Identifying Loggers’ Reactions and Priorities in an Increasingly Fragmented Landscape

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**ABSTRACT** – Through the process of parcelization, tracts of undeveloped land are subdivided, sold, and often converted to urban or exurban land-uses. Some consequences of sprawl-type growth include habitat fragmentation, reduced water quality, and forest management difficulty. The changing values of neighboring landowners, the management restrictions they impose, and the productivity losses from reduced tract size alone make it difficult for loggers to maintain viability. To investigate the effects of parcelization on the logging workforce, a repeatable survey was distributed to the members of two professional timber producer organizations in South Carolina. Questions inquired about trends in changing parcel size, moving and hauling costs, and crew characteristics. Seventy-three percent of respondents have noticed a reduction in tract size. In 1998, the majority of respondents were harvesting tracts 80 acres or larger, whereas now most loggers operate on 20-40 acre tracts. Thirty-two percent have adapted by reducing their number of employees; 26 percent by downsizing their system; 15 percent by refusing to harvest small tracts; and 13 percent by increasing their productivity. Thirteen percent of respondents have made no adjustments whatsoever. In addition to observing a reduction in parcel size, loggers have identified that fuel prices (36.5 percent) and fixed costs (31.1 percent) are also to blame for a diminishing workforce.

**INTRODUCTION**

The subdivision of contiguous tracts at the Wildland-Urban Interface (WUI) contributes to urban sprawl, habitat fragmentation, and a reduced economic yield of managed resources, including forest products (Macie and Hermansen 2003). This problem is pronounced in the southeastern United States where smaller parcels diminish the economies of scale in highly mechanized harvesting operations. As the previously undeveloped wildland is subdivided and resold in smaller parcels, some forest owners resist the pressure to build, leading to a fragmentation of forest resources. Fragmentation reduces the likelihood that remaining forested properties will later be managed or harvested (Barlow et al. 1998). Timber producers here must also adapt to changing business pressures resulting from increasing residential populations and changing resident values, as population density has been shown to have an inverse effect on probability of harvest (Wear et al. 1999, Sampson and DeCoster 2000).
Background

The majority of privately owned forests in the U.S. occur in the form of NIPFs; occupying 363 million acres, under 10.3 million owners (Blinn et al. 2007). The average NIPF size is 24 acres (Lapierre and Germain 2005). Ten million acres of NIPFs were lost to development between 1982 and 1997, with 70 percent more lost between 1992 and 1997 than from 1982 to 1991 (Best 2002). Where population density is 19 people per square mile the probability of management is 75 percent (Sampson and DeCoste 2000), and where population exceeds 150 individuals per square mile, it is unlikely that management will occur (Wear et al. 1999).

Approximately 58 percent of the southern forest land base is under the NIPF category of ‘family forest owners’ (Butler 2008). Twenty-six percent of forestland is in counties with more than 250,000 people, occupying about 28 million acres; 43 percent of which is unmanageable for timber resources (Barlow et al. 1998). In Georgia, Atlanta sprawl consumed about 355,500 acres between 1982 and 1997 (Best 2002), and from 1982 to 1989, parcels less than 10 acres in size increased almost 7 percent, while parcels greater than 200 acres decreased about 18 percent (Greene et al. 1997). Though overall productivity in Georgia has increased over the last 20 years, loggers have noticed a decreased return on investment from factors related to parcel subdivision and changing landowner values (Baker and Greene 2008).

South Carolina’s NIPFs accounted for 74 percent of the state’s 12.3 million acres of timberland as of 1993 (Thompson 1997). Sixteen percent (1.5 million acres) were in tracts greater than 500 acres; 31 percent (2.8 million acres) were in tracts between 101 and 500 acres, and 10 percent (0.9 million acres) were in tracts 10 acres or less. The dominant size category was between 11 and 100 acres, accounting for 43 percent (3.9 million acres).

Concern for Profitability

Row (1978) found that economies of scale for minimized harvest cost were effective between 20 and 40 acres, and that they are negatively impacted by reduced parcel size. Similarly, Greene et al. (1997) found that in Georgia harvesting costs increase rapidly on tracts less than 50 acres, and there is little motivation for harvesting tracts less than 20 acres. Parcelization and changing land use leads to a reduced number of timber sales, while logger expenses (fuel, machinery, hauling, and labor) can increase on smaller tracts. Small parcels may be suitable for harvesting, but this is unlikely in the southeast where most harvesting systems are highly mechanized.

