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Mechanization, Safety, and Manpower in Southern Forestry: 21st Annual Forestry Symposium, 1972

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21st ANNUAL
FORESTRY SYMPOSIUM 1972

MECHANIZATION, SAFETY, AND MANPOWER
IN SOUTHERN FORESTRY

LOUISIANA STATE UNIVERSITY
DIVISION OF CONTINUING EDUCATION
BATON ROUGE
21ST ANNUAL
FORESTRY SYMPOSIUM
MECHANIZATION, SAFETY, AND MANPOWER
IN SOUTHERN FORESTRY

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BATON ROUGE
FOREWORD

The title chosen for this volume of our Forestry Symposium series may, at first glance, disturb some readers. After all, it is a collection of papers presented at a symposium. And the classic definition of "symposium" is a conference where one subject is discussed in depth. How then can the three subjects listed in the title qualify under such a definition?

The fact is that mechanization, safety, and manpower are all parts of the single topic "People in the woods." No longer is there unlimited labor to produce timber crops from our southern forests, so changes have come surging upon us in the recent past. One less worker means that much less production unless all the others are more efficient, have better tools to work with, and remain healthy.

Our accident record in forest operations is one of the poorest in all industries. The 1970 Occupational Safety and Health Act has already brought about some noteworthy changes in attitudes among woods workers. This is, hopefully, a first step toward greatly improved safety practices in forestry.

The term "sophisticated" is frequently applied to the many machines designed to lift seedlings or prepare forest sites for planting or harvesting trees. Most of them are complex and expensive, and all of us agree that we can't afford to trust a marginal worker with such costly and powerful equipment. So the real heart of the matter--oversimplified, of course--is how to find the people we need, train them in higher skills, and mold them into a team which not only can, but wants to achieve better production as a matter of pride as well as enlightened self-interest.

Until recent years, the woods worker in the South has been a woods laborer. Too frequently he was a person of little education and limited skills. Yet he was for the most part a hard worker, willing if not content, to accept some discomfort and personal hazard as a tacit condition of employment. Now he is becoming a skilled technician, better prepared for modern woods work, but also
more aware of his surroundings. The supervisor who seeks stabil-
ity in his work force must therefore modernize his thinking in
terms of reducing this discomfort and these hazards as far as
possible.

A recent study conducted in one county in the South confirmed
the view already held privately by many foresters in the area,
that the average citizen does not have a very high regard for a
career of employment in the woods. Such opinions have prompted
industrial spokesmen to express the belief that to attract better
woods workers it is important to "change the image" of the worker.
The statement is undoubtedly correct, but in the context of this
symposium it is a phrase which goes only part way in describing
the forester's interest in the workman. It leaves out the compas-
sion of the resource manager for the people who help him manage it.
Omitted too is his compassion for, and abiding interest in, the
land as a resource, with its productive capacities for wildlife,
water, and recreation, as well as timber.

But the forest manager can no longer be content with solving
only the problems implicit in his operations and afterward relax
and admire his technical abilities. Now in addition to satisfy-
ing his examiners in the conference room of his corporation or
agency, he must also answer to a new examining group, the general
public. This group is quick to express opinions about his
forestry activities sometimes in a quite emotional manner. Yet
this causes foresters to reevaluate and defend their decisions.
If they are ecologically sound and reasonable, as a vast majority
of them are, the thoughtful public will support them strongly.
If they are not sound, they should be discarded anyway.

So although he may employ the men and machines to produce
crops of timber and in the short run may ruffle the fur of one or
another segment of the public, the forest manager is ever seeking
ways to better these men and machines. Thus he can protect his
base—the good earth. After all, the forest may furnish his live-
lihood, intrigue him as a student, and involve him as a concerned
citizen, but it also brings him much pleasure as a sportsman, a
recreationist, and a conservationist.

Robert W. McDermid,
Editor
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21st Annual
Forestry Symposium

1972
PART I

MECHANIZATION IN SOUTHERN FORESTRY
ENGINEERING SYSTEMS FOR INTENSIVE FOREST MANAGEMENT IN AN ENVIRONMENTALLY-ORIENTED SOCIETY

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Hudson Pulp & Paper Corp.
Palatka, Florida

THE ENVIRONMENTALLY-ORIENTED SOCIETY

A systems approach takes into account as many relevant factors as possible which may have a bearing on the subject of study. Seldom today do we find engineers or scientists dealing with an isolated circumstance or technique. Awareness of the interrelatedness and interdependence of widely differing phenomena is one of the hallmarks of our time. Often in the past, serious mistakes have been made in forest management because we failed to look at a broad enough spectrum of factors influencing a given course of action.

One of the very important, but still often overlooked factors that must be considered in the intensive forest management of the 1970's is the growing environmental concern of the society within which we operate. Engineering systems for forest management which ignore this factor will have difficulty in succeeding.

"Ecology" and "environment" have become commonplace household words in recent years. Yet, forest industry continues to ignore the far-reaching implications of the changing attitude of the public in this area until it comes face to face with regulations prohibiting or seriously limiting forest management prerogatives. The idea that education of the public to what we are doing and why will let us continue with business as usual is still prevalent among forest industry leaders. Yet, our severest critics are those most familiar with our operations. To see the problem as simply the public's emotional reaction to preservationist groups such as Audubon and the Sierra Club is to overlook the realities of the new conservation.
It has been said that conservation interest runs in cycles of 20 to 30 years, and that the current peak of interest will subside as has often happened in the past. Certain differences in the current upsurge in conservation and environmental interest need to be recognized. Past peaks of interest seem to have been limited to relatively small but influential groups of people such as those who urged resource conservation during the T. R. Roosevelt era. Often the interest was regional as, for example, the efforts to save the California redwoods at a time when the magnificent stands of bald cypress in the South were being logged into oblivion with scarcely a voice raised in protest. Today's interest in environmental conservation covers the entire nation and all classes of people. Its support is widespread, stretching from concern for the death of living coral reefs in the Florida Keys by construction-caused siltation to the effects of an oil pipeline on the fauna and flora of the arctic tundra in Alaska.

The new conservation is largely built upon the land ethic suggested by Aldo Leopold, a forester whose stature among conservationists has continued to increase since his death in 1948. It gained its major impetus from the publication of the prophetic book *Silent Spring* by Rachel Carson in 1962. Industry and agriculture seriously underestimated the impact of this book written by an extraordinarily articulate woman with a masters degree in Biology from Johns Hopkins University who had spent years with the U.S. Fish and Wildlife Service documenting the effect of pesticides on wildlife.

An often overlooked phenomenon is the part played by vicarious experience in the widespread interest displayed by our society in environmental issues. While the effects of a dam and canal on the Oklawaha River in Florida will only be local, the death of several hundred acres of flooded trees becomes a national issue with coverage in newspapers from coast to coast. Why, when only a few people even in the counties where the Oklawaha is located have ever navigated its twisting channels?

A reader of a national conservation magazine finds that he has a special interest in the beautiful Green River basin in Wyoming after reading an article on the threat to this area posed by a proposed dam. He may never visit this remote area, yet it gives him great satisfaction just to know it is there. An extreme case of vicarious experience is exemplified by proponents for closing certain wilderness areas to all human visitors (including the wilderness proponents!) with the satisfaction coming from their just knowing that a place exists untouched by the influence of man. We are all influenced by our vicarious experiences, yet only recently has the importance of this phenomenon been recognized.

As forest managers, this says to us that we must concern ourselves as much with the public that only hears or reads about what we are doing as with those who may actually visit our operations.

Do not underestimate the influence of the new conservation.
To do so could result in actions which would seriously harm a viable forest industry. It would also be foolhardy to take too much comfort in the fact that people will have to make a choice between cutting down trees or doing without housing and paper products. They may choose to keep the trees or, more probably, it could prove impossible to convince the public that there is any kind of relationship between the two choices.

If an environmentally-oriented society is here to stay and the concern will increase instead of abate, does this mean that the forest manager should throw up his hands in despair? Many have thus reacted when forest management practices have been caught up in environmental controversy. A more fitting reaction would be to accept the challenge of designing engineering systems for intensive forest management that are compatible with a sound land-use and conservation ethic.

The Challenge

When consideration has been given to the impact of forest management on the environment too often we have concerned ourselves with minimizing the adverse impact, usually at some additional cost to the landowner as when leaving screening vegetation along roads. This need not be the case. Very often, carefully planned and executed forest management practices can have highly beneficial effects on wildlife, watershed and esthetic values. I would like to review, from experience in the Southeastern coastal plain three areas where forest management practices offer real possibilities of creative design for positive environmental impact, in most cases at no additional cost.

Water Control

The first of these areas is water control. The attention given to the engineering of forest-land drainage has seldom been more than cursory, the only requirement for a drainage canal having been that the outlet was at a lower elevation than the inlet. Ditches have been dug in straight lines, ignoring ground contours and natural drainages. However, the day of haphazard and unplanned drainage is fast coming to an end. State departments responsible for maintenance of water quality are taking a closer look at forest drainage. Currently in Florida, dredge and fill regulations are being promulgated which will apply to drainage of forest land. Reasonable control of this activity has been generally accepted by Florida's forest industry. Recently, for example, one major forest industry voluntarily filled in portions of a drainage canal that did not meet State requirements.

Some of us have taken a closer look at what has passed for water control in the past and found glaring deficiencies. While a properly-engineered water-control system can be one of the best investments in intensive forest management, the goal must encompass more than just getting rid of water. Overdrainage is common and seldom has provision been made for maintenance of an optimum
water table. We are aware, for instance, that optimum growth of pine usually occurs in flatwoods when the water table does not drop below 18" to 36". The goal for such areas should be to maintain this level. In hardwood stands, the optimum is often a saturated soil subject to some flooding and water-control systems involving swamplands must be designed accordingly.

Pollution of a receiving stream by silt from forest land drainage will increasingly concern conservationists. Oversize canals, high water velocities and outlets directly into streams will come under close scrutiny. It is often desirable for canals to discharge into swampland instead of a stream so that sheet flow can be maintained to allow for natural filtering and desilting.

With the use of well-designed canals and structures, we can attain goals of excess water removal without reducing site or water quality, and we may find that our costs are lower.

Wetlands have become one of the sacred cows of the new conservation and we can expect increasing pressure against drainage of swamps and ponds. When all costs are considered drainage of such areas is many times ill advised from the economic standpoint.

Serious consideration needs to be given to the aesthetics of canal design. Canals can be constructed to resemble small meandering streams and very often this is the cheapest method with a minimum of earthmoving and generally low maintenance. Particular attention should also be given to the use of shallow "V" or parabolic waterways where they are applicable.

I would like to emphasize that good water-control design requires more than formulas; it requires a feel for land forms and water-flow characteristics. Creative solutions are possible and the challenge of the 70's will be to consider all of the many factors influenced by the engineering of a water-control system for forest lands.

Regeneration

"Clearcutting" has become a dirty word to many in our society, even to those who have no idea what the word means. The merits of even-aged management of intolerant species are, of course, well known to the practicing forester. Informed wildlifers are also well aware of the rapid buildup of desirable forbs, grasses and shrubs following the clearcutting of a dense stand of pine. While the term "clearcut" has become a red flag, criticism of the practice itself has generally resulted from misuse of this valuable practice in the clearing of excessively large areas at one time.

A systems approach to pine regeneration in the South will often show that such large-block clearcutting practices may in fact be poor economics. We have become enamored of economies of scale and the capabilities of large land-clearing equipment to
the point that we have failed to heed some of the realities of forest regeneration.

Economies of scale accrue to site preparation mainly from one source--equipment moving costs. Let's take a look at the cost of moving a piece of site-preparation equipment, say a tractor and harrow, a distance of 30 miles. Truck-transport operating costs, lost production and labor will normally not exceed $75 for a move. Prorating this moving cost over various acreage results as follows:

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<th>Area</th>
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<tr>
<td>100 acres</td>
<td>75¢</td>
</tr>
<tr>
<td>500 acres</td>
<td>15¢</td>
</tr>
<tr>
<td>1000 acres</td>
<td>7 1/2¢</td>
</tr>
<tr>
<td>5000 acres</td>
<td>1 1/2¢</td>
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If we are comparing, for instance, the clearcutting of an entire 5,000 acre block with cutting only one-fifth of this area at intervals of several years, we are only increasing the cost of site preparation by this tractor and harrow by 6¢ per acre. Even with several pieces of equipment on the job, the added cost would probably not exceed 50¢ per acre. Almost certainly the reduced fire hazard of a dispersion of age classes within a cutting block would more than offset this additional site preparation cost. Ideally, each of the five age classes would not occur contiguously, but would be made up of scattered stands of 150 to 200 acres at most. Such a practice would provide a major improvement in wildlife habitat and also in the esthetics of timber harvesting and regeneration and at the same time provide a degree of natural protection against fire, insects and disease.

While I am not trying to define the optimum size of cutting area for every organization, I would encourage consideration of all of the implications, some rather costly, of large clear cuts. And remember, this is one aspect of our forest operations that has received much criticism from the public. Take a close look at your regeneration system. Is it really optimum where all factors are considered?

A further consideration in forest regeneration is whether all sites are worth regenerating. Many of the most valuable wildlife habitats and esthetically valuable vegetation types are only marginal for production of timber species. Much of the sandhill oak scrub in the Southeast fits this category. Vast areas of this type have been cleared to establish slash pine plantations at a cost of $40 - $60 per acre. Where the site index (age 25) is 50 or less, such areas will seldom produce sufficient growth to justify the cost. Careful regeneration planning and analysis of soil profiles will prevent this wasteful practice. In Florida, we have found that many of our xeric hammocks are only marginal pine producers even though the lush appearance of the original stand of live oak, magnolia and hickory gives the impression of a productive soil. This is an outstanding example of a fragile site that has progressed
through long stages of ecological development, but which when destroyed, leaves a rather barren soil. The key is found in the soil profile. Careful planning would allow the conversion of the better soils to pine, leaving islands of native scrub for wildlife and esthetic purposes at no cost to the landowner; another example of the systems approach benefiting landowner and public alike. Intensive forest management has too often meant the expenditure of large sums per acre for site preparation whereas it should mean obtaining the maximum benefit from every acre and this does not always mean timber production.

Another place where the systems approach to intensive forest management may find us wanting is in the large-scale use of bedding for pine regeneration. We all know the benefits of bedding in improved survival and initial growth of seedlings. How many can tell what the increased cost of logging these stands will be? Hundreds of thousands of acres of forest land have been banded in the South without the first study of the effect of this practice on logging cost. Yet, logging is just as important a part of the intensive forest management system as regeneration. Of particular interest in this regard are the alternatives to bedding on wet sites. Research at the University of Florida has indicated that the same growth improvement on wet savanna soils can be achieved by the use of phosphorus and nitrogen fertilizers in relatively small quantities. Excess water can be controlled in many cases by a system of low-cost shallow ditches. Have we looked carefully at the alternatives to the bedding bandwagon? The hunter and other outdoor recreationists look at bedding with something less than enthusiasm. Does this practice deserve the widespread use in the 70's that it has found in the past decade?

Before we leave the subject of regeneration, let's look at an almost forgotten practice—natural regeneration. Most forest industries acquired land that had been repeatedly cut over and otherwise mismanaged. Often, little was available in the way of a seed source, brush had encroached and artificial regeneration seemed to be the only alternative. We now are rapidly reaching the point where our timber harvesting is in the well-stocked stands established during the 40's and early 50's. Volumes run high, stumps are a serious impediment to mechanical site preparation and the value difference between pulpwood and products such as poles, sawtimber and veneer is increasing. Are conditions ripe for a return to more natural regeneration, particularly the shelterwood system? Such a system provides sufficient seed for regeneration even during a series of poor seed years and provides for the growth of a portion of the stand into high-value products which currently command a unit price of double or more that of pulpwood. And, of course, few things could please our environmentally-oriented public more. The final stand is cut only after there is visual evidence of the next stand of trees.
Forest Road Construction

The last area that I want to talk about is forest road construction. This area has received little attention in the way of engineering design or consideration of adverse environmental impact. In extreme cases, roads have been built in straight lines with no consideration being given to topographic or physiographic features. Such roads, in addition to being costly to build and maintain, have little to offer from an aesthetic standpoint. Usually, the soils with highest trafficability are found in the transition zones between wetlands and well-drained upland in the Southern coastal plains. Again, as in the case of drainage, a feel for landforms is essential to the design of good forest roads.

Special consideration needs to be given to roads constructed in swamp areas. Undue obstruction of sheet flow, for instance, can have detrimental effects on hardwood growth. Roads constructed with fill removed from deep roadside ditches create difficulty in logging adjacent woods besides seriously altering normal drainage patterns. Possibilities for improvement exist in the use of hauled-in fill. Often such a road can be constructed for the same cost as one using roadside-ditch fill and will usually be easier to maintain because fill material can be selected for trafficability. Needless to say, route selection plays an important part in swamp road construction with particular attention being given to skirting pockets of deep muck for instance. Usually, a well designed road will be an esthetically appealing road, thus accomplishing environmental goals at no additional cost.

The use of hauled-in fill can create one of the most obtrusive eyesores, the borrow pit; usually, a rectangular hole in the ground too deep in water to grow trees and too shallow for fish. Yet, it is a functional necessity in the construction of modern forest roads. However, with only minor modifications and a little imagination this liability can become an asset—a very attractive woodland pond creating habitat for fish, ducks, otter and racoon. In our coastal plain flatwoods, the only special measures required are an irregular shape, sloping sides and a small percentage of the pond area with a minimum water depth of six feet. Some ponds will be eligible for cost-sharing payments under the USDA - ASCS program. These cost-sharing payments will usually offset any additional costs incurred in establishing the fish pond and may be sufficient to reduce the cost below a conventional borrow pit.

CONCLUSION

I have sought here to simply illustrate from our experience in North Florida a few areas where modification of conventional approaches to forest management can actually enhance wildlife and environmental values. We have seen how a systems approach may also result in an optimal solution for an entire forest in the long run where conventional techniques often only provide a misleading minimum cost for one function.
We have not tried to provide answers to every situation; instead, I hope that we have opened your eyes a little wider to the possibilities for creative thinking that can make forest management in the 70's a challenging, profitable and even "fun" endeavor.
Mechanize or go out of business. Loggers and forest managers have been facing those choices for some time. Whenever a piece of equipment wears out, and often before it wears out, it must be replaced with something better. Something that will do more work and require less labor, because labor costs always seem to be getting out of hand. Selection of the proper equipment and systems to get the job done in the woods has become critical. Investments are huge by standards set just a few years ago, and there is little margin for error. Forest Service engineering research is designed to assist in this difficult and seemingly endless task of mechanizing woods operation.

How does engineering research assist? In the ways that seem likely to make the most of limited numbers and resources. Sometimes we design things, sometimes we evaluate equipment and systems, and sometimes we analyze problems with an eye toward an engineering solution.

Although we receive overall direction from the office of the Chief of the Forest Service in Washington, our research effort is largely regional. We are organized into work units that are associated with regional experiment stations. This setup gets us close to real problems, which vary considerably with terrain, market situation, and forest type. The location, staff, and principal efforts of each of the five Forest Service engineering research work units is shown in Table 1. All are on or near university campuses, where there is impressive supplemental expertise, technical reference material, and other facilities.

I lead the southern work unit, which is located at Auburn University. I will try to outline some plans nationwide for stimulating forest mechanization. Most of the discussion, however, will
center on the South, because that is my chief area of interest.

Falcon

Let me begin with an exciting national program that is just on the horizon. It is probably the most ambitious plan ever proposed in forestry research and is named "Forestry, Advanced Logging, and Conservation." It is better known by its acronym FALCON. Its major goal is to help resource managers predict both economic and environmental consequences of logging subsystems. Improved transport subsystems, particularly those involving cableways, balloons, and helicopters, will be emphasized in analyses. In time, tradeoffs and combinations of aerial and more conventional skidding subsystems will be proposed. The objective will be to provide the best configurations consistent with environmental constraints for various logging problems.

Engineers in FALCON will study design and performance of equipment and determine operational requirements. If the program is fully funded, about $10 million will be spent per year for 5 years. Work is scheduled to begin on the West Coast, then spread to the interior West, the South, and the East. We expect significant changes in logging operations as a result of this work.

In the South

Our most recent study is designed to set performance requirements for site preparation equipment. We are having some difficulty in gathering precise data.

Within 2 months we should begin a cooperative study of the effects of ditching and diking in hardwood stands on future mechanization of harvesting.

Within the next 4 months a cooperative study may begin on swamp logging. We think a portable tower with a running skyline partially supported by balloon (skyhook) will prove practical. The aerial show may be evaluated on both drained and wet sections of swamp.

Sometime this year we will enter a joint study with the research foresters at the Naval Stores Laboratory in Olustee, Florida. We will redesign a power chipper, which should eliminate much of the drudgery surrounding collection of gum. The naval stores industry knows it must mechanize gum collection rapidly; most of this work now is done by hand. Newer studies should lead to redesign of a gum harvesting subsystem and to setting of requirements for pipelining gum naval stores.

Cooperative work will continue for another year with the Aerospace Engineering Department at Auburn University on a prototype seed-dispersing device for seeding in three or four rows from
the air. The single-row seeder has attained rates surpassing 5,000 seeds per minute. The multiple-row seeder, which should be airborne this summer, will deliver close to 2,000 seeds per minute through each of three or four orifices. With this machinery, seed requirements may be reduced by about 70 percent over broadcast seeding.

Work continues on another cooperative study at Auburn in the "blue-sky" expanse of programmed levered mechanisms. The design requirement fits a four- or six-legged walking mechanism that might be used in naval stores operations or logmaking, particularly in bottom lands and swamps.

A new concept to which we should devote much of our time is the "fiber-fetcher." We envision a tree-shredding device with a light footprint and sufficient flexibility for operation in plantations or swamps. The initial plan includes recovery of most root fibers to simplify site preparation and planting. Processing would be done at the stump. Fiber would be blown from the shredder through flexible tubing to a van. At this or a later point, fiber would be pulped.

In later models we envision fiber being blown directly from the stump to an electronically controlled "batch-box." Here the tree particles would be mixed with a synthetic resin to form a viscous matrix. Desirable shapes could then be put together by either casting and cooking or by cold-forming. The new dimensional process would consist of building up from tiny particles instead of cutting down from large solid material. Preliminary research suggests that the greatest obstacles are rapid wear of raker teeth during the shredding process and lack of desirable structural properties in expensive epoxies.

All of these and later studies should help establish better man-machine relationships through identification of total energy output per unit production.

Outside the South

Improved mechanical design in skyline carriages and design and layout with portable towers continues. Remote control further reduces labor in some situations.

A working-size pipeline for hydraulically transporting wood chips is slated for construction within the next 2 years. If trees were chipped at the stump and chips piped directly to a processing facility, a very high degree of mechanization and reliability would be attainable.

The separation of bark from chips remains a stubborn problem. Chemical, mechanical, sonic, and vibrating methods have been explored. This research continues.
Mainly through simulation, other forest engineering research seeks the most economical combination of available machines for harvesting within certain ecological boundaries. Such studies invariably lead to redesign or new designs in equipment and to fuller mechanization.
Table 1. Organizational summary of forest engineering research work units

<table>
<thead>
<tr>
<th>Station/City</th>
<th>University Cooperator</th>
<th>Engrs./Techn.</th>
<th>Principal Efforts</th>
<th>Timber/Terrain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pacific Northwest</td>
<td>University of Washington</td>
<td>4/1</td>
<td>Design and evaluation of aerial yarding subsystems.</td>
<td>West Coast, large softwoods/steep slopes</td>
</tr>
<tr>
<td>Seattle, Washington</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intermountain</td>
<td>Montana State University</td>
<td>3/0</td>
<td>Hydraulic transport of wood chips by pipeline. Slope/road stability. Logging systems analysis.</td>
<td>Northern Rockies, relatively smaller softwood timber/steep slopes</td>
</tr>
<tr>
<td>Bozeman, Montana</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North Central</td>
<td>Michigan Technological</td>
<td>4/1</td>
<td>Bark-chip separation. Harvest-transport studies</td>
<td>Upper Lake States, small to medium soft hardwoods/</td>
</tr>
<tr>
<td>Houghton, Michigan</td>
<td>University</td>
<td></td>
<td></td>
<td>moderately hilly</td>
</tr>
<tr>
<td>Northeastern</td>
<td>West Virginia University</td>
<td>4/2</td>
<td>Evaluation of wheeled skidders. Harvest subsystem simulations.</td>
<td>Appalachian area, small softwoods to medium hardwoods/moderately steep slopes</td>
</tr>
<tr>
<td>Morgantown, West Virginia</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Southern</td>
<td>Auburn University</td>
<td>2.8/0</td>
<td>Improvement of regeneration, cultural practices, naval stores, and harvesting subsystems.</td>
<td>Entire Southeast area, small softwoods to medium hardwoods/upland, bottomland, swamps</td>
</tr>
<tr>
<td>Auburn, Alabama</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
SCHEDULED PREVENTIVE MAINTENANCE PROGRAMS

Richard T. Hevey, Forest Engineer
Boise Southern Company
DeRidder, Louisiana

Maintenance, like other "non-productive" activities a manager must organize, usually is a low priority item. This seems to happen for two reasons. First, the equipment may be new. If it is, it is probably running well without much care, making you think that it is maintenance free. Second, we fail to see the close connection between good maintenance and good department performance. Although good maintenance will not guarantee good performance it makes a good performance possible.

The mechanization of the forest industry, in particular the harvesting of trees, means that as operating managers, we must now set up and operate effective scheduled preventive maintenance programs. In the past, relatively little equipment was required, so maintenance was not a big task. This situation has changed rapidly in just a few years. Now we are using huge quantities of equipment that is infinitely more sophisticated than anything we might have used before. Owning and operating equipment has come to be the most significant cost item for nearly all operations.

Along with the increase in sophistication of equipment comes the need for more sophistication of the maintenance program. No more will a "lick and a promise" technique do. Our investment is too high and the penalties too great to operate without a good maintenance program.

SCHEDULES

The basic component of a scheduled preventive maintenance program is the schedule. Without one it is impossible to carry out the program because there are too many details to keep up with. Also, without a schedule it is too easy to procrastinate and delay
necessary services. Generally, if something is scheduled to happen it will, but unscheduled events tend not to happen.

The schedule is a plan of organization. It specifies what is to be done and when, but not how to do it. A maintenance schedule we are all familiar with is the one printed in our car operators manual— if you've read it. Most manufacturers schedules are based on time periods such as "every three months change the oil." Sometimes miles are used as the measure of use. For many of us, with our types of equipment, the best measure of machine use or rate of wear is the hours of actual operation.

A simple, effective, and accurate way of measuring hours of use is to use a mechanical clock. Figure 1 illustrates such a clock. The clock is fastened directly to the machine. Since the clock is activated by machine movement any time the machine moves, a record will be made of that movement in terms of hours. The chart on which the hours of use is recorded provides a permanent record for future use. Figure 2 illustrates a typical chart for a log truck.

The mechanical clock can serve many functions besides the maintenance function. It furnishes the manager with accurate data for more precise scheduling of operations. It can be effective in determining down time and machine utilization. It can also serve as a means of checking on starting and quitting times, or break times without requiring the manager to be on the job at these specific times. Considering the many useful features of the clocks, their high initial cost is justified.

If a mechanical clock is used to record usage, then the maintenance schedule must be in terms of operating hours. Most manufacturer's maintenance recommendations are stated in terms of hours of use, but some, particularly for trucks, are stated in miles. In the latter case, miles must be converted to hours by estimating hours of use per 1,000 miles, or whatever mileage interval the manufacturer uses.

With hours set up as the basic measure of use, the next step in organizing a maintenance program is the most important. Study the manufacturer's recommendations. Note similarities in requirements for similar or related equipment. This step is time consuming, but necessary.

After you are familiar with the requirements of all the machines, attempt to group machines with similar requirements. Usually all the trucks can be grouped. The skidders form another group. Crawlers form a third group, etc. Of course, if you only have one machine, you'll only need one schedule, but with a fleet individual machine schedules would be impossible to administer. Thus, by grouping the units four or five schedules may take care of a whole fleet of machines.

To group machines and use one schedule for the group, compromises will have to be made. Each manufacturer's recommendations or model's recommendations will be different to some degree.
Therefore, longer intervals specified for certain machines in the group will necessarily have to be shortened to conform with the shorter intervals of the rest of the machines. Never lengthen intervals beyond those recommended, except, perhaps slightly. Substantially lengthening the intervals may void the manufacturer's warranty and cause premature failures.

Due to the compromises, some units in a group will be serviced more frequently than necessary. This additional servicing won't harm anything, and only increases cost slightly—if at all. This is only true if the units in the group were relatively similar to begin with. So, group selection is very important.

After the groups have been formed, a schedule of services and procedures must be prepared. Figures 3 and 4 illustrate a maintenance schedule for a group of skidders. Since the group consists of different models, not all of the services on the schedule will apply to every unit in the group.

**RECORD KEEPING**

Incident to the formulation of a maintenance schedule is the development of a record keeping system. Without good up-to-date records, a maintenance program is nearly useless. Records, although painful to keep, are the backbone of practically any endeavor, including maintenance.

Before you can develop a record system it is necessary to be able to positively identify each machine. Assigning a number to each unit is the easiest way to accomplish this. The number should be prominently painted on each machine to avoid errors in the field.

We have already touched on one item of the record keeping system. The clock chart is the basic record and provides data input from the field that is accurate and relatively free of human error.

From the clock chart, a machine use summary can be prepared. Figure 5 is an example of such a summary. You will note that the summary is for one machine for one year.

The daily hours of operation are accumulated on the summary so that total use is always known. "Total hours" is important, so you can determine when servicing is required. At the bottom of the summary sheet is a space for recording the service intervals and actual service time. On the sample summary sheet, the service intervals are 100 hours, 200 hours, and 800 hours. In the first block labeled "Serviced Last," the number 1739 appears. Thus the last 100 hour service was performed at 1739 hours. The 1739 hours of total use was reached on April 5, 1971. The date of service is determined by checking the accumulated hours of use data for the number 1739. The schedule calls for servicing every 100 hours, so the "Next Scheduled Service" block has the number 1839 in it. When 1839 was reached a 100 hour service plus a 200 hour service was performed. Subsequent blocks indicate additional 100 and 200 hour
services performed. Finally, at the block labeled "Next Scheduled Service" with the number 2539 in it, a 100 hour, 200 hour and 800 hour service was performed according to the maintenance schedule.

To the right of the scheduled services blocks is a section for annual inspection services. Here the procedure is the same, except that the interval is every 1500 hours. There is no written procedure for the annual inspection. The maintenance shop is simply instructed to thoroughly clean, tear down and inspect the entire unit. All parts that need replacing are replaced or repaired. Any part that will not last until the next 1500 hour inspection is replaced. All adjustments are checked and the unit is assembled. Finally, a new coat of paint is applied.

A clerk prepares and keeps the Machine Use Summaries, and when a 100 hour service is due, or an annual inspection, she notifies the foreman by radio, telling him what service is required. Each crew foreman has a book containing all the maintenance schedules and procedures. When notified by the clerk that maintenance is required, he has the machine operator or the mechanic perform all the listed services.

On Figure 3, line 38, it says, "Complete a Periodic Service Report." This report, illustrated in Figure 6, is a small card that the operator and/or the mechanic date and sign whenever a schedule service is completed. The card is forwarded to the clerk, who records the total hours of use on the date of servicing in the "Serviced Last" box on the bottom of the summary sheet.

This system centralizes all record keeping and eliminates one job the foreman ordinarily performs, thus freeing him to spend more time being a foreman instead of a bookkeeper. It also allows more efficient operation of the maintenance shop due to the scheduling of work.

Another item in the record keeping system is the Operator's Shift Report, figures 7 and 8. This report is started at the beginning of the shift and turned in with the clock chart at the end of the shift. The report is a card printed on both sides. The front has spaces for identification of the operator and the machine plus room to report any needed repairs. The seriousness of the required repair is indicated by the foreman checking the red or green block. A red repair means the unit is inoperable until the repair is completed. A green repair is less serious and it can be delayed.

The back of the card (Figure 8) is a daily inspection and service list that the operator can use as a guide. The list is very general and is geared for several types of equipment. All of the listed services would not be performed for every machine.

When the clerk receives the shift report, it is forwarded to the shop if repairs are needed. Otherwise, it is temporarily filed
and eventually destroyed. When the shop foreman receives it, he schedules the repair and returns the card to the clerk when the repair is completed. The mechanic performing the work dates and signs the card in the space provided. All shift reports that indicate the need for repairs are saved as evidence of that repair.

TESTING

You may wonder at times, after your maintenance program is operating, if your service intervals are correct. Perhaps your 100 hour or 200 hour interval is too short or too long. There is a way to determine the validity of the service interval. It is called lube oil analysis.

Samples of used oil from an engine, transmission or other component are secured. Several of the major oil companies and some private laboratories can then conduct several tests on the sample to determine its condition. If the change interval is too long, the lab report will advise a shorter interval. If the oil is contaminated with silicon (sand), glycol (anti-freeze), water, or one of several common engine metals, the degree of contamination will be stated as parts per million.

Figure 9 is an example of a composite lab report for a diesel engine. You will note that the lab report gives the condition of the sample and recommends specific actions.

A system of frequent oil testing will allow you to validate your maintenance schedule intervals and predict or spot incipient failures. Frequently, the lab report turns up engine problems that are not yet externally detectable. Such a service can eliminate or reduce the occurrence of total component failures.

This paper has been necessarily brief and should only serve as an outline of how to organize a scheduled preventive maintenance program. Your individual needs for maintenance will vary and so the best program for your situation will vary. However, scheduling and record keeping will necessarily be a part of every program.

Other factors such as job training for mechanics, shop organization, equipment operator training, and safety training will affect and possibly be a part of your maintenance program. These topics though require more than mention and must be dealt with separately and not forgotten.
Figure 1. Mechanical Clock.
Figure 2. Clock Chart.
Type Equipment:  Skidders

Every 100 hours

1. Change engine oil
2. Change engine oil filter element
3. Drain sediment from fuel strainer and filter
4. Clean crankcase breather element
5. Check tension and condition of drive belts
6. Service air cleaner and check air intake system for leaks
7. Check radiator coolant level
8. Check radiator cap for proper operation
9. Inspect and clean radiator core
10. Inspect fuel, air, oil, and water lines
11. Check hydraulic oil level
12. Check transmission lube level
13. Clean transmission breather
14. Check planetary lube level
15. Check differential lube level
16. Check brake master cylinder fluid level
17. Test service brakes
18. Test parking brake
19. Check brake pedal free travel
20. Check winch reduction box lube level
21. Check winch lube level
22. Check winch cable condition
23. Check battery mounting
24. Check battery electrolyte level
25. Inspect battery cables and connections
26. Lubricate tachometer drive
27. Check operation of all gauges and instruments
28. Check operation of all controls
29. Inspect steering cylinder pivots
30. Check frame hinge for free play
31. Inspect tires and check air pressure
32. Check fire extinguisher
33. Clean belly pans and around engine
34. Inspect all steps, handles, guards and other safety devices
35. Inspect entire skidder for loose hardware
36. Drain fuel tank sediment
37. Lubricate all grease fittings
38. Complete a Periodic Service Report

Figure 3. Major Service Procedures
Type Equipment: Skidders

Every 200 hours
1. Inspect solenoid and starting motor connections
2. Inspect generator connections
3. Lubricate generator bearings
4. Inspect engine and transmission mountings
5. Check wheel stud nut torque
6. Replace fuel filter element
7. Replace fuel strainer element
8. Replace air filter element

Every 800 hours
1. Change hydraulic fluid
2. Replace hydraulic fluid filter element
3. Change transmission fluid
4. Replace transmission fluid filter element
5. Clean transmission fluid strainer
6. Change winch lubricant
7. Change winch reduction box lubricant
8. Change planetary lubricant
9. Change differential lubricant
10. Clean blower screen
11. Drain heat exchanger and clean zinc electrode
12. Clean engine air box drain tubes
13. Check engine valve clearance

Figure 4. Major Service Procedures
Figure 5. Machine Summary.
PERIODIC SERVICE REPORT

The Recommended Major Service Procedures have been performed.

Operator ______________________ (must sign)
Mechanic ______________________
Date _______________ Miles ____________
Equipment No. ____________________

Figure 6. Service Report.
### BOISE SOUTHERN COMPANY

**OPERATOR'S SHIFT REPORT**
- Operator: 
- Date: __/__/__

<table>
<thead>
<tr>
<th>Type Machine</th>
<th>Miles</th>
<th>Equipment No.</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>REPAIRS NEEDED</th>
<th>Red¹</th>
<th>Green²</th>
<th>Mechanic</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

1. Machine cannot operate until repaired
2. Machine can be operated but repairs are needed within 36 hours

**STOP MACHINE FIRES—CLEAN MACHINE DAILY**

(Over)

---

Figure 7. Shift Report (front).
<table>
<thead>
<tr>
<th>DAILY INSPECTIONS AND SERVICES</th>
</tr>
</thead>
<tbody>
<tr>
<td>□ Engine Oil</td>
</tr>
<tr>
<td>□ Hydraulic Oil</td>
</tr>
<tr>
<td>□ Transmission Lube</td>
</tr>
<tr>
<td>□ Radiator Coolant</td>
</tr>
<tr>
<td>□ Clean around Radiator</td>
</tr>
<tr>
<td>□ Clean around Engine</td>
</tr>
<tr>
<td>□ Clean Belly Pans</td>
</tr>
<tr>
<td>□ Check Batteries</td>
</tr>
<tr>
<td>□ Battery Connections</td>
</tr>
<tr>
<td>□ Fuel</td>
</tr>
<tr>
<td>□ Drain Fuel Strainer</td>
</tr>
<tr>
<td>□ Drain Fuel Filter</td>
</tr>
<tr>
<td>□ Drain Fuel Tank Sediment</td>
</tr>
<tr>
<td>□ Service Air Filter</td>
</tr>
<tr>
<td>□ Empty Dust Cup</td>
</tr>
<tr>
<td>□ Water Leaks</td>
</tr>
<tr>
<td>□ Fuel Leaks</td>
</tr>
</tbody>
</table>

(Over)

Figure 8. Shift Report (back).
Coolant additives (Sodium, Chromium) detected with 2.0% water. Inspection disclosed hair-line crack in head.

Feusp. solids abnormal. Indicated need for filter change.

Oil drained and filter changed. Air intake restricted – changed air filter.

High silicon (abrasives) has caused an increase in ring/cylinder wear (iron).

Recommend inspection of air intake system and crankcase flush.

Customer found improperly installed air cleaner element, allowing unfiltered air to reach intake manifold.

Wear condition returns to normal upon proper servicing of air cleaner.

Figure 9. Lab Report.
THE MECHANIZATION OF TIMBER HARVESTING

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Logging Development Program
Canadian Forest Management Institute
Ottawa, Ontario

The term mechanization, like that of automation, has come to be misunderstood by many. It often engenders pictures of destruction and of forest land laid waste. There is no doubt that forests have been destroyed and areas laid waste as a result of the use of machines, but this does not have to be. In truth, the result should be just the opposite. Mechanization should free the logger from all previous constraints and permit him to treat the forest in a manner impossible in the past. Previously, manual and animal power could only drag, and with mechanical aids lift. Mechanization permits an untold variation in the application of power to cut, pick up trees bodily and manipulate them without damage to the residual stand. This could only have been dreamed of before mechanization was introduced, and it represents the mythical "sky-hook" of the old time logger.

Mechanization is simply an agent of science, blind and without direction of its own. Technology in the form of mechanization devises the means to put the laws of science to work. Like the laws of science, mechanization depends upon man's capacity to make use of it and also to protect himself against its inherent perils. To control mechanization demands a superiority over the instruments of production and requires that everything be subordinated to human needs (Giedion, 1969). More of this later.

Mechanization of forest operations just for the sake of mechanization has no place. It must be purposeful and directed. The biological factor is a most important consideration in the mechanization of timber harvesting and the forest engineer must be familiar with the basic principles and practices of silviculture. He must also understand labor, its motivations and desires. It is surely becoming more and more artificial for specialists to meet to discuss
research work with far-reaching social implications while ignoring studiously any discussion of their broader aspects (New Scientist, Editorial Article, 1970).

The effect of mechanization upon silviculture is really only now being studied. Silvicultural methods, which developed primarily in Europe during a relatively static two hundred year period when lumber and timbers were almost the only industrial forest products, must be re-examined in the light of what is now possible when wood fiber is the major, if not the highest, valued use of trees today.

To date in North America, the emphasis in logging operations has been cost and the pressure has always been on the front line to harvest trees at minimum cost, with all other considerations being secondary. Public opinion is rapidly forcing a change in this attitude. Proper mechanization of our harvesting operations should permit the logger to have greater freedom to produce wood at low cost in a manner that would be compatible with public pressures.

The mechanization of timber harvesting is a long-term dynamic process, the ultimate aim of which is to ensure an adequate supply of wood at a cost acceptable to processing plants. The form of the wood produced, whether lumber or wood fiber will be determined by the end-usage. An intensification of mechanization in timber harvesting today is the result of a number of factors: the rise in the level of technology generally, the need for cost maintenance or reduction on behalf of the forest-based industries, the need for increased man-day productivity because of the shortage of adequately trained labor, and the availability of capital for investment in heavy and relatively costly equipment.

With the intensification in the mechanization of timber harvesting, mental attitudes and ways of thinking about these operations have to be or are being changed. Timber harvesting is changing from a plant-cropping operation to an operation producing industrial raw material. The industrial production approach is being extended beyond the mill walls into the forest, at least this is the case in eastern Canada.

Logging methods are giving way to logging systems. The following is a distinction that can be made between logging method and logging system. A method is a manner of procedure for the accomplishment of an end. In this sense, partially mechanized and fully mechanized methods have evolved to date. A system in modern terminology implies a different concept. It may be defined as an assemblage of objects, in this instance, logging machines, arranged in a particular logical sequence. Thus a fully mechanized logging method may be called a system. When considering a method as a system, the difference is both qualitative and quantitative due to the interdependence of the machines involved.

The intensification in the mechanization of timber harvesting
Mechanization of Timber Harvesting

has resulted in a new way of looking at forests. Over the cen-
turies, forests and trees have been studied in great detail from
a biological and physiological point of view. Tree growth in re-
lation to site, genetic characteristics of species, ecologic char-
acteristics of forest stands and many other aspects of trees and
tree communities have been analyzed in depth. Too little atten-
tion has been paid to the physical or engineering characteristics
of trees and forest stands. When logging was labor intensive and
human and animal power were plentiful and cheap, there was little
need to know much about the physical characteristics of trees and
forests. Trees were felled and their products were dragged or
lifted to the roadside. Today, when trees are manipulated by
machines, the forces generated in this equipment vary widely and
to date are little known. Until the physical characteristics of
the crop to be harvested and the environment in which equipment
is to be operated become better established, design and operation
of machinery in the woods will continue to be more of an art than
a science. Too high safety factors will be used and this is costly,
or availability of equipment will be too low.

What is really known about the physical characteristics of
trees - their size distribution throughout the stand, the range in
physical dimensions, in weight, in branchiness? In eastern Canada,
the size-ranges of merchantable trees vary by 200 to 300 per cent
and weights by 1,000 to 2,000 per cent. Studies of the branching
characteristics of pulping softwood species show wide variations
in numbers of branches longitudinally per foot of live crown and,
with all species, show marked variations circumferentially. Limbs
do not occur with any regularity around the stem but always with
an asymmetric pattern. This fact can be of considerable importance
in the design of a delimbing mechanism, for example, as the load-
ing on delimber knives will always vary widely and be asymmetric.

To add to the equipment designer's problems, there are often
marked seasonal changes in tree characteristics. Weight is
affected with changes in moisture content and bark adherence varies
with season. In the north, the ease of debranching varies tremen-
dously, depending upon whether or not the tree is frozen. In win-
ter, limbing becomes easier but bark removal more difficult.

With reference to characteristics of forest stands, our ig-
norance is vast. To the writer's knowledge, no work has been done
in forestry on the effect of tree spacing upon vehicle speeds
within forest stands. Some studies by the U.S. Corps of Engineers
indicate that vehicle speeds are controlled by tree spacing in
relation to the vehicle dimensions. Little is known of the rela-
tionship of sight distance to stand composition and density.
Sight distance has a direct effect upon operator reaction and ve-
hicle speeds in the forest, just as it has on low standard roads.
Another factor affecting vehicle travel within forest stands is
the lack of knowledge of what size, number, and species of trees
are immovable obstacles which would stop and probably seriously
damage a vehicle and what size, number, and species could be en-
countered and overridden without damage to the vehicle.
Logged-over forest areas present formidable obstacles to vehicle travel in the form of stumps, slash, windfalls, and boulders, as well as residual trees. The search for suitable vehicles to operate in this environment continues but to date without too much success.

Horses, which in their day did a good job, have disappeared. Conventional crawler tractors appeared in various applications to carry or drag wood across the logged-over areas. They proved to have a number of shortcomings in this application and, to a large degree, have disappeared from this scene. Subsequently, specially designed soft-tracked machines were introduced but they have met with little success.

Reasons for the failure of tracked vehicles in this environment are many. The conventional tractor with a somewhat rigid track tended to bridge very rough terrain and this over-stressed track components. A loaded track passing over a stump, boulder or windfall creates a very heavy concentrated loading on a single track link, track pins and track roller, whereas under the more favorable conditions (for it) of road construction, bulldozing, etc., the loading would be distributed over the whole track surface in contact with the ground. If a tractor is turned between stumps and comes in contact with them, a strong side thrust may be placed on the track. In forest work, tracks are continually exposed to conditions which tend to over-stress them, shorten their physical life and result in high costs.

Soft-track machines exposed to the same conditions showed the same weaknesses.

Wheels were introduced onto logging operations in the Post World War II period. Their success has not been complete but their performance to date on the whole has been better than that of tracks. Wheeled tractors have smaller ground contact than that of tracks. Tires are flexible and do not tend to jam between stumps. Wheels have the advantage of minimum moving parts and points of wear compared to tracks. In spite of these characteristics, wheels offer high unit ground pressures, up to 18-20 pounds per square inch.

What other ways of wood transport over the extremely rough ground surfaces are possible? The ideal may be some form of walking machine of the types that are under development in the United States. However, because of their great complexity, it is doubtful if any of them will prove sufficiently economic to be used in commercial operations. Under the Falcon program, currently under review in Congress, the United States Forest Service plans to study in depth the possible applications of balloons, helicopters, and S.E.V.s (Surface Effect Vehicles) as means of transporting wood. There are other types of transport which should be considered, such as mobile monorail systems which are capable of moving loads at speeds of 20-25 mph within forest stands or cutovers and are also capable of moving their own tracks within the stand.
This is a most promising technology for rough and also for soft terrain.

Under relatively level, soft-ground conditions, there would appear to be a place for the S.E.V. - A.C.V. (Air Cushion Vehicle) - as it is known in Canada. Developments are moving very rapidly in this technology. Large rafts capable of carrying a 100-ton payload and travelling 6 feet above the ground surface are already in use in the far north. These units are not self-propelled but are pulled by a tug machine, in this instance, a soft-tracked tractor. The Canadian Forest Service has a small test platform which can transport 2.5 tons 2 feet off the ground. It is being used to study this whole phenomenon of movement above the ground surface. If it proves practical, physically and economically, this may be the next major development in the progression of horses, tracks, wheels to ?.

No discussion of logging mechanization would be complete without a discussion of the man-machine relationship and of the implications of complete mechanization to woods labor. This aspect of mechanization cannot be stressed too strongly. As an area of investigation, it lags badly behind all others. I don't know how to interest management in this subject but if the logging researcher can't, time will, because successful mechanization of operations does not simply involve the purchase of this new machine over that old one - the whole complex of training and retraining, of remuneration, of understanding the motivation of your work force is essential to the successful mechanization of our forest operations.

Many instances are known where workers shun the air-conditioned, Muzak-filled cab of a sophisticated machine to work harder for less money under more difficult conditions. Why? I know of one highly mechanized logging camp in Quebec, in eastern Canada, which could not hold men, let alone fill a camp. Five miles away a relatively lower standard camp using labor-intensive cut-and-pile methods was full to overflowing with men sleeping in the washrooms and elsewhere. The only factor that could be established for this was that the latter camp had T.V. reception, the mechanized camp hadn't. It was as simple as that.

Unless advantage is taken of the fact that industrialization of our woods operations is in its relative infancy compared to manufacturing, and woods labor is seriously taken into account during this process, we will probably end up with the same horrible record of labor relations as the rest of industry. In our own self-interest, this whole area of study should be given top priority.

I would like to close with a plea that greater effort be expended in forest-engineering research. The job being done and to be done is enormous and the surface has only been scratched. I believe that we are ahead in Canada because our forest industries have been production oriented from their very beginning. In our
universities, logging is emphasized more than I believe it is in the U.S.A., but even there, it tends to be downplayed. In the Faculties of Forestry, Professors of Logging tend to be on the defensive, under pressure from conservationists. They should be working hard to convince these conservationists that there has to be a continuing industrial use of our forest and that forests can be harvested economically with due regard to the amenities of the landscape and ecological considerations.
### Table II. Harvesting of North American crops

<table>
<thead>
<tr>
<th>Item</th>
<th>Grain (major field crops)</th>
<th>Wood (pulpwood only)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market value - 1966 crop</td>
<td>$13 billion at silo</td>
<td>$2 billion at mill blockpile</td>
</tr>
<tr>
<td></td>
<td>$0.03 per lb.</td>
<td>$0.005 per lb.</td>
</tr>
<tr>
<td>Weight - standing crop</td>
<td>450,000,000 tons</td>
<td>238,000,000 tons</td>
</tr>
<tr>
<td>(including straw and chaff)</td>
<td></td>
<td>(including limbs and tops)</td>
</tr>
<tr>
<td>- processed crop</td>
<td>242,000,000 tons</td>
<td>175,000,000 tons</td>
</tr>
<tr>
<td>Yield per acre - standing crop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>weight</td>
<td>2,800 lbs.</td>
<td>101,000 lbs.</td>
</tr>
<tr>
<td>value</td>
<td>$40</td>
<td>$45</td>
</tr>
<tr>
<td>- processed crop</td>
<td>1,500 lbs.</td>
<td>80,000 lbs.</td>
</tr>
<tr>
<td>weight</td>
<td>$46</td>
<td>$450</td>
</tr>
<tr>
<td>Cost of harvesting and transport</td>
<td>$6 per acre</td>
<td>$400 per acre</td>
</tr>
<tr>
<td></td>
<td>$8 per ton</td>
<td>$10.7 per ton</td>
</tr>
<tr>
<td>Increase in value as a result of processing and transport</td>
<td>15%</td>
<td>890%</td>
</tr>
<tr>
<td>Labor content per ton of crop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Processed and transported</td>
<td>$2.66 or 33%</td>
<td>$6.95 or 65%</td>
</tr>
<tr>
<td>Area cultivated/logged</td>
<td>380,000,000 acres</td>
<td>235,000,000 acres</td>
</tr>
<tr>
<td>Area harvested each year</td>
<td>320,000,000 acres</td>
<td>4,700,000 acres</td>
</tr>
<tr>
<td>Time to grow crop</td>
<td>1 year</td>
<td>20-80 years average 50</td>
</tr>
<tr>
<td>Terrain</td>
<td>Prepared, fertilized level ground</td>
<td>Natural ground, often hilly and rugged</td>
</tr>
</tbody>
</table>

1Mr. D. Spanjer (Massey-Ferguson Ltd., Akron, Ohio) personal communication, 1971.
Table III. Comparison of logging research effort - 1970

<table>
<thead>
<tr>
<th>Country</th>
<th>Approximate Annual Volume Forest Output - Cunits</th>
<th>Logging Research - Prof. Manpower</th>
<th>Research Dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>36,610,000</td>
<td>≥17</td>
<td>686,000</td>
</tr>
<tr>
<td>United States</td>
<td>130,000,000</td>
<td>35</td>
<td>1,185,000</td>
</tr>
<tr>
<td>Sweden</td>
<td>21,000,000</td>
<td>60</td>
<td>840,000</td>
</tr>
<tr>
<td>Norway</td>
<td>3,450,000</td>
<td>34</td>
<td>231,000</td>
</tr>
<tr>
<td>Finland</td>
<td>13,400,000</td>
<td>13</td>
<td>327,000</td>
</tr>
<tr>
<td>Russia</td>
<td>133,000,000</td>
<td>800(1)</td>
<td>-</td>
</tr>
</tbody>
</table>

1 Staff only of the major logging research institute (The Central Scientific Research Institute of Mechanization and Energetics of the Timber Industry).
Table IV. Distribution of professional forest resource research workers in Canada - in 1968*

<table>
<thead>
<tr>
<th>Subject Area</th>
<th>Professional Man Years</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Factors of Environment</td>
<td>119.5</td>
<td>11</td>
</tr>
<tr>
<td>2. Silviculture</td>
<td>107.3</td>
<td>10</td>
</tr>
<tr>
<td>3. Work Science, Forest Engineering</td>
<td>23.1</td>
<td>2</td>
</tr>
<tr>
<td>4. Forest Injuries &amp; Protection</td>
<td>161.1</td>
<td>15</td>
</tr>
<tr>
<td>5. Forest Mensuration</td>
<td>13.2</td>
<td>1</td>
</tr>
<tr>
<td>6. Forest Management</td>
<td>71.3</td>
<td>6</td>
</tr>
<tr>
<td>7. Marketing of Forest Products</td>
<td>22.4</td>
<td>2</td>
</tr>
<tr>
<td>8. Forest Products &amp; Their Utilization</td>
<td>570.7</td>
<td>53</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1088.6</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>

*Source - "Forest Resources Research in Canada" -- Smith & Lessard (Background Study for Science Council of Canada)
Figure 10. Circumferential distribution of branches. Distributions of number of branches and branch stub area per tree by quadrants. Circles are drawn at 5-cunit intervals.

Figure 11. Effect of increased spacing between trees upon vehicle passage.

Figure 12. Visibility within forest stands as related to forest cover types.

Figure 13. Single standing tree override tests. Work required to fail coniferous trees in the United States.

LITERATURE CITED


SIMULATION AS A TOOL FOR FORESTRY DECISIONS

J. R. Strickland
Field Service Coordinator
International Paper Company
Mobile, Alabama

The objective here is to create an awareness of how simulation can be used as a tool for forestry decisions and to briefly review some of the present uses of simulation in forestry making decisions.

What is meant by simulation? Simulation is an artificial representation of a phenomenon, concept, system, or operation by digital representation, usually programmed for solution on a computer and includes the use of laboratory models and "test bed" sites.

Simulation is a very powerful management science tool used by operations research groups and others. Simulation often seems to be a mysterious type of operation. It can be very complex but actually it is logical and includes many disciplines. Statistics, mathematics, computer programming, systems analysis, etc. join with other fields to work together in the new science of make-believe simulation.

Following are some of the advantages of simulation:

1. Decisions concerning future systems in a conceptual stage can be easily made.

2. System performance can be simulated under all conceivable conditions.

3. Results of field system performance can be extrapolated from computer simulation models for purposes of prediction.
4. System trials can be speeded up by incredible orders of magnitude.

5. Artificial, yet realistic data on a system can be provided quickly and in large quantities without having to exercise the real world system.

6. Chance elements associated with a system can be gamed by Monte Carlo method to determine system outcome in a probabilistic context.

7. A model is an extremely flexible device and is adaptable to almost any reasonable application.

8. The model of a conceptual system is useful in forecasting success or failure.

9. Computer modeling and simulation is often the only feasible technique to analyze and evaluate a system.

When determining whether simulation is the proper approach to the solution of a problem, great care should be taken in investigating the situation around the problem. If simulation is in fact a solution to a problem, the first step is to properly define the problem. The next step is to create a model to describe how all the parts of the problem relate to and operate with each other. Modeling in itself is often times worth the whole simulation effort, because in explaining the problem and breaking it down, solutions can become evident without simulation. In other words, a closer look at problem definition often times solves the problem.

The three broad categories of models used in simulation are as follows:

1. Deterministic models represent concepts, systems, or operations in which there are unique outcomes for a given set of inputs.

2. Stochastic or nondeterministic models have functional relationships depending on chance parameters. The outcomes for a given set of inputs can be predicted only in a probabilistic context.

3. Expected value model - one in which the expected values (or means) are assigned to the chance parameters.

For purposes of discussion, examples of harvesting mechanization simulation will be used. Efforts of three separate groups will be discussed.
Simulation as a Tool for Forestry Decisions

JOINT DEVELOPMENT BY THE ROYAL COLLEGE OF FORESTRY, STOCKHOLM, SