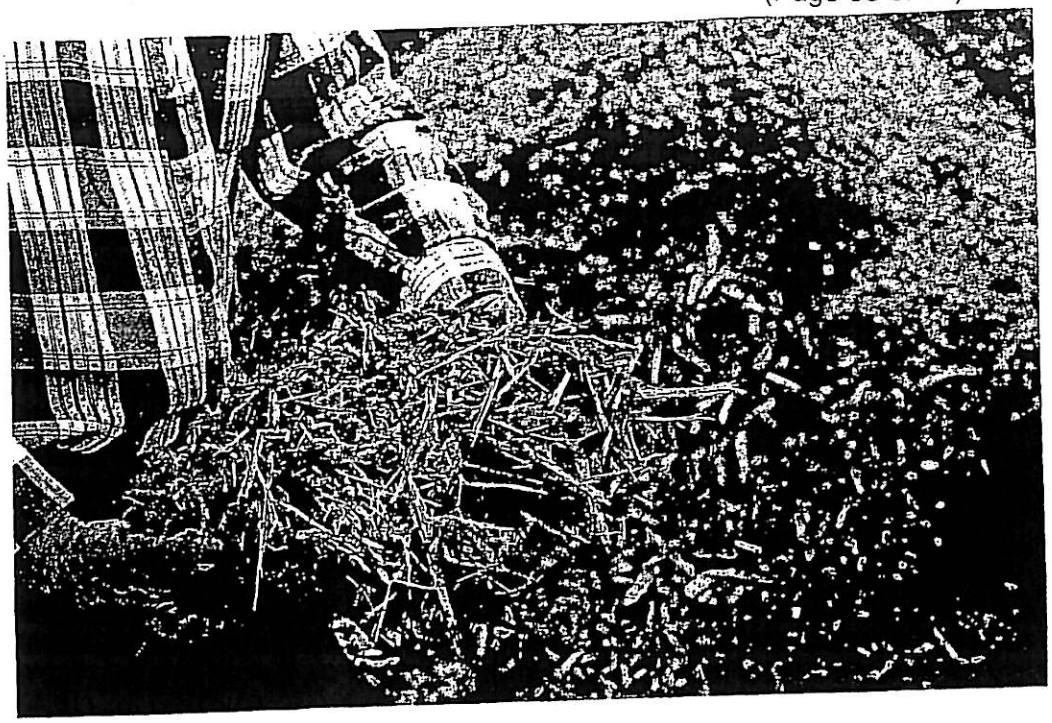
4. SOUTHERN FUEL WOOD YARD

5. SO. FUEL WOOD YARD

6. DON POST AT SOUTHERN FUEL WOOD WITH FUEL CHIPS - 20 TONS PER DAY

7. MORE SO. FUEL WOOD URBAN HARDWOOD RESIDUE

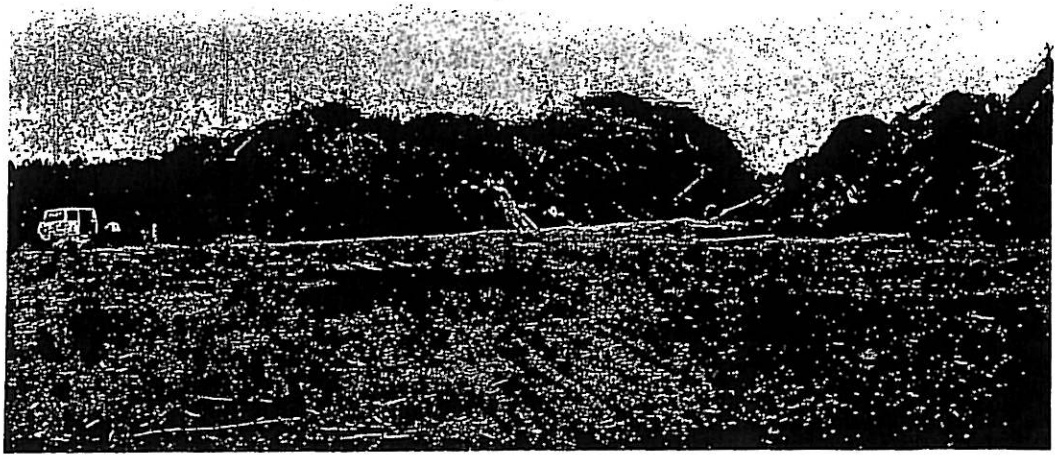
8. OCALA TREE DEBRIS YARD



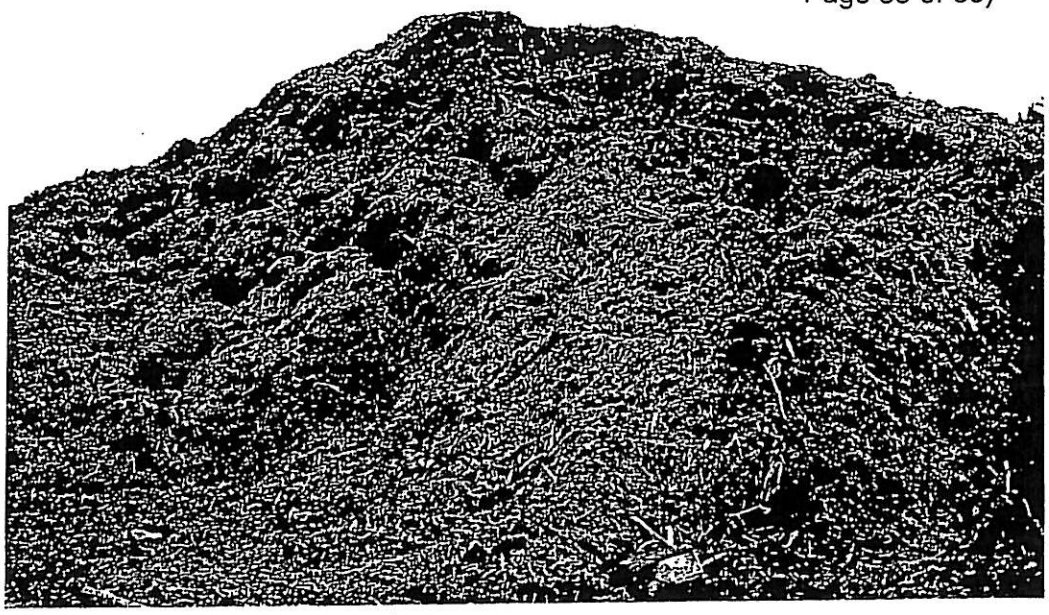
9. OCALA TREE DEBRIS FUEL WOOD (CLOSE UP)

10. OCALA TREE DEBRIS, FUEL WOOD PILE - 140 TONS PER DAY

11. OCALA TREE DEBRIS



12. WOOD RESOURCE RECOVERY YARD



13. WOOD RESOURCE RECOVERY FUEL CHIPS - 60 TONS PER DAY

D. CLEARING, CONSTRUCTION AND DEBRIS WOOD

This category involves the debris containing tree wood cleared from most construction sites in the area. The businesses and people we contacted who are permitted to take clean debris and who handle the largest quantities are Watson Construction (Larry Watson) and Osteen Brothers (Ron O'Steen). Andrews Paving, Buck and Wayne Johnston and Whitehurst road construction receive much smaller amounts of material.. Clean debris is trees and brush taken from construction sites. It includes large diameter trees usually hardwoods that are transported in 25 to 40 yard trucks in large pieces with each truck carrying an estimated 8 tons per load. This wood will be air dried and be about 25% moisture. Being mostly hardwoods the Btu/lb. will be approximately 7500-8000.