Moving costs should include the cost of transporting equipment between sites, wages paid to unproductive employees, fixed costs for idle equipment, and the value of timber not being actively harvested (Cubbage 1982). Small partially-mechanized systems may cost between $400 and $1,100 per move, while highly mechanized systems may cost between $2,200 and $5,400 per move (Cubbage 1982, adjusted to 2008 dollars). Small systems cost less to move, and require less time to move than highly mechanized systems.

Reference:
METHODS

A repeatable survey instrument was designed to assess the threats of parcelization on SC timber producers and the forest products industry. Mailing lists of logging contractors were obtained from the South Carolina Timber Producers Association (SCTPA) and the South Carolina Forestry Association’s Timber Operations Professionals (TOP) program. The initial survey population consisted of 437 firms contacted during the summer of 2008.

Modeled after Dillman’s Tailored Design Method (2000), the survey materials were distributed in four separate mailings. The first mailing included a prenotice letter; the second mailing included the 28-question survey with accompanying cover letter, a letter of support from the President of the SCTPA, and a Clemson Forestry decal as a token of appreciation. The third mailing included a reminder/thank you postcard, and a fourth mailing containing one additional survey was distributed to nonrespondents. The survey questions addressed topics like firm demographics, parcelization and tolerances, moving and hauling, reactions to rising costs, and firm priorities.

Completed questionnaires from responding firms were recorded in a spreadsheet upon their receipt. Responses were coded using numerical representations of the answer, permitting the calculation of descriptive statistics. Most analyses included simple averages and percentage calculations.

RESULTS AND DISCUSSION

Of the 437 questionnaires that were successfully mailed, 179 were completed and returned, yielding a total response rate of 41 percent. The questionnaire was divided into five sections including firm demographics, parcelization and tolerances of reduced tract size, moving and hauling, reactions to rising costs, and logging firm priorities. The first four sections inquired about their average time and dollars spent carrying out various tasks associated with timber production. The loss of competition among logging firms and its influence was the subject of the fifth section.

Firm Demographics

Sixty-two percent of respondents obtain at least 80 percent of their production from family forests, while 15 percent of respondents produce 60 to 80 percent of their timber from family forests. This indicates a dependence on family-forests for a continuous timber supply. Twenty-four percent of the responding firms are located in the lowcountry of SC, 23 percent in the midlands, and 53 percent in the upstate. Average family forest dependence in the lowcountry is 40 to 60 percent, and 60 to 80 percent in the midlands and upstate. Twenty-two percent of responding firms were established in the 1970s; 27 percent during the 1980s, and 34 percent have been established since 1990.

With usage at 90 percent, a large majority of respondents operate a conventional feller-buncher/skidder system, three percent operate a track-feller/skidder system, one percent operate a harvester/forwarder system, and six percent operate a manual system. For their main product, most firms (48 percent) harvest softwood pulpwood, 23 percent harvest softwood sawtimber, 18 percent harvest hardwood pulpwood, and 10 percent harvest hardwood sawtimber. Only one percent of firms included fuelwood as a major product. Highly mechanized systems like the feller-buncher/skidder system are popular throughout the southeast where firms are focused on high
system productivity and pulpwood extraction. As tracts continue to subdivide, loggers should find a balance between the productivity of the traditional feller-buncher/skidder system, and the moving efficiency of a smaller system with fewer pieces of equipment.

**Parcelization and Tolerances**

Seventy-three percent of responding firms noticed a reduction in parcel size in recent years. In reaction, 32 percent have reduced their number of employees, and 26 percent have downsized their system. Other adaptations included refusing to harvest smaller tracts (15 percent), increasing system productivity (13 percent), or making no adjustments to their operation whatsoever (15 percent). Forty-nine percent of respondents modified their system in two or more ways to cope with reduced tract size; the most common combination being a reduction in employee number and pieces of equipment.

As identified in Table 1, 33 percent of logging firms were harvesting tracts 80 acres or greater in 1998, while only 8 percent were harvesting tracts less than 10 acres. Currently, 33 percent of respondents are harvesting tracts between 20 and 40 acres, and 14 percent harvest on tracts less than 10 acres. During the next 10 years, respondents expect the distribution of tract size to be such that 26 percent of operations are on tracts less than 10 acres; 25 percent on 10 to 20 acre tracts, and 27 percent on 20 to 40 acre tracts. They estimate that 17 percent of operations will be on 40 to 80 acre tracts and only 5 percent on tracts greater than 80 acres.

Twenty percent of respondents said they would consider harvesting tracts 10 acres or less; 27 percent would harvest 10 to 20 acre tracts, and 24 percent would harvest 20 to 40 acre tracts. Twenty-nine percent would only consider harvesting tracts at or greater-than 40 acres. Fifteen percent of respondents would tolerate production levels of 1 load or less per acre; 41 percent would tolerate production levels of 2 loads per acre, and about 44 percent would require a minimum of 3 loads per acre (Table 2). Respondents are concerned about other site factors such as tree volume, timber quality, terrain, and the amount of site-preparation and other special practices required (e.g. Best Management Practices). Forty-five percent of firms are spending 2 to 4 weeks on each tract, though most (43 percent) would consider moving their operation for 4 to 6 working days.

<table>
<thead>
<tr>
<th>Tract size</th>
<th>% response</th>
<th>Working days</th>
<th>% response</th>
<th>Loads per acre</th>
<th>% response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;10 ac.</td>
<td>20</td>
<td>≤3 days</td>
<td>16</td>
<td>&lt;1 load</td>
<td>3</td>
</tr>
<tr>
<td>10-20 ac.</td>
<td>27</td>
<td>4-6 days</td>
<td>44</td>
<td>1 load</td>
<td>12</td>
</tr>
<tr>
<td>20-40 ac.</td>
<td>24</td>
<td>7-10 days</td>
<td>22</td>
<td>2 loads</td>
<td>41</td>
</tr>
<tr>
<td>40-80 ac.</td>
<td>21</td>
<td>11-15 days</td>
<td>9</td>
<td>3 loads</td>
<td>16</td>
</tr>
<tr>
<td>&gt;80 ac.</td>
<td>8</td>
<td>&gt;15 days</td>
<td>10</td>
<td>&gt;3 loads</td>
<td>28</td>
</tr>
</tbody>
</table>

Reference:
Moving and Hauling

Fifty-six percent of respondents haul their products between 40 and 60 miles for processing, and 26 percent haul between 20 and 40 miles. Only two responding firms (1 percent) haul to a processing facility within 20 miles of their operation – both are located in the SC upstate. Forty-eight percent of firms own and operate their own trucks; 13 percent completely contract their secondary transport, and 38 percent use a combination of company-managed and contract trucking.

Fifty-seven percent of harvesting sites are 20 to 40 miles apart and 26 percent are 40 to 60 miles apart. Most respondents (35 percent) spend 4 to 6 hours moving between sites; 23 percent require 2 to 4 hours to move, and 22 percent require 6 to 8 hours per move (Table 3). To minimize the disruption of moving, most logging operations move their system either after hours (27 percent), during the weekend (29 percent), or in phases (30 percent).

Table 3: Parameters for moving between tracts.

<table>
<thead>
<tr>
<th>Distance</th>
<th>% response</th>
<th>Time</th>
<th>% response</th>
<th>Cost</th>
<th>% response</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20 miles</td>
<td>13</td>
<td>&lt;2 hours</td>
<td>5</td>
<td>&lt;$0.25/ton</td>
<td>2</td>
</tr>
<tr>
<td>20-40 miles</td>
<td>56</td>
<td>2-4 hours</td>
<td>23</td>
<td>$0.25-0.75/ton</td>
<td>16</td>
</tr>
<tr>
<td>40-60 miles</td>
<td>26</td>
<td>4-6 hours</td>
<td>35</td>
<td>$0.75-1.25/ton</td>
<td>19</td>
</tr>
<tr>
<td>60-80 miles</td>
<td>5</td>
<td>6-8 hours</td>
<td>22</td>
<td>&gt;$1.25/ton</td>
<td>25</td>
</tr>
<tr>
<td>&gt;80 miles</td>
<td>1</td>
<td>&gt;8 hours</td>
<td>15</td>
<td>Don't know</td>
<td>39</td>
</tr>
</tbody>
</table>

