

The Southern Center for Sustainable Forests

ABSTRACT OF STUDY RESULTS: ECONOMIC AND ECOLOGIC IMPACTS ASSOCIATED WITH WOOD CHIP PRODUCTION IN NORTH CAROLINA

**Rex Schaberg, P.B. Aruna, Frederick Cabbage, Daniel Richter,
George Hess, Robert Abt, James Gregory, Sarah Warren,
Anthony Snider, Brandon Greco, Stacy Sherling, and John Dodrill**

The North Carolina Wood Chip Mill Study examined the economic and ecological impacts associated with production of wood chips at 18 satellite chip mills and with timber harvesting in the state of North Carolina. The integrated study used interdependent data and models to analyze and project forest resource conditions and land area change, timber product outputs, timber supply projections, soil erosion rates, and wildlife habitat. Additional related analyses examined timber market structure, forest inventory impacts around new mills, stormwater runoff practices at chip mills, opinions of community members near mills, and economic benefits generated by wood chip markets for private forest landowners. The study was conducted by researchers at Duke University and North Carolina State University—partners in the Southern Center for Sustainable Forests. Extensive public input for the study was facilitated by the NC State Natural Resources Leadership Institute.

The study found that North Carolina's forest land area increased from 1938 to 1964, and has decreased since then. Forests covered 19.3 million acres in the state in 1990, or about 62% of the total land area. Total softwood and hardwood timber volumes in North Carolina increased from 14.7 billion to 32.7 billion cubic feet from 1938 to 1990, or a 122% increase. Softwood volumes increased from 7.4 to 12.5 billion cubic feet (a 69% increase). Hardwood volumes increased from 7.3 to 20.2 billion cubic feet (a 175% increase).

Large forest land losses occurred in North Carolina from 1982 to 1997, averaging about 77,000 acres per year, or -0.35 annually. Urban land area increased more than a million acres from 1982 to 1997, or 111,000 acres per year. In comparison, by 2000, timber harvests were estimated to affect about 500,000 acres per year, with 350,000 of those acres being clearcut and about 50,000 of those clearcut acres being needed to furnish wood chip mills. About 350,000 forested acres per year were affected by natural disasters such as hurricanes, fires, and insects and disease during the 1980s.

Pulpwood production has comprised about 40% of the timber harvest in North Carolina. Between 1990 and 1997, pine pulpwood production volumes increased 24%; hardwood pulpwood production increased 17%; and combined pulpwood production increased 21%. In 1997, wood chip mills processed about 27% of the state's pulpwood harvest, and 12% of the state's total timber harvest. About 15% of the pulpwood in the Coastal Plain was processed by wood chip mills; 49% in the Piedmont; and 75% in the Mountains. In 1997, 25% of North Carolina pulpwood production was exported to other states, and 6% was exported out of the country.

Wood chip mills were statistically correlated with an increase in timber production and harvest in the state, especially in the Piedmont and Mountains. Wood chip mills would require the equivalent of about 1000 acres per 100,000 tons of capacity per year to provide the wood for each mill. They were generally located in areas where wood supply was plentiful, and usually would not individually make harvest levels exceed growth levels in the areas within 50 miles of the mills. However, the cumulative effects of overlapping mill procurement zones and other product harvests required additional analyses as part of the state-wide timber supply situation.

Timber supply projections were made for private forest lands. They assumed that timber harvest rates would increase about 1% per year, and forest land losses would occur at the -0.35% per year, distributed per historical trends among the five major forest management types in the state. The projections indicated that softwood removals on private forest lands exceeded growth as of 1990, and would continue to do so, decreasing total softwood inventory to 10.3 billion cubic feet by 2020, from the 1990 level of 11.2 billion cubic feet. Hardwood removals would exceed growth by about 2005, decreasing projected inventory slightly from 17.5 billion cubic feet in 1990 to 17.3 billion cubic feet in 2020. Thus total projected timber removals exceeded growth by 262 million cubic feet per year by 2020. About 152 million cubic feet (58%) of the annual removals in excess of growth

could be attributed to increased timber harvests, and 42% to land losses. For hardwoods, increased timber harvests caused almost all (89%) of the incremental reduced inventory levels that were projected to occur from 1990 to 2020. For softwoods, land losses accounted for all the incremental inventory decreases.

The planted pine area was projected to increase about 1.1 million acres between 1990 and 2020, and natural pine management types were projected to decrease by about 1.1 million acres. All other natural forest management types were projected to decline from about 225,000 acres (lowland hardwoods) to 500,000 acres (upland hardwoods and mixed-pine hardwoods) from 1990 to 2010. These timber harvest increases would alter forest structures on private forest lands, generally creating more young seral stages after harvests, and fewer old growth seral stages. The Coastal Plain and Piedmont had the most adverse effects of projected changes on forest habitat for bird, amphibian, and reptile species identified as being of conservation concern in the state. Most species of conservation concern would experience increases in their forest habitat in the Mountains, with only a few species being adversely affected. If management of public lands favors mature forests, their addition would not change the projections much in the Coastal Plain; reverse much of the generally adverse wildlife habitat impacts in the Piedmont; and improve conditions even more for species in the Mountains. Field surveys indicated that sites harvested partially for chip mills had less residual woody debris than other harvests.

For the state of North Carolina in aggregate, agricultural lands were computed to contribute about 54% of the total erosion load in the state as of 1997; urban land was estimated to contribute about 25%; minor land uses about 8.5%; forest land uses about 6.7%; and rural transportation about 2.9%. The approximate area of newly disturbed urban land and rural roads contributed about 14.2% per year. Undisturbed natural forests contributed about 4.5% to the state's erosion as of 1997. All timber harvest practices probably contributed about 1% more of the state's erosion load, with wood chip harvests probably about 0.1%, and mechanical site preparation perhaps another 1.2%. State forestry surveys indicate that forestry Best Management Practices (BMPs) have been widely used, with more than 90% of timber harvests inspected being found in compliance.

Visual surveys of 12 of the 18 chip mills in the state found that they have effective stormwater management plans and practices, with little indication of adverse effects on water quality from mill discharges. Accelerated channel erosion was the most common stormwater problem at wood chip mills, and could be reduced by using BMPs (detention ponds, water bars, filter, terracing, etc.). Stream water quality sampling was not performed.

As of 1996, forest products firms employed 105,000 people and the nature-based tourism industry employed about 91,000 people. Total employee compensation in the wood-based industries was \$3.2 billion; for tourism it was \$1.4 billion. Thus the average wood based industry annual wage was \$30,800. The average tourism sector annual wage was \$15,500. Industrial output was \$13.5 billion for the forest products industry in 1996, and \$3.9 billion for the tourism sector. Total sales value for all travel and tourism in 1984 was \$8.3 billion. Value added for the forest products industry was \$4.9 billion and was \$2.2 billion for the nature-based tourism sector. From 1977 to 1996, the wood-based industries grew more slowly than the rest of the state's economy; the nature-based tourism sector grew more rapidly. Regional economic multipliers for the wood-based sector were slightly larger than those for the nature-based tourism sector. Nonmarket values estimates could equal or exceed the estimates of direct market values from forest products or from tourism.

Wood chip mills contributed to greater integration among timber markets in the state, leading to about \$5 million or more in added returns received by nonindustrial private forest landowners. Social impact analysis found that polarization is increasing particularly because of the growing perception that private properties provide public benefits, resulting in conflict and confusion related to private property rights and responsibilities. Differences of opinion and perception are exacerbated by economic and social stress in the state's rural communities.