Watson Construction gave us numbers for 4 months hauling in 2003: July, August, September and October. The total per day calculated from these loads is 55 tons/day. Larry Watson stated that they burned in the field more than they hauled in to the pit. At the end of this Chapter "D" are pictures of Watson's "Curtain Burner" that can burn 40 tons/hour! It is being used at the time this report was being prepared at the site of the new Catholic High School west of town. Because of the disposal of wood on site in this manner we will use a figure of 100 tons per day from Watson. O'Steen Bros. was contacted and both Larry Watson and the O'Steen pit foreman, Billy, confirmed that O'Steen receives more clean debris than Watson. We use the figure of 60 tons/day in order to be conservative and to reflect the fewer loads received during December, January and February. The other companies, though permitted to receive clean debris, have no numbers to offer at this time. We therefore will use a **165 ton/day** figure to describe clean debris material from these entities. GRU is grouped in this chapter clears electric transmission line and reports **20 t/day**.

Being excellent business people, Larry Watson and Ron O'Steen, like everyone else, want to know what the specifications of the product will be. In the case of Watson, the volume used by this material in the pits has a negative return, i.e., the volume can be more profitably used by C&D debris. L. Watson has windrowed hogged wood for years using a Rome mawler (pictures #4 and #5). He was and still is considering composting these mountains of tree waste. The mawler is reportedly for sale.

Clean tree debris comes from the construction sites and no weighing is done and no fee paid. Larry Watson appears willing therefore to charge only what it will cost to chip and screen it. A range of $10 to $12.60 was suggested based on what fuel chips will cost from one firm in Ocala including transportation.

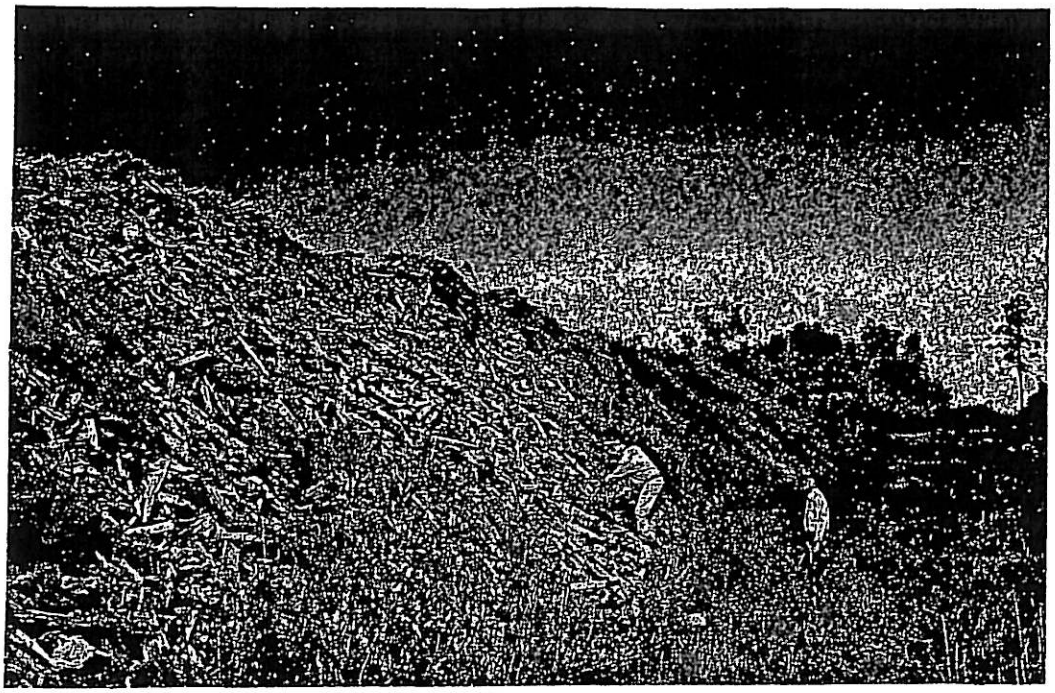
TABLE 5: OTHER BUSINESS "CLEAN DEBRIS"

BUSINESS	DAILY TONNAGE	HEATING VALUE*	PRICE / MmBtu
1.Watson (site work contracting)	(delivered) 55 t/day (burned) 50 t/day	16 x 10^6 Btu/ton " "	$10/ton minimum "
2. O'Steen Bros. (site work contracting)	(delivered) 60 t/day	" "	"
3. Others (GRU)#	20 t/day	" "	no charge
4. **TOTAL**	**185 t/day**	**16 x 10^6 Btu/ton**	**$10/ton minimum**

* Based upon 8,000 Btu/lb. Moisture content of air-dried waste wood will range from 15% to 25%.

There are 7 Asplund crews working the 775 miles of distribution and transmissions lines under contract to GRU. A conservative average of 40 yds. per day is brought in according to Tracy Maxwell of GRU. Twenty tons is the wet weight of this material which must then be 37 lbs. per cubic foot. Corn silage is 30 lbs. per cubic foot. Without having precise data, the assumption is justified.

WOOD RESIDUE AND DISPOSAL FROM SITE CLEARING BUSINESSES – 185 TONS PER DAY

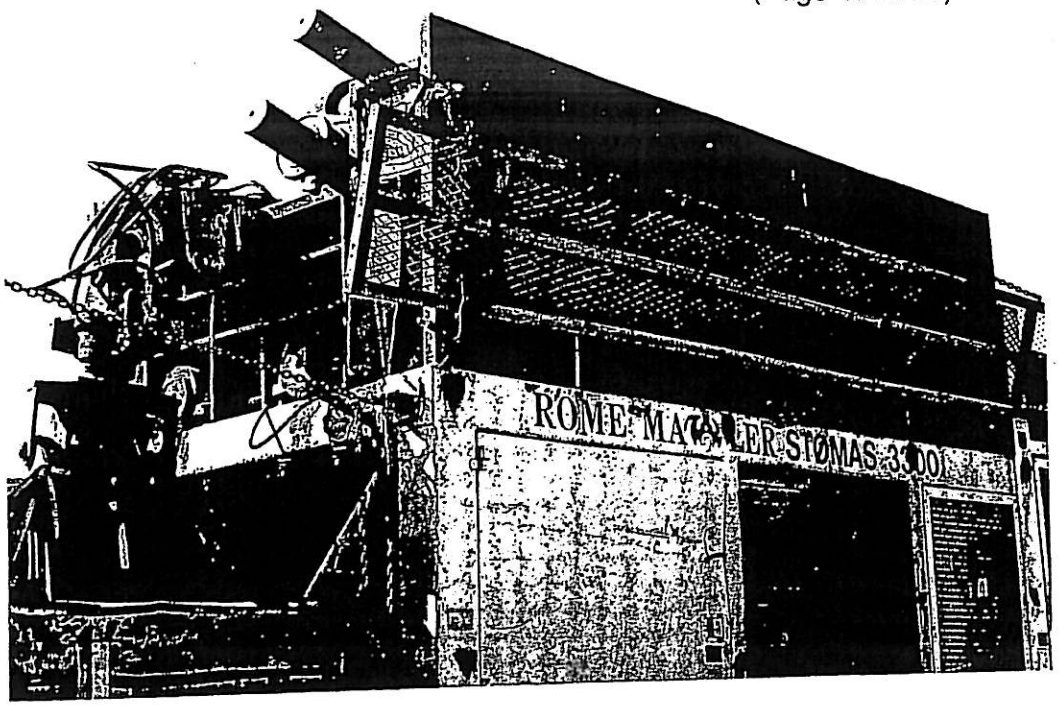


1. LARRY WATSON AND DON POST AT WATSON'S COMPOST MOUNTAIN BUILT OVER THE YEARS USING WOOD DEBRIS

2. WATSON'S PROBLEM WOOD RESIDUE

3. WATSON'S WOOD WASTE NEXT TO LANDFILL PIT

4. WATSON'S ROME MAWLER USED TO CRUSH INTO LARGE PIECES WOOD WASTE FOR COMPOST MOUNTAINS



5. ANOTHER VIEW OF THE WATSON MAWLER

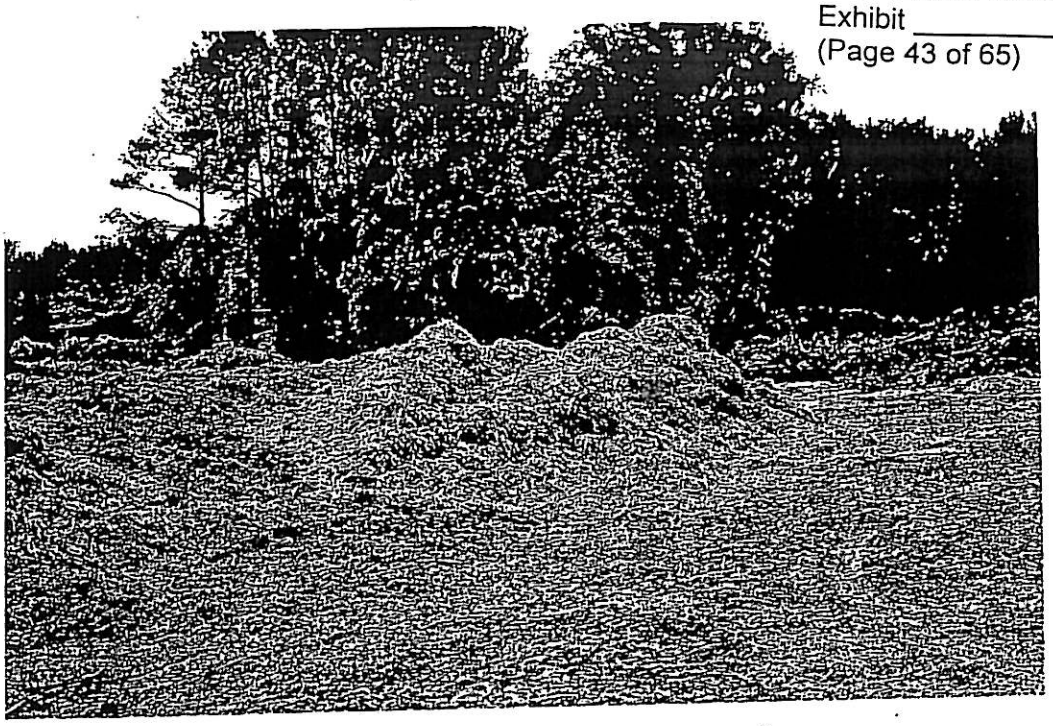
6. 15 FOOT HIGH WOOD PILE AT WATSONS

8. 40 FOOT LONG CUTAIN BURNER BEING USED BY WATSON AT THE ST. FRANCIS H.S. SITE

9. CURTAIN BURNER WILL HANDLE 40 TONS PER HOUR

10. ANOTHER VIEW OF CURTAIN BURNER - INSTANTLY USELESS COMBUSTION

11. WATSON CURTAIN BURNER SHOWING 40 FT. LONG AIR BLOWER



12. MIXED YARD DEBRIS FROM CITY OF GAINESVILLE AT WATSON DAIRY

7. LAND CLEARING WEASTE WOOD NEAR TRENTON, FL

E. BIOMASS CROP POTENTIAL IN ALACHUA COUNTY :

Biomass crops represent the "ace in the hole" card that could, if necessary, be played in the new carbon economy. If the above sources cannot be sustained beyond the next 50 years or so, farm land should represent back-up potential. Land availability: Alachua County (about 965 sq. miles or 617,600 acres) alone has approximately 1086 farmers in operation on 198,193 acres with an average farm size 182 acres and a total of 75,368 acres in crop land that could produce yearly crops. This acreage is all in Hardiness Zone 8b. There are 43 farms with 1,000 acres or more in the county, up from 32 five years ago.

Energy crops are grouped into two categories: herbaceous and woody and have been grown experimentally by the Agronomy Dept. and the School of Forest Resources and Conservation for many years. Herbaceous crops can be harvested yearly while the woody crops can only be harvested once every 2-4 years. Leucaena, the only legume in the mix, is the lowest cost biomass crop per MmBtu but and can be harvested on a one to four-year cycle if grown as "wood grass." The yields below in Table 7 are expressed as dry matter (dm) per acre per year.

TABLE 7: BIOMASS CROPS AND THEIR FUEL CHARACTERISTICS

Crop	YIELD/acre	COST/ton	MOISTURE	MAF BTU/lb
Grasses:				
Elephant grass	16-22 tons	$24..94	22%	8178
Energycane	11.7-19	nd	nd	nd
Sugarcane	15-25 (presscake)	$22.92	16.8	8668
Switchgrass	9-10	$17	15%	8000
E-grass	nd	nd	nd	nd
Woody Species:				
Giant Leucaena*	12-15 tons	$15-20	35%	8494
Cottonwood	12.5	32.67	35	4728
Eucalyptus	11-015	35	35	8370
Slash Pine	6-9	33-45	35	9000
SUMMARY:	**14 t/acre**	**$25.79**	**27.6%**	**7,920**

*Leucaena spp. was stated to exhibit allelopathic characteristics in the 1997 GRU report written by Chuck Williams. This claim was based upon one cited reference, i.e., D.W. Nellis. This reference is contradicted by over 1,000 references from Leucaena Research Reports published between 1981 and 1992 by the Nitrogen Fixing Tree Association, J. Brewbaker, editor, which are available upon request.

If the average dry matter yield of 14 tons per acre is used to calculate the total yield from 25% of the available acreage, **722 tons per day** would be realized.

NOTES:

Why Tall Grasses?

The so-called energy grasses present many reasons for use in biomass to energy systems in the north-central FL. Some of them include the following:

a. An efficient C4 metabolic system for converting solar energy to plant food. Sugarcane and energycane are the most efficient converters of solar energy in the plant kingdom known to man.
b. Active vegetative leaf and stem growth over and entire growing season with floral development occurring late in the growing season.
c. Resistance to winter kill in underground parts so that rapid regrowth occurs in the following spring.
d. Dead lower leaves cling to the strong stems so most of biomass produced can be harvested. This material can be round-baled after air-drying.
e. Can be harvested in winter after the top growth has ceased, so harvesting does not reduce the length of the growing season.
f. The biomass produced can be stored dry as rolled hay or densified for efficient storage and handling.
g. E grass along has just been assessed by the UF Center for Aquatic and Invasive Plants as being safe for recommendation by IFAS Extension in north, central and south Florida.

Why woody biomass crops?

a. Woody crops in general have a larger harvesting window than herbaceous energy crops in some cases as long as 12 months. Storage costs are thus much reduced.
b. All the woody crops cited are either native or can be recommended by UF Extension for north FL.
c. These crops can be left to air dry in the field much better than the herbaceous crops due in part to their woody stems.
d. These crops cannot be baled. In the case of Eucalyptus and cottonwood, heavier, more expensive harvest machinery is generally necessary. Woody stems 25-35 ft. in length can be handled like pine.
e. Only Giant Leucaena can be harvested with forage harvester if planted as "wood grass." If planted at wider spacing and given 2-3 years of growth, the heavier equipment becomes necessary.
f. Except for slash pine, the woody crops described above perenniate, that is, they coppice or regrow from underground meristematic tissue. The strongest coppicer is Leucaena.
g. Giant Leucaena has just been assessed by UF Center for Aquatic and Invasive Plants as being safe for recommendation by IFAS Extension in north and central FL. (See letter attached to this chaptert).

1. The assumptions made to prepare the data above come in part from the study found in "Economic Development through Biomass Systems in Central Florida" prepared for the National Renewable Energy Lab by Polk County Extension CED James Stricker and by the UF Center for Biomass, Wayne Smith, Project Director. Yield data for the grasses come from Gordon Prine, emeritus Professor of Agronomy. Yield data for the woody species come from CoSAF (for giant Leucaena), and Matt Langholtz with Don Rockwood of the School of Forestry.
2. The grasses take advantage of the long growing season and should be harvested in the fall from September to December. They cannot be allowed to stand in the field longer than 3-4 months making their effective harvest 7-8 months long or 210-240 days. It is possible to air-dry the grasses if they are baled. Large air-dried bales repel water quite well and will remain at 15-22% moisture.
3. The woody species can be harvested when weather permits after 2 to 3 years of growth. .Only giant Leucaena, following a 3-4 year establishment period, can be harvested yearly like the grasses. The woody stems of all these species can be stacked in the field and air-ried to less than 30% moisture.

F. PERMITTED WOOD BURNING AND THE WILDLAND – URBAN INTERFACE

The USDA Forest Service has a one-year old office in Gainesville where its Southern Center for Wildland Urban Interface Research and Information is located. Although there is not a lot to report at this time regarding the fuel wood potential that is being researched in conjunction with the UF School of Forestry, a letter from the Center's Project leader, Ed Macey, is included here. It supports the basic concept of reducing wild fire potential through the harvest and use of waste wood. The newly enacted Healthy Forest federal legislation may have support for this work in our area. Contact Annie Hermansen, the Technology Exchange Coordinator at 376-3271 for additional information. The Ed Macey letter is attached to this chapter.

Finally a word should be said about the burn permits issued by the Division of Forestry. In Alachua County, the District Forester issued over 4,881 fire permits last year alone. The number of acres reportedly burned may be somewhat suspect and were 12,410 acres. Almost seventy-five per cent of the permits were for land clearing in residential areas: in other words development. This urban-wildland interface is changing to be sure. There were 1,607 authorized fires on agricultural lands in the county. This data is included here.

The point we'd like to emphasize here in summary is that GRU Green Energy Program will find a great deal of enthusiastic participation from the folks who are or will be threatened by wild fire IF an attempt to work with the USDA is successful. At www.loc.gov one can access HR 1904 using the "thomas" link and legislative search engine.

Burning Authorizations Summary

Waccasassa Forestry Center
1/1/2002 through 12/31/2002

Alachua

Burn Type	Authorized Fires	Authorized Acres	Authorized Piles
Agricultural--Pasture	1607	6239	0
Agricultural--Range management	0	0	0
Agricultural--Stubble (post harvest)	0	0	0
Agricultural--Sugarcane	0	0	0
Agriculture--Citrus	0	0	0
Land clearing--Non-residential--With ACI	0	0	0
Land clearing--Non-residential--Without ACI	0	0	0
Land clearing--Residential--With ACI	0	0	0
Land clearing--Residential--Without ACI	3023	3095	0
Silvicultural--Disease control	33	14	0
Silvicultural--Ecological	16	96	0
Silvicultural--Hazard removal	125	2021	0
Silvicultural--Other	2	100	0
Silvicultural--Prior to seed	0	0	0
Silvicultural--Site preparation	68	768	0
Silvicultural--Wildlife	7	77	0
Total	4881	12410	0

Gilchrist

Burn Type	Authorized Fires	Authorized Acres	Authorized Piles
Agricultural--Pasture	455	2706	0
Agricultural--Range management	0	0	0
Agricultural--Stubble (post harvest)	0	0	0

BIOMASS CROPS – A CLOSER LOOK AT SOME OF THE SPECIES – 722 TONS PER DAY USING 25% OF CROPLAND IN ALA. CO.

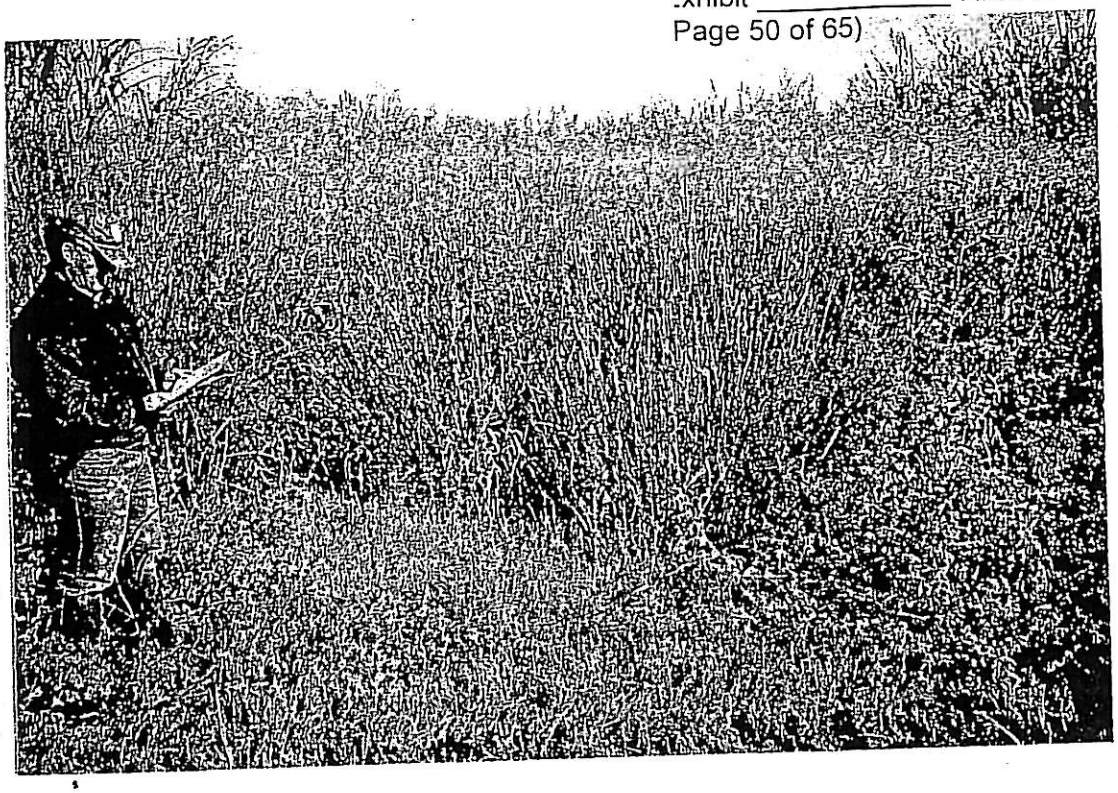
Docket No. 090451-EI
Post-Cunilio Biomass Study
Exhibit _____ RMS-2
(Page 48 of 65)

1. GORDON PRINE OF UF AGRONOMY WITH 2-YRS GROWTH OF LEUCAENA

2. THREE-MONTH OLD LEUCAENA REGROWTH FOLLOWING HARVEST OF 14-15 TONS PER ACRE POLE WOOD IN GAINESVILLE

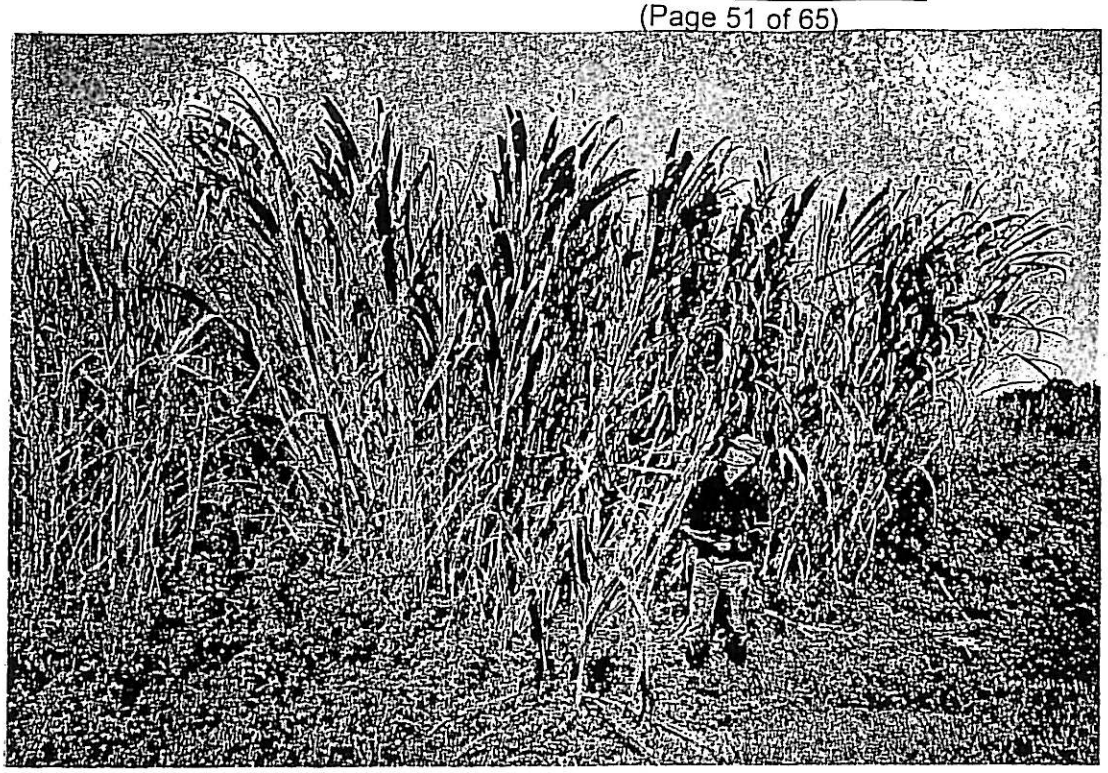
3. FROST TOLERANT LEUCAENA (*L. diversifolia*) at UF LAKE ALICE NURSERY IN 1994

4. ELEPHANT GRASS AT DAIRY RESEARCH UNIT. HAGUE. FL



5. TOM CUNILIO AT AGRONOMY SWITCH GRASS PLOT

6. TOM CUNILIO AT ENERGY CANE PLOT AT DRU, HAGUE, FL

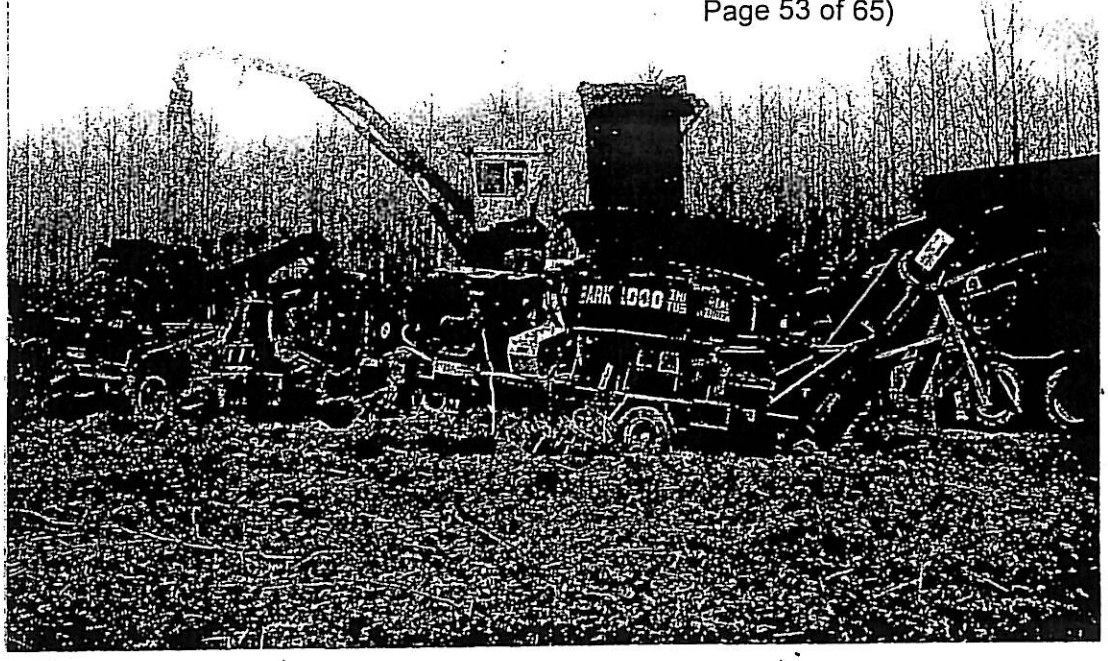


7. MORE ELEPHANT GRASS

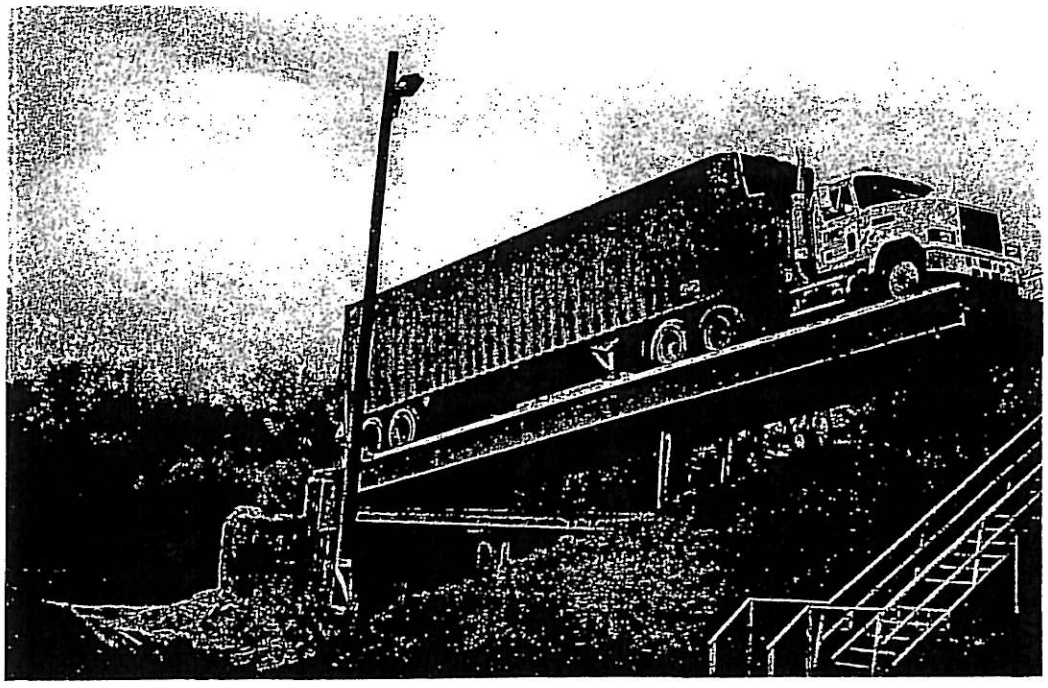
8. MORE ENERGY CANE

9. THE UNDER-STUDIED "E GRASS" (*Arondo donax*) IN A WEAK STAND AT DRU, HAGUE, FL

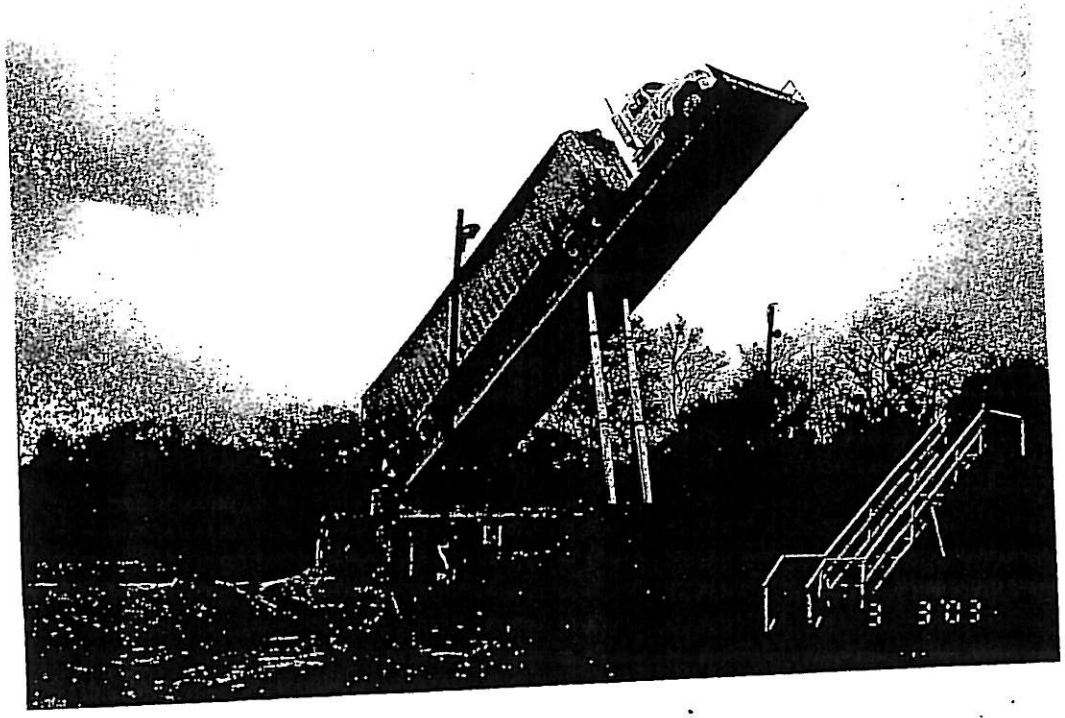
1. MOBILE TUB GRINDER AT OCALA TREE DEBRIS



2. MOBILE TUB GRINDER WORKING ON WHOLE TREES (COTTONWOODS) AT SCOTT PAPER IN ALABAMA IN 1994



4.& 5. 20 TON TRUCK LOADED WITH TUB-GROUND WOOD WASTE FROM TALLAHASSEE BEING UNLOADED IN 15 MINUTES AT JEFFERSON POWER



APPENDIX "A": A DESCRIPTION OF SAMPLES

Ten samples prepared in duplicate were collected by the survey team of Post and Cunilio over a three week period in November, 2003. Below is presented the physical characteristics of those samples. One set of samples was delivered to GRU Strategic Planners on November 21, 2003 with this report. The second set of 10 samples has been kept by the authors for later possible use. It will be shown to Alex Green at his lab.

1. Southern Fuel Wood: Live oak. This was from logs and tub ground. It was 22% Moisture, is brown and quite clean.

2. Southern Fuel Wood: Pine (killed by beetles) through tub grinder. It is 22% moisture. light brown and quite clean and less coarse than #1.

3. ABC Tree Service: Urban Oak-Pine chipped into truck with 34% moisture. This is the nicest textured material collected.

4. Line clearing by ?: Oak-Pine found along a Gilchrist Co. road with 30% moisture. It contains a good portion of leaves and small diameter twigs. It is brown in color.

5. Don Post's 40-acre clear cut: stump wood ground in a chipper at 30% moisture. Light brown with very good texture.

6. Don Post's 40-acre clear cut: slash pine tops left by logging; 27% moisture. Small chips and much leaf material. Brown and green.

7. Wood Resource Recovery: Environ Mulch product sold for $8/yd with 34% moisture. Tub ground. Dark Brown with much coarse stick material. Some small stones found.

8. Ocala Tree Debris: hardwood fuel wood at approx. 25% moisture. A horizontal grinder was used to produce this material. It is light brown, clean and not too coarse.

9. Wood Resource Recovery: Fuel wood at 43% moisture. Dark, very coarse and not clean. A part of a spring was found in this material.

10. Southern Fuel Wood: Oak chips at 20% moisture. Light brown, coarse with leaves and twigs but clean.

University of Florida 1853

ICAAS
Clean Combustion Technology Laboratory

Bryant Space Science Center
PO Box 112050
Gainesville FL 32611-2050

Phone-(352) 392-2001 Fax-(352)392-2027 Email-aesgreen@pine.circa.ufl.edu

Executive Summary: **BIOMASS OPTIONS FOR GRU**

This report was commissioned by the Energy Advisory Committee for execution by the Generation Sub Committee (Tom Cunilio and Alex Green) with an allocation of $500 by the Gainesville City Commision. It consists of a general summary of biomass to electricity options by Sergio Peres - utility engineer with CHESF, the largest utility in Brazil, and a PhD candidate in Mechanical Engineering with the Clean Combustion Technology Laboratory (CCTL) at the University of Florida. The report notes that the conversion of biomass to energy is an area of vast opportunity for communities in agricultural and forestry areas. Biomass offers a continually renewable source of energy. Growth in the use of biomass for energy and increased efficiencies in operational practices can assist in solving Florida's landfill problems, lower the dependence on fossil fuels, reduce harmful emissions and help Florida become more energy independent. "Biomass" is viewed to include energy crops, waste wood from forestry operations or lumber mills, urban yard waste, municipal solid waste, and dried sewage sludge. The summary differentiates direct conversion in which biomass is burned directly in the combustor and indirect conversion in which the biomass is first converted to a liquid or gaseous fuel to be used in a combustor or turbine. The report contains the following attachments:

(1) Reprint of an article by Donald Rockwood and associates entitled "Woody Biomass Production Systems for Florida" Biomass and Bioenergy 5 (1): 23-34, 1993. It describes the biomass properties and economics of Eucalyptus and other species suitable for short rotation intensive culture systems. Woody biomass production research in Florida has addressed genetic improvement, coppice productivity, clonal propagation, biomass properties, and economics of *Eucalyptus* and other species in short rotation, intensive culture systems. Improved *E. grandis* seedlings could more than double productivity, but exceptional clones offer more immediate potential in southern Florida. *E. tereticornis* ad *E. camaldulensis* appear to have frost-resistance and good growth in central and southern Florida. For northern Florida, *E. amplifolia* has good frost-resilience and coppicing ability. *Eucalyptus* species are suitable for fermentation processes. Other promising species include *Casuarina glauca* and *Taxodium distichum* in southern Florida, and *Sapium sebiferum* state-wide. Break-even costs for biomass production systems with *Eucalyptus* are in the competitve energy price range ; short rotation culture appears feasible for slash pine in northern and central Florida but cannot yet be advised for sand pine.

(2) Reprint of an article by Tom Cunilio and Gordon Prine "Leucaena as a Short Rotation Woody Bioenergy Crop." , Soil and Crop Sciences Society of Florida Vol. 54, 44-48, 1995- The tropical leguminous shrub/tree, leucaena (*Leucaena* spp.mainly *leucocephala)*, is adapted to well-drained soils; long, warm growing seasons; and mild winters. These conditions are common in Florida and the humid lower South. In much of this area the topgrowth is killed by frost during winter, with plants regenerating from under ground parts each spring. Leucaena can grow for many years in warmer sites, forming a small tree. The paper describes the excellent yields obtained in this region, notes that leucaena is being seriously considered in sustainable grazing systems and provides other quantitative information essential to the implementation of Leucaena energy crops.

376 - 5935

14 November 2003

Tom,

Here are the results for this batch of species. We're revising all the "(), *, re-2, re-10, RB" notes so it makes more sense and is easier to understand. Leucaena came out "NO" for south Florida, and "need more information for assessment" in the north and central Florida. That means for now UF Extension faculty can recommend Leucaena in north and central Florida while we keep trying to track down more information.

Arundo is an "OK" for north and central Florida, and a "need more information for assessment" in south Florida.

Randall Stocker

Post-it® Fax Note 7671		Date 11-14-03	# of pages ▶ 6
To TOM		From RANDALL STOCKER	
Co./Dept.		Co.	
Phone # ?		Phone # 392-7622	
Fax # 376-5935		Fax # 846-2856	

13-Nov-03	No	Avoid +RB	Conclusions: Avoid +re 2	Caution +re 2	OK +re 10 #	
Albizia lebbeck				S	N, (C)	
Ardisia crenata		N*,C*			S	
Arundo donax					N, C, (S)	
Bischofia javanica				S	(N, C)	
Buddleja lindleyana					N, C, S	
Canna indica					(N, C) S	
Cinnamomum camphora		N*,C*			(S)	
Colocasia esculenta	N, C	S*				
Hymenachne amplexicaulis	N, C, S					
Leucaena leucocephala	S			(N, C)		
Lonicera japonica		N*, C, S				
Miscanthus sinensis					N, C, S	
Nephrolepis cordifolia		C*		S	N	
Panicum repens	N, C, S					
Paspalum notatum				(C, S)	(N)	
Passiflora foetida				S	N (C)	
Pennisetum alopecuroides					N, C, S	
Pennisetum setaceum					N, C, S	
Ruellia tweediana		N*, C*		S		
Syzygium cumini	S				(N, C)	
Thespesia populnea	S				N (C)	
Tradescantia fluminensis			N		(C, S)	
Urena lobata	C, S				N	

RB = Needs formal risk-benefit analysis
re-2 = fill data gaps, reassess in 2 years
re-10 = reassess in 10 years

* = Eligible for consideration under Section D to see if "Specified and Limited Uses" can be defined.

Professional Biography of Professor Don M. Post

Date & Place of Birth - July 7, 1927 - Umatilla, FL
Marital Status - Married: 1 son.
Military - United States Navy 1945-46 SIC

Education:

High School (1945), Umatilla, FL

B.S.F. with minor in Ag Engineering (1950), University of Florida.

M.S.F. in Forest Utilization (1951), University of Florida.

Thesis:

Cost Analysis of Milling Southern Pine on a Portable Mill in Relation to Diameter Class in Alachua County, FL.

Special Training:

Caterpillar Division, Gibbs Corp., Jacksonville, FL. (Employed Summer (1951) as trainee to learn about logging equipment MFG by Caterpillar)

International Harvester, FL. Georgia Tractor Co., Jacksonville, FL. (Internship with service representive with particular interest in logging and milling equipment (1951).

Moore Dry Kiln Co., Jacksonville, FL. Internship in Service and Engineering Dept. (1951).

Square Deal Machinery Co., Allis Chalmers Dealer, Orlando, FL. Internship in service representive with particular interest in Logging and Milling equipment (1952).

Detroit Diesel Engine Division, General Motors Corp., Detroit, Mich. (Completed Factory Service School on 71 Series Engines, July, 1952.

Continuing Education:

Attending and/or participating in most of the Chapter, Section and National meetings and conferences of the Society of American, beginning in 1950.

Attended - Fire by Prescription Seminar, Atlanta, GA. 1976.

Attended - LSV/MSV Logging Management Seminar in 1978.

Attended LSU/MSU Industrial Forestry Organizational Management, 1980.

Attended Fire Management Seminar, Atlanta, GA. 1984.

Professional Employment:

University of Florida, School of Forestry, 1958-1984. Major responsibility areas while at the University of Florida.

Teaching:

1. Introduction to Forestry
2. Lumber Seasoning
3. Logging & Lumbering (lecture course)
4. Logging Practices
5. Milling
6. Forest Operations
7. Forest Fire Use & Control
8. Teacher of the Year Award (1980)

Operations Manager of the Austin Cary Forest (a 2,200 acre experimental forest under the control of the School of Forestry 1953-1980.

Research:

Don M. Post. 1951. Cost Analysis of Milling Southern Pine on a Portable Mill in Relation to Diameter Classes in Alachua County, Florida. Masters Thesis. 37pp.

James W. Miller and Don M. Post. 1953. Tandom-Wheeled Logging Sulky for Southern Pine Region. University of Florida School of Forestry Research Report No. 2. 6pp.

Don M. Post. 1956. Fire Suppression Unit for the Small Forest. U.S. Forest Service, Fire Control Notes, Vol. 17, No. 1 pp. 18-19. Forestry Digest. August, 1956. 2.pp.

Don M. Post. 1958. War Surplus Crash Truck Converted to Forest Fire Use. U.S. Forest Service. Fire Control Notes, Vol. 19, No. 3. pp. 110-111.

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Don M. Post and W. H. Smith. 1972. Municipal Compost Disposal on a Forest Site. American Chemical Society.

Don M. Post and Peter A. Straub. 1976. Rate of Growth and Nutrient Concentrations of Trees in Cypress Domes: In: 3rd Annual Report of Wetlands Project.

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W. H. Smith and D. M. Post. 1973. Wastewater Disposal in Forest and the Production of Forest Plants. Wastewater Workshop.

W. H. Smith, D. M. Post and F. W. Adrian. 1978. Waste Recycling in Forests. 8th World Forestry Congress. Jakarta Indonesia.

R. F. Fisher, D. M. Post, D. L. Rockwood, J. E. Smith, and E. T. Sullivan. 1979. Forest Management for Small Ownerships. Bulletin #447 Extension Service.

Kay M. Eoff and D. M. Post. 1980. How to Power a Gasoline Engine with Wood. Extension Circular #15.

D. M. Post and Kay M. Eoff. 1980. Economic Feasibility of Using Low-Grade Hardwoods as a Power Source. Symposium on Utilization of Southern Hardwood Nashville, Tennessee. (This paper was used as Chapter 28 of book entitled Utilization of Hardwood Growing Southern Pine Sites by Peter Kotch.

L. N. Shaw, D. M. Post and C. A. Arnold. 1982. Greenhouse Heating with a Wood Gasifier Furnace. Proc. of FL State Hort. Soc. 95:158-159.

L. N. Shaw, D. M. Post, J. D. Whitney, S. L. Hedden, and D. B. Churchill. 1983. Energizing on Irrigation Pump Engine with Citrus Wood. ASAE Paper No. 82-3076. Presented at the 1983 ASAE Annual Meeting, Bozeman, MT.

L. N. Shaw, D. M. Post and K. M. Eoff. 1983. Fuel Preparation and Continuous Feeding Systems for Downdraft Gasifiers. Paper presented at the Third Annual Solar and Biomass Workshops and printed in proceedings. Co-Sponsored by USDA, DOE, TVA, SERI, and FES, Atlanta, GA. April 26-28.

E. M. Eoff, L. N. Shaw and D. M. Post. 1983. Biomass Gasification as a Source of Acidic Substances. Acid Deposition Causes and Effects Workshop Proceedings. Published by Government Institutes, Inc. 966 Hungerford Drive, #24, Rockville, MD. pp. 153-161.

Books:

J. R. Gross, L. D. Coward, R. E. Derosiers, E. A. Donath, H. E. Dregene, K. M. Eoff, J. W. Goodrum, A. M. Hay, D. Hugart, E. Johansson, H. LaFontaine, J. W. Lincoln, F. Mergen, H. Popenoe, D. M. Post, B. Russel, and L. N. Shaw. 1983. Producer Gas: Another Fuel for Motor Transport. National Academy of Science, Washington, D.C. 101pp.

Travel:

Over 100,000 miles of organized forest operations related travel in the U.S., Canada, Central America, Europe and Scandinavia.

Forestry Consulting:

Kanapaha Ranch - 4,000 acre property, 4 miles west of Gainesville, FL.
Accock Property - 30,000 acres in Lafayette. Property has been leased to Buckeye Cellulose Corporation.
President - Florida Forestry Services, Inc. Incoporated in 1984.
Battelle Pacific Northwest Laboratories - 1982.
Southern Fuelwood, Newberry, Florida (continuing).

Court Appearances:

Brad Fuller vs. State Park Service. (Fire case against the State of Florida.)

Reddish Family vs. Georgia Power Corp. (Case concerned timber value dispute over R. W. land)

Barrington vs. C.F. Manning. (Case involved the smell of smoke on highway when an accident occurred.)

John Simpson vs. Alachua County. Case concerned timber value of R. W. taken by Alachua County.

Memberships and Offices held + other scholarly activities:

1. Society of American Foresters. 1950-Present.
   Chairman, Suwannee Chapter.
   Secretary Tresurer, Florida Chapter.
   Secretary Treasurer, Southeastern Section.
   Chairman, Florida Chapter.
   Chairman Elect, Florida Section.

2. Member. XI Sigma Pi (Forestry Honorary Society).

3. Member, Forest Products Research Society.

4. Member and Past President, Southern Wood Seasoning Association.

5. Appointed to Board of Registration for foresters in the state of Florida by Governor Rubin Askew. 1974-1978.

   Re-appointed to the same board by Governor Bob Graham. 1978-1892.

6. Participated in Georgia Legislature Weekend. 1981 (Wood Energy).

7. Participated in the Production of television documentary "Florida Energy Secret".

8. In charge of University of Florida's Wood Energy Exhibit at Florida State Fair. 1980-83.

9. Member of Florida Forestry Association.

10. Member Energy and Tree Farm Committees.

11. Private "Tree Farmer" (North Central Florida).

12. Drove a Wood Powered Pickup Truck over 15,000 miles during the 1979-80 Energy Council representing the U. of F. from Atlanta Ga. to Miami Fla.

Thomas Victor Cunilio

Home: 3953 N.W. 27th Lane, Gainesville, FL 32606; Tel: (352) 376-6265. Florida resident since 1994.
Health: Excellent. Swims, bikes and gardens. His workday is filled with God's grace.
Family: Married in 1974 to Maria Cristina Cunilio. They have one child, Christopher T. Cunilio, who lives in Jacksonville and works as a manufacturing engineer.

Background Summary:

Innovative and experienced agronomist, horticulturist, and entrepreneur with 3 years of US Peace Corps experience and 20 years of technology development and transfer - first from Univ. of FL and later from own non-governmental organization. Main focus has been on organic farming system development following models experienced in Latin Am. and Africa. Established NGO "CoSAF" in 1989 to work with sustainable subtropical legume species capable of supplying fuel, food, forage and fertilizer for new farming systems. Primary accomplishments include 1) extending one woody legume species to reclaimed phosphate mined land in central FL; 2) developing no-till planting technique for legume biomass species that also eliminates cogongrass on same mined land soil; 3) coordinating an R&D team to convert "woodgrass" to methane and value-added compost products. The last is made possible by the SEBAC technology patented by the UFL.

Occupational Goals:

Seeks continued part-time consulting with electric utilities that are planning green energy from biomass programs. Prefers remaining in Gainesville area but will relocate if right offer is made.

Education:

University of Florida – Gainesville. July, 1984 to August, 1988.
- Major: Spanish
- Degree: Master of Arts
- Research: Teaching methodologies

University of Florida – Gainesville. August, 1975 to August, 1979.
- Major: Agronomy
- Degree: Bachelor of Science
- Research: Grass-legume establishment

John Carroll University – Cleveland, OH. September, 1964 to August, 1968.
- Major: Political Science
- Degree: Bachelor of Arts

Work Experience:

Center of Sustainable Agroforestry, Inc. (CoSAF). From 1989 to present as Lead Agronomist and President. Gainesville, Florida. John Sweitnicki, Board Member also since 1989. (904) 384-7617. Duties include fund raising, research and writing.

Hernando County Public Works Department. From 2002 to present as Geo-scientist. Steve Whitacker, supervisor. Part-time. (352) 754-4060.

University of Florida. From 1981 to 1984 in various lab and field tech positions dealing with biomass research. From 1993-1994 as Extension faculty in Glades County. Supervisor: Gordon Prine, PhD, Professor emeritus, Agronomy. (352) 392-1811 Ext. 216.

Columbia County and Duval County Public Schools and Santa Fe Community College. From 1984 to 1991. Spanish instructor. (Relevant supervisors' names available upon request.)

References:

1. Rev. John Gillespie, Pastor, St. Augustine Catholic Student Center, Gainesville, Florida. (352) 372-3533.
2. Dr. Gordon M. Prine, Professor, UF Agronomy Department, Gainesville, FL. (352) 392-1811, Ext. 216.
3. William Messina, UF Food and Resource Economics Department, Gainesville, FL. (352) 392-1826, Ext. 308.

Publications:

1. "Leucaena: a forage and energy crop for the lower south. 1992. Soil and Crop Science Society of Florida, Vol. 51.
2. "Leucaena as a short rotation woody bioenergy crop." 1995. Soil and Crop Science Society of Florida. Vol. 54.
3. "Giant Leucaena as a productive and environmentally friendly, multi-purpose energy crop." Soil and Crop Science Society of Florida. In press.
4. Leucaena Production Guide for Florida. In press.