Reactions to Rising Costs

The survey was distributed from June to August 2008, when fuel prices were at their recent all-time high. During these months the national price for low-sulfur diesel fuel averaged $4.48 per gallon (EIA 2008). In reaction to high fuel prices 31 percent of respondents reduced their number of employees; 27 percent downsized their system; 14 percent purchased more fuel-efficient equipment; 11 percent have not adjusted their system at all, and 17 percent have modified their system in various other ways. These include minimizing moving or hauling distance, reducing their number of days worked per week, reducing skid distance, cutting only high quality timber, hauling loads over legal weight limits, and cutting their family forest to pay for fuel. Many loggers have considered terminating their operation altogether. Respondents adjusted their systems similarly in reaction to high fixed costs.

Firms employing less than 3 people per crew increased from 22 percent in 1998 to 42 percent in 2008 (Table 4). Twenty-three percent of firms had 6 to 8 employees ten years ago, whereas now only 7 percent of firms employ 6 to 8 people. A diminishing workforce has negative consequences for unemployed operators and the future of the forest products industry.

Table 4. Changes in crew size in South Carolina.

<table>
<thead>
<tr>
<th></th>
<th>≤3 employees</th>
<th>4-6 employees</th>
<th>6-8 employees</th>
<th>8-10 employees</th>
<th>≥11 employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 years ago</td>
<td>22</td>
<td>31</td>
<td>23</td>
<td>13</td>
<td>11</td>
</tr>
<tr>
<td>5 years ago</td>
<td>23</td>
<td>39</td>
<td>23</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Currently</td>
<td>42</td>
<td>44</td>
<td>7</td>
<td>5</td>
<td>3</td>
</tr>
</tbody>
</table>

Reference:
Logging Firm Priorities

Eighty-seven percent of respondents have noticed a reduction in competing logging contractors – only 11 percent of respondents consider parcel size to be a contributing factor. Thirty-seven percent of firms credit fuel-related expenses as contributing to a loss in competition; 31 percent of responding contractors blame high fixed costs, and only 15 percent of respondents feel that the logging-workforce availability is contributing to a loss in competing contractors. Firms are attempting to streamline their crews by reducing employee numbers, implying that an adequate workforce is readily available, but budgetary constraints (related primarily to fuel expenses) have forced companies to downsize. Six percent of respondents list other reasons for reduced competition, including low log value, mill quota, equipment repair expenses, and poor silvicultural practices. All of the above factors, including fuel-related expenses, will increasingly constrict loggers if parcelization continues at its current rate.

CONCLUSION

Population growth and development are leading to a reduction in NIPF size, and changing resident values are influencing the way timber is harvested. It can be assumed that logging companies are harvesting a greater number of tracts through increasingly selective measures to maintain production levels and business viability. Regionally comparable studies have identified that firms are increasing the mechanization level of their operation, and their moving frequency. According to this research, South Carolina timber producers have observed a decrease in parcel size in the NIPF family forests category. Respondents admit that during the next ten years they may face challenges for rising fuel costs and fixed costs, and a more limited availability of timber. This survey identifies that many loggers have taken measures to reduce the size of their system, usually by cutting their number of employees, or their number of pieces of equipment. As parcel subdivision continues, firms will continue to make decisions about the scale of their harvesting system. In a smaller system a logging contractor may realize:

- Reduced capital investment – fewer pieces of equipment
- Reduced fixed costs – fewer employees
- Less site-damage – easier BMP compliance
- Reduced moving time – fewer trips
- Reduced moving expenses – fewer working hours and less volume sacrificed

As a limiting factor, parcelization is not yet so great that firms cannot adapt, so they need not divest themselves of highly mechanized equipment. However, many companies are struggling and making extreme sacrifices just to stay in business, particularly from high fuel expenses and fixed costs. The scale of the system should properly address the scale of the site, and loggers should be aware of this as parcelization becomes a greater hindrance to their productivity. Timber quality, yield, and accessibility may be the most important factors for maintaining firm viability as parcels continue to subdivide. Fostering good relationships among neighboring forest owners and among the forestry professions may improve the effectiveness of cooperative management. Landowners and professionals should be active in local land-use planning efforts, to encourage the perpetuity of contiguous and continuous supplies of forest resources.

Reference:
REFERENCES


Reference: