

THE TIMBER INDUSTRY'S SUSTAINABLE FORESTRY INITIATIVE:

INADEQUATE TO ENSURE THE LONG-TERM SUSTAINABILITY OF THE SOUTH'S FORESTS

By Danna Smith, Doug Murray and Bud Watson

Abstract

This paper highlights the relationships between recent increases in production of pulp and chipboard, resulting harvest increases in the South and large timber companies that claim to be practicing sustainable forestry under the American Forest and Paper Association's "Sustainable Forestry Initiative"(SFI). Data presented in this paper document that SFI companies contribute disproportionately to the unsustainable harvest rates in the South and that the SFI program fails to provide adequate performance measures to ensure positive growth to removal ratios.

This paper documents: (1) a dramatic increase in both paper and OSB production in the South; (2) a marked increase in harvests for paper and chipboard in the South to a current unsustainable level of 5 million acres per year; (3) Eighty-five percent of the pulp produced in the South and 94% of the OSB is produced by SFI companies; (4) removals of pine forests throughout the South exceed growth; (5) a dramatic increase in harvests of hardwood pulpwood in the South leads industry experts to predict the overcutting of hardwoods across the region within the decade; and, (6) the overcutting of forests on timber industry land across the country and the South.

Introduction

"This isn't some abstract debate...this is a basic issue of sustainability... you cannot take more from the land than the land can sustain."

~ Michael Dombeck, former Chief of the US Forest Service in a speech to the American Forest and Paper Association (2000)

Southern forests contain some of the biologically richest ecosystems in all of North America. From the Gulf Coast, Ozark Mountains, and Southern Appalachians to the East Coast, these forests support an abundance of plant and animal diversity and healthy watersheds. Many of the region's plant and aquatic species can be found nowhere else in the world. In addition to maintaining this biological uniqueness and diversity, Southern forests also provide clean drinking water and support strong tourism and recreation businesses. Overall, southern forests contribute tremendously to the quality of life and economic well-being of communities across the region. However, according to the World Wildlife Fund, Southern forests are not only ecologically unique but also endangered (Ricketts, et al., 1999).

The southern forest provides wood products in the form of lumber, plywood, paper and chipboard. Recent increases in harvests of small diameter trees that are ground into wood chips used for manufacturing paper and chipboard have led to increased concern about both the sustained ecological and economic viability of the southern forest for several reasons.

First, expanding markets for products like paper and chipboard that are made from chipping small diameter trees encourage clearcutting. Clearcutting is the only economical harvest method for acquiring large volumes of small diameter trees used in paper and chipboard production. Second, increases in demand for smaller diameter trees encourage the management of young forests, impacting the availability of large trees necessary for future production of quality lumber, decreasing soil fertility, and diminishing habitat for species that depend on mature forests. Finally, increases in harvests to feed these expanding markets have pushed harvest rates to unsustainable levels. In fact, in a speech to the American Forest and Paper Association last year, Michael Dombeck, former Chief of the US Forest Service, warned of this trend in the South: "This isn't some abstract debate...this is a basic issue of sustainability... you cannot take more from the land than the land can sustain," Michael Dombeck, former Chief of the US Forest Service in a speech to the American Forest and Paper Association (2000).

The Sustainable Forestry Initiative (SFI)

In response to growing public concern and increased demand in the marketplace (from large wood retailers such as Home Depot and Lowe's) for products originating from well-managed forests, the Sustainable Forestry Initiative was created by the American Forest & Paper Association (AF&PA) for its members. The AF&PA is a national trade association for the US forest products industry, and includes the largest producers of wood products in the US, including International Paper, Georgia Pacific and Weyerhaeuser. The SFI consists of a set of standards intended to define good forest management. Participation in the SFI is a condition to membership in the AF&PA.

The standards and procedures under the SFI were developed and approved by industry for industry, rather than by a balance of environmental, social and economic interests. Member companies are largely free to choose their own standards and monitor their own compliance. Companies that are members of the AF&PA's SFI program claim to be committed to sustainable forest management. Yet, as this paper documents, **SFI companies are contributing disproportionately to the unsustainable harvest rates that threaten the South's forests; and SFI standards fail to provide meaningful definitions and performance standards related to the most basic measure of sustainability – positive growth to removal ratios.**

1 • Increasing Paper and Oriented Strand Board (OSB) Production in the South

In the 1970s, 1980s, and early 1990s, there was a rapid expansion of the pulpwood and chip industry in the Southeast (Cruikshank, 1954; Knight and Nichols, 1964; Bellamy, 1974; Hutchins, 1985; Howell and Hartsell, 1995;

Johnson, 2000). From 1985 to the present, more than 100 wood chipping facilities were constructed in the South to supply increased production of both paper and OSB. (Smith, 1997)

Increases in Pulp and Paper Production

In the last 50 years, the South has become the wood basket of the global pulp and paper industry. In 1953, there were only 61 pulp and paper mills in the Southeast, each of which had only an average production of 470 tons of pulp per day. Total pulpwood production in the Southeast in 1953 was approximately 44 million tons per year. In contrast, by 1998 there were 103 mills each with an average production of 1,365 tons of pulp per day — nearly three times as large as the 1950s mills — and total pulpwood production in the South had grown to over 200 million tons per year. (Cruikshank, 1954 and Johnson, 2000). See **Table 1 and accompanying graph.**

Graph Source: Cruikshank, 1954; Knight and Nichols, 1964; Bellamy, 1974; Hutchins, 1985; Howell, 1995; Johnson, 2000

Pulpwood Production in the Southeast from 1953 ~ 1998 (Tons)

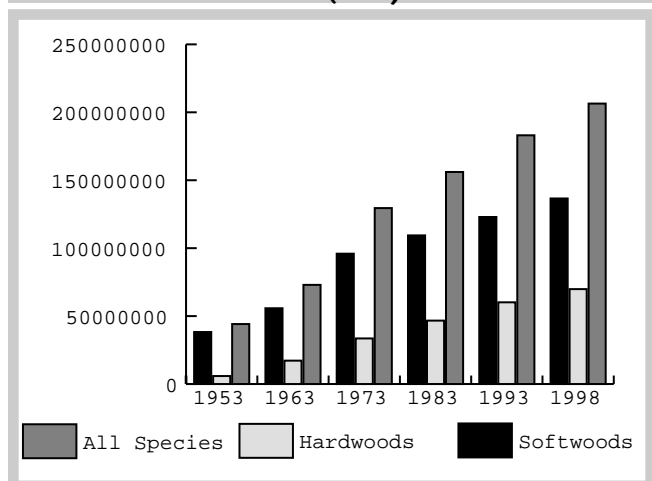


Table 1: Pulpwood* Production in the Southeast from 1953 through 1998 (Tons)

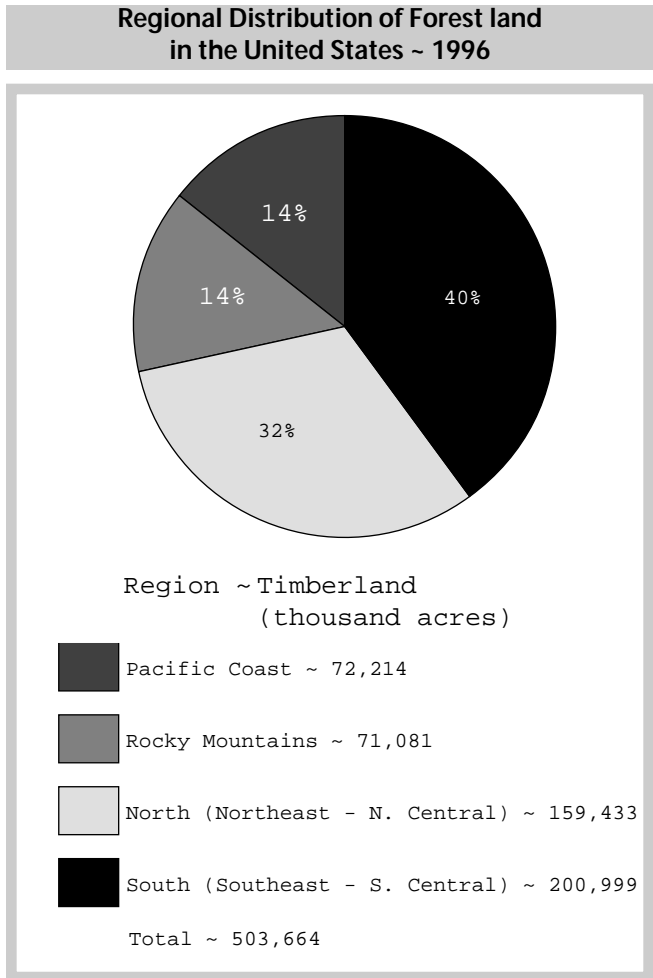
Year	Softwoods	Hardwoods	All Species
1953	38,270,850	5,879,648	44,150,148
1963	55,773,155	17,209,392	72,982,547
1973	95,942,950	33,559,331	129,502,281
1983	109,398,370	46,676,384	156,074,754
1993	122,936,910	60,143,584	183,080,494
1998	136,572,280	69,859,477	206,431,757
Percentage Change 1953 to 1998	257%	1,088%	368%

Sources: Cruikshank, 1954; Knight and Nichols, 1964; Bellamy, 1974; Hutchins, Cecil C. Jr., 1985; Howell and Hartsell, 1995; Johnson, 2000. *Pulpwood is classified as raw wood used for pulp.

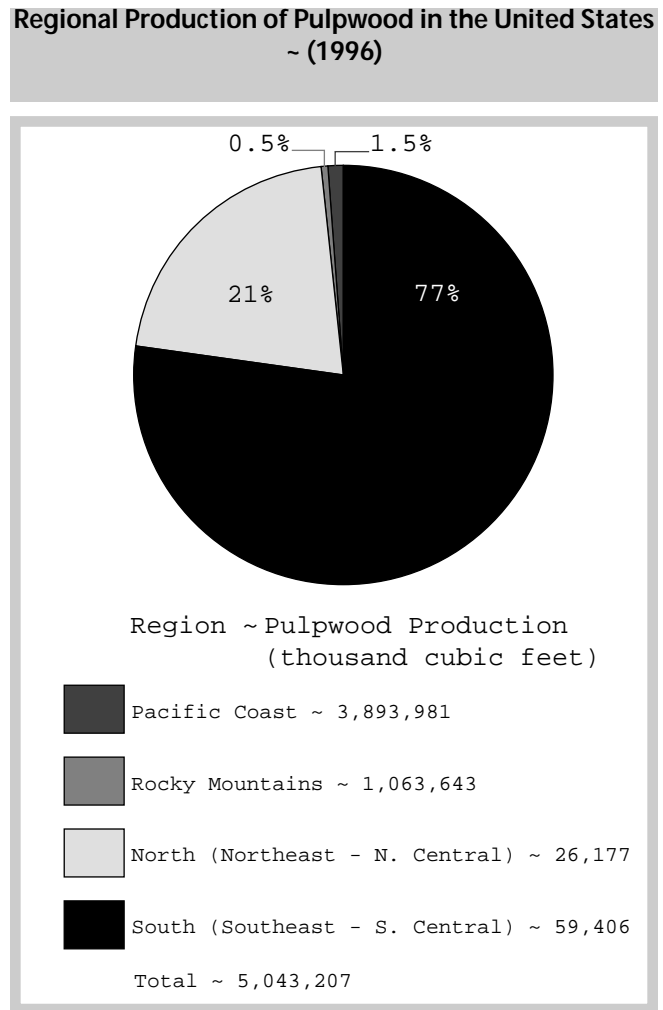
From 1983 to 1998 pulp production in the South increased by 32%. During that same period the use of softwood trees for pulp increased 24% while the use of hardwoods increased 50%. Although there was a 2% decline in

production from 1998 to 1999, industry experts project continued expansions in the industry in the South over the coming years (Howard, 2001).

For the past 10 years, the South has been producing approximately 77% of the nation's pulp, although it contains only 40% of the nation's forests. (Howard, 2001) See accompanying Pie Charts.



Source: Smith and Sheffield, 2000



Source: Smith and Sheffield, 2000

Increased Production of OSB

Beginning in the mid-1980s and early 1990s, large softwood trees became unavailable in the Northwest as old growth forests were depleted and restrictions were placed on the timber industry. These firs and pines had been a primary source of plywood — the standard panel (siding) material for home building – and other non-solid wood products. As

the Northwestern resource was depleted, a new technology developed that allowed panel producers to use smaller hard and softwood trees to produce a material, OSB, that is comparable to plywood. OSB is produced by gluing and pressing together wood flakes produced from trees too small to produce plywood. The recovering forests of the South

provided a plentiful supply of these immature forests and, thus, the producers of OSB began moving to the region.

Since 1995, the production of OSB mills has steadily increased. Between 1995 and 1998 OSB roundwood consumption increased by 63 percent, or an average of 16 percent per year. In 1983 there were two OSB mills in the Southeast. Today there are at least 25 OSB mills in the

region, accounting for nearly ten percent of the wood chip market. (McKeever, 1998). These trends are likely to continue with increased protection of old growth forests and as supplies of remaining large diameter trees are depleted.

2 • Five Million Acres of Southern Forests Clearcut Every Year for Paper and OSB

The current pulp/paper and OSB production levels result in about 5 million clearcut acres of forests each year. (See Table 3) There are just over 200 million acres of forests in the southern region. Assuming that all of the 200 million acres of forests in the South are available for logging, the industry is cutting on a 40 year cycle. However, all the forests in the

region are not available for harvest, so in reality, the cutting cycle is much shorter than 40 years. Even a 40-year cutting cycle for trees that require 80–100 years to reach maturity is not sustainable.

Five million acres is a very large area. For comparison:

- There are only about 4 million acres of National Forests in the entire Southern Appalachian Mountains.
- Great Smokey Mountain, Everglades, Shenandoah National Parks combined contain only approximately 2 million acres.
- At 5 million acres a year, the industry cuts an acreage of forests greater than the total acreage of all the forests of North Carolina every 4 years.
- The amount of woodchips produced by harvesting 5 million acres of forest per year could fill boxcars on a train stretching halfway around the world.

Today's rate of harvesting is rivaled only by the harvests of the early 1900s when nearly all the forests of the Southeast were cut — a devastating harvest from which the Southeast is only now recovering.

Approximately 5 million acres of Southern forests are clearcut each year to produce paper and OSB.



Table 3: Pulpwood Consumption by Southeastern Mills and Acres of Forest Required to Supply Pulpwood Demand 1995-1998 (Thousands of Tons)

Forest Type	Pulp/Paper	OSB	Import	Export	Total	Acres Harvested
1995						
Hardwoods	66,976	2,534	(300)	0	69,210	1,730,000
Softwoods						
Native Forest	100,350	8,108	(2)	20	108,476	2,712,000
Plantations	25,088	2,027	(1)	5	27,119	338,988
Total	192,414	12,669	(303)	25	204,805	4,780,988
1996						
Hardwoods	61,468	3,420	(367)	166	64,687	1,617,000
Softwoods						
Native Forest	96,019	10,943	(1.6)	26.4	106,987	2,674,675
Plantations	24,005	2,736	(0.4)	6.8	26,747	364,130
Total	181,492	17,099	(369)	199.2	198,421	4,626,017
1997						
Hardwoods	71,120	3,968	(338)	11	74,761	1,869,025
Softwoods						
Native Forest	103,827	12,697	(2.4)	0	116,522	2,913,050
Plantations	25,957	3,174	(0.6)	0	29,130	364,130
Total	200,904	19,839	(341)	11	220,413	5,146,205
1998						
Hardwoods	65,599	4,037	(434)	305	69,507	1,737,675
Softwoods						
Native Forest	105,384	12,920	(8)	12.8	118,309	2,957,725
Plantations	26,346	3,230	(2)	3.2	29,577	369,715
Total	197,329	20,187	(444)	321	217,393	5,065,115

Sources: Johnson, 2000; McKeever, 1998; Cabbage, 2001. (A note on the methodology for this analysis is outlined in Appendix A).

Other Demands on Southern Forests Push Harvest Rates Over 5 Million Acres/year

Unfortunately, demand for woodchips made from small diameter trees is not limited to pulp and OSB. The production of **Medium Density Fiberboard (MDF)**, **High Density Fiberboard (HDF)** and other **engineered wood products** also rely on the chipping of small diameter trees from Southern forests. Depending on the availability of waste wood and sawdust, these solid wood substitutes sometimes use virgin chips. An analysis of these industries was not included in this paper because of limited information related to production and raw material use. In addition the Southeast is now the major supplier of **forest-based biomass**—wood burned to generate electricity. Research shows that consumption of wood for biomass electrical generation now equals about 1/2 of the harvest for pulp and paper production (Howard, 2001). Finally, southern forests are also being harvested to produce **lumber and plywood**. In reality, southern forests are being harvested at a rate faster than 5 million acres/year.

3 • SFI Companies Responsible for 85% of Pulp Production and 94% of OSB Production and the Harvest of 4.25 million Acres of Southern Forests/Year

The top twenty pulp producing companies control approximately 85% of the southern pulp market. Sixteen of the top twenty pulp producing companies are members of the AF&PA's SFI program. Overall, SFI companies account for approximately 85% of the pulp produced in the South. (Johnson & Stepleton, 2000) In addition, SFI companies are responsible for 94% of the OSB production in the South. See Table 5.

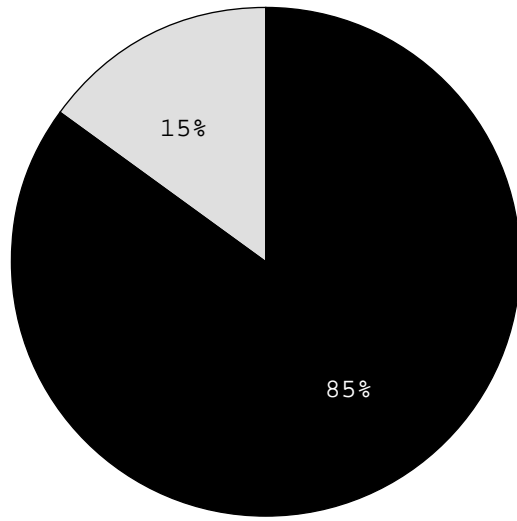
Approximately 4.25 million acres of southern forests are harvested each year to supply SFI companies' pulp and OSB production.



Table 4: Production of 20 Largest Forest Products Companies in 1998

Company	number of mills	SFI Membership	Pulp Production in tons per year
International Paper	23	SFI	13,587,125
Georgia-Pacific	13	SFI	6,559,050
Smurfit-Stone	8	SFI	4,460,300
Weyerhaeuser Macmillan Bloedel	6	SFI	3,393,405
Bowater	2	SFI	1,832,350
Westvaco	3	SFI	1,733,750
Willamette	4	SFI	1,602,350
Temple-Inland Inc.	3	SFI	1,387,000
Tenneco	2		1,368,750
Alabama River Co.	1		1,186,250
Mead	2	SFI	1,149,020
Riverwood International Corporation	2	SFI	1,087,70
Donahue Industries Inc.	2	SFI	1,047,550
Boise Cascade	2	SFI	939,875
Gaylord Container Corp.	1	SFI	912,500
Rayonier, Inc.	2	SFI	762,850
St. Laurent Paper Corp.	1	SFI	704,450
Inland Eastex	1		675,250
U.S. Alliance Coosa Pines Corp.	1		649,700
Top Twenty Corporations	78		45,039,225

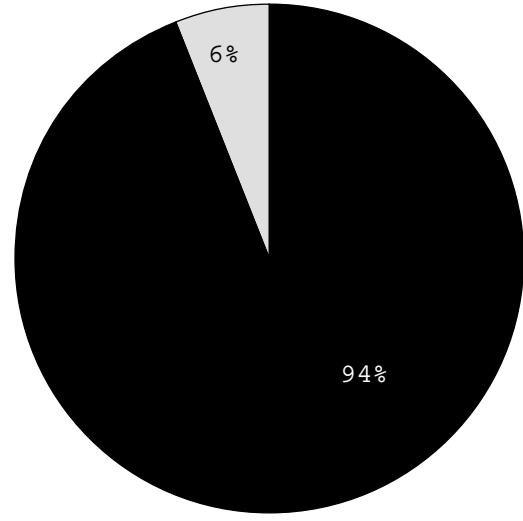
Source: Johnson & Stepleton, 2000; SFI company information from AF&PA website (www.afandpa.org)

Southern Pulp Production



 Companies that subscribe to the AF&PA's Sustainable Forestry Initiative
 Other Companies

Southern OSB Production





 Companies that subscribe to the AF&PA's Sustainable Forestry Initiative
 Other Companies

Table 5: OSB Production in the South by Company (1998)

Company	number of mills	SFI Membership	OSB Production in tons of trees used per year
Louisiana-Pacific	7	SFI	5,978,016
Georgia-Pacific	5	SFI	4,081,088
Huber	3	SFI	2,662,880
International Paper	3	SFI	2,369,664
Weyerhaeuser	2	SFI	1,980,704
Nordboard	1	SFI	1,151,920
Willamette	1	SFI	795,872
Martin Louisiana	1		688,160
Langlade Georgia	1		502,656
Total OSB Production	24	SFI=94%	20,210,960

Source: M'Keever & Spelter, 1998; SFI Company Information from AF&PA website (www.afandpa.org); one cubic meter of OSB = .88 tons; one ton of OSB requires 3.4 tons of wet trees for production.

4 • Overcutting Southern Forests

As harvest rates have increased to 5 million acres/year to supply the increasing demand for pulp and OSB, a wave of negative growth to removal ratios is sweeping from the Deep South northward.

Softwoods (Pines)

According to the USFS, removal of pines throughout the region currently exceeds growth. **See Table 6.** Softwoods have traditionally made up the bulk of the fiber used in the manufacture of pulp and paper. **See Table 1.** South-wide, the softwood growth to removal ratio is expected to decline from .91 to .71 by the year 2020 (Abt et al 1993).

The highest deficits in growth to removal ratios for pine across the South can be found in the South's largest pulp producing states — Alabama, Georgia, South Carolina, Mississippi and Louisiana. (Cubbage, 1998)

Hardwoods

While the most recent USFS data show overall positive growth to removal ratios for hardwoods, the use of hardwood for pulp has increased markedly in recent years. Over the last 50 years, softwood harvests have increased by 257% while hardwood harvests have increased by 1,088%. From 1983 to 1998 hardwood pulpwood production increased by 50%. While hardwood fiber only accounted for 13% of the fiber in southern pulpwood production in 1953, today it accounts for approximately 37%. **See Table 1.**

From 1983 to 1998 hardwood pulpwood production increased by 50%.

Table 6: Recent Growth to Removal Ratios for Selected Southeastern States (1997)

State	Softwoods	Hardwoods
Alabama	.69	1.24
East Texas	.79	.95
Georgia	.95	1.15
Louisiana	.93	1.35
Mississippi	.88	1.09
North Carolina	.98	1.4
South Carolina	.65	.79
All South	.91	1.30

Source: Smith, 2000

Industry experts project a negative hardwood growth to removal ratio across the South due to the increased use of hardwoods in paper manufacturing. (McWilliams, 1993.) Longer term projections indicate that the hardwood growth to removal ratio will decline from 1.30 to .87 by the year 2020. (Abt, et, al 1993) However, the most recent state study completed in 2000 by NC State and Duke Universities projects removals of hardwoods will exceed growth throughout North Carolina by 2005.(Cubbage, 2000) In East Texas and South Carolina, removals of hardwoods already exceed growth according to the most recent USFS Forest Inventory Analysis. **See Table 6.**

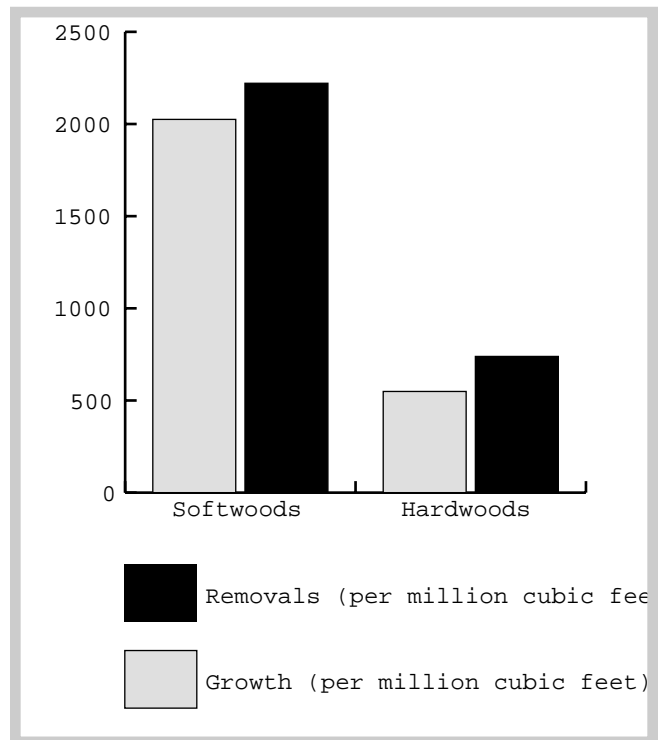
Hardwood harvest rates across the South are projected to continue to increase from a moderate 10% in Mississippi to almost 100% in Tennessee and Oklahoma. (Abt, 1993)

Removals Exceed Growth on Industrial Timber Land Throughout the South

According to the US Forest Service (USFS), the cutting of forests exceeds growth on timber industry land across the US. (Smith, Brad W. 2000) **AF&PA member companies control approximately 90% of the industrial timberland in the US.** (AF&PA website, www.afandpa.org) International Paper, Georgia Pacific/Plumb Creek and Weyerhaeuser are the largest Industrial Timberland owners in the US, and are all members of the SFI. There are 37 million acres of Industrial Timberland in the South, representing about 54% of the total Industrial Timberland in the US (Smith & Sheffield, 2000.)

According to the most recent USFS data, removal of softwoods and hardwoods on Industrial Timberland throughout the South exceeds growth by 386 million cubic feet. (USDA Forest Service, 1999) **See Bar Graph.**

Growth and Removals by Species on Timber Industry land in the South



The most recently completed USFS Forest Inventory Analysis (FIA) in the South was conducted in the Southeastern Coastal Plain of North Carolina. Released on June 18, 2001, the FIA data show:

1. Removals of hardwoods and softwoods exceed growth on all timber industry land
2. Removals of hardwoods and softwoods exceed growth for all forest ownerships

International Paper, the largest timber company in the world, is the largest industrial landowner in the Southeastern Coastal Plain of North Carolina. International Paper is the largest paper producer in the Southeastern Coastal Plain of North Carolina and is a member of the SFI. Georgia Pacific, also an SFI company, is the other top wood producer in the Southeastern Coastal Plain of North Carolina.

5 • The Sustainable Forestry Initiative is Inadequate to Ensure Sustainable Forest Management in the South

SFI standards in general fail to provide adequate performance-based measures to evaluate whether SFI

company's forest management practices meet specified ecological and social performance measures in the field.

Instead, SFI standards place emphasis on intensive forest management practices (i.e. intensively managed plantations, clearcutting, chemical use and intensive management of natural forests.) (Heaton, 2001)

Specifically, SFI standards fail to define sustainable harvest rates and do not provide specific performance measures to ensure minimal positive growth to removal ratios, among other significant shortcomings. The SFI performance measure regarding harvest rates reads as follows:

“Program participants shall ensure that long-term harvest levels are sustainable and consistent with appropriate growth and yield models and written plans.” SFI Standard SFI-2001 4.1.1.1.4

No where in the standard is it explicitly stated that a positive growth to removal ratio is desired, much less required. Further, the SFI’s emphasis on forest growth is focused on replanting trees. In fact, many in the industry see the expansion of intensively managed pine plantations as the long-term solution to the South’s negative growth to removal ratios. The SFI supports this line of thinking, emphasizing replanting after harvest, while failing to provide measures that prevent natural forests from being converted to pine plantations.

According to the USFS, approximately 40% of the native pine forests in the South have already been converted to intensively managed plantations, and experts predict a doubling of plantations in the South over the next 20 years. (Cabbage et, al, 2000.) The expansion of plantations negatively impacts the uniquely diverse forests of the South. Even if SFI companies commit to positive growth to removal ratios over the long-term, the SFI program will remain inadequate until it provides protections against the further conversion of native forests to plantations.

In addition to issues related to the overcutting of forests, there are many other weaknesses in the SFI program that will need to be addressed before it can be seen as a part of the solution to the unsustainable demands being placed on southern forests. SFI’s standards are too flexible, weak and open-ended despite recent attempts at improvement. Not only does SFI lack clear benchmarks for performance, it also fails to define sound forest management in terms of actual forest practices for environmental outcomes. Consequently, almost any company can be found in compliance.

6 • Conclusion: Immediate Government and Corporate Action Needed to Protect Southern Forests

Production increases in paper and OSB have reached levels in recent years that require the harvesting of approximately 5 million acres of southern forests per year. Removals of softwoods, which make up the bulk of the fiber in pulp production, currently exceed growth throughout the South. Industry analysts project a similar fate for hardwood forests across the South in the near future due to the increasing use of hardwood fiber in pulp production. Across the South, the highest deficit of growth to removal ratios can be found in the South’s largest pulp producing states. Eighty-five

percent of the pulp production in the South is controlled by large timber companies that subscribe to the SFI.

Across the country, removals of forests exceed growth on forest industry land. Ninety percent of the forest industry land in the US is managed by SFI companies. Removals of forests on timber industry land across the South currently exceeds growth according to a 1997 study by the USFS.

The SFI is insufficient to ensure the long-term sustainability of the South’s forests, yet the industry and even some state governments and officials are promoting the SFI as the standard for good forestry.

For example:

- Just this year, the South Carolina House of Representatives passed H.B. 4051, a resolution that recognizes the creation and implementation of the SFI as a means to the responsible use of the state’s natural resources.
- In North Carolina, following the release of the Governor’s study of the ecological and economic effects of woodchip mills last year, the Department of the Environment and Natural Resources recommended the state promote the Sustainable Forestry Initiative in North Carolina as a means of improving forest management across the state.

- In Tennessee an amendment was attached to a pending bill that would have resulted in the withholding of state tax incentives for new wood chipping facilities, pending an assessment of the impact the facility would have on resource availability (i.e. growth to removal ratios). The amendment exempted companies that were certified under the SFI program.

The need for forest protection policy in the South

In other states (i.e. California, Oregon, Washington and Maine) where industrial logging has reached unsustainable levels, state legislatures have passed comprehensive State Forest Practices Acts. There are currently no State Forest Practices Acts in any states in the southern region to provide legal protections to ensure the long-term sustainability of the

South's forests. Voluntary programs are insufficient to address the magnitude of the unsustainable demands being placed on the South's forests. Until such comprehensive policy is in place, a moratorium on the expansion of wood chipping facilities is in order.

The need for reduced pressure on Southern forests through greater use of recycled fiber

The current rate of harvest for paper and OSB production is unsustainable. Government policy alone will not be enough to ensure the protection of southern forests. **Unless market pressure is taken off southern forests, we will never see truly sustainable forest management in the region.** With 4.6 million acres a year being logged to make paper alone, the most logical place to start is by increasing the amount of recycled fiber used in the manufacture of paper. Large retailers of paper products must start demanding higher post-consumer recycled content from their suppliers.

For example, a company like Staples, the largest and fastest growing office supply superstore in the world, could have a positive impact on southern forests by demanding higher post-consumer content recycled paper from their biggest suppliers, International Paper – the largest paper producer in

the southern region and Georgia Pacific – the second largest paper producer in the South.

In the absence of immediate strong government and corporate leadership, the uniquely diverse southern forests will quickly become nothing more than an industrialized tree factory for large paper companies. Those who live in the South and enjoy the quality of life that southern forests bring to their lives deserve better. Our children and grandchildren have a right to experience a quality of life that includes all the mysteries and wonders our native southern forests provide.

References

- Abt, R.C., G Pacheco and F. W. Cabbage, 1993, The Southern Timber Supply Model: Model Development and Application in North Carolina proceeding Southern Forestry Economic Workshop, EP 183-192.
- Bellamy, Thomas R., 1974, Southern Pulpwood Production, 1973, Resource Bulletin SE-29. Asheville, NC, Department of Agriculture, Forest Service, Southern Research Station, 22 pp.
- Cruikshank, James W. 1954. 1953 Pulpwood Production in the South, Forest Survey Release No. 43. Asheville, NC, U.S. Department of Agriculture, Forest Service Southeastern Forest Experiment Station, 30 p.
- Cabbage, Fred W. 2001. Personal communication with Doug Murray in May, 2001.
- Cabbage, Fred W. et al, The Ecological and Economic Impacts of Wood Chip Production in North Carolina, prepared for the NC Department of Environment and Natural Resources, September 2000.
- Cabbage, Fred W., and Robert Abt Southern Timber Supply: Implications for the Pulp & Paper Sector, PaperAge Vol. 114, n. 2, February 1998.
- Heaton, Kate, Behind the Logo: An Assessment of the Sustainable Forestry Initiative in Comparison with the Forest Stewardship Council in the USA, a report prepared for FERN by Kate Heaton, Natural Resources Defense Council, March 2001.
- Howell, Michael Hartsell, 1995. Southern Pulpwood Production, 1993. Resource Bulletin SE-152, Asheville, NC, Department of Agriculture, Forest Service, Southern Research Station, 24 p.
- Howard, James I. 2001. U.S. Timber Production, Trade, Consumption, and Price Statistics 1965 to 1999, Res. Pap. FPL-RP-595. Madison, WI, U.S. Department of Agriculture, Forest Service, Forest Products Laboratory, 90 p.

- Hutchins, Cecil C. Jr., 1985, Southern Pulpwood Production, 1983, Resource Bulletin SE-79. Asheville, NC, Department of Agriculture, Forest Service, Southern Research Station, 26 pp.
- Johnson, Tony G. and Carolyn D. Steppleton. 2000. Southern Pulpwood Production, 1998, Resource Bulletin SRS-50. Asheville, NC, Department of Agriculture, Forest Service, Southern Research Station, 34 p.
- Knight, Herbert A. and Nichols, 1964. Southern Pulpwood Production, 1963, USFS Resource bulletin SE-63, Asheville, NC, Department of Agriculture, Forest Service, Southern Research Station, 28pp
- McKeever, Tim and Henry Spelter. 1998. Wood-Based Panel Plant Locations and Timber Availability in Selected U.S. States, Gen. Tech. Rep. FPL-GTR-103. Madison, WI, U.S. Department of Agriculture, Forest Service, Forest Practices Laboratory. 53 p.
- McWilliams, William H.; Mills and Burkman, "The State of the Nation's Forestland," National Woodlands (Citing USFS, April 1993)
- Pacheco, Geraldo, Robert C. Abt, and Fred W. Cabbage. 1996. Southwide timber supply projection and assessment. Paper presented at the 1996 Southern Forest Economics Workshop, Gatlinburg, TN, March 27-29, 1996.
- Ricketts, Taylor H., Eric Dinerstein, and David M. Olson. 1999. Terrestrial Ecoregions of North America — A Conservation Assessment, Island Press, Washington, D.C., World Wildlife Fund, 485 pp).
- Smith ,Brad W. , Sheffield, Raymond M.. 2000 A Brief Overview of the Forest Resources of the United States, 1997 (and attached RPA tables). USDA Forest Service, Washington, D.C. and Asheville, NC (NOTE: This document contains a brief overview of the forest resource situation in the United States based upon data compiled for 1997. A separate document with more detailed trend analysis is in preparation.)
- Smith, Danna, Chipping Forests and Jobs: A Report on the Economic and Environmental Impacts of Chip Mills in the Southeast, published by Dogwood Alliance, August 1997.
- USDA Forest Serviv, South RPA Region Timberland and Growing Stock Summary; Forest Resources of the United States, compiled by W.V. Smith December 1999.

Appendix A: Note on Method Used to Determine Harvest Rates

The 1998 harvest rate arrived at in this study was determined based on the actual consumption of chip using industries (pulp/paper and oriented strand board) plus the pulpwood exports from the region. Consumption rates of the mills are based on reports from the mills and not based on sampling or statistical projections (Johnson, 2000 and McKeever, 1998). Regional imports were then subtracted from the total of mill consumption and an acreage figure was calculated by using USFS figures of an average of 40 tons per acre for

pulpwood tonnage for native Southeastern hardwood and softwood forests (Cabbage, 2001). The data were further refined by assuming that approximately 20% of the Southeastern softwood production comes from pine plantations that produce approximately 80 tons per acre (Cabbage, 2001). The results of this analysis for the four years of most recent data are shown in Table 2 in the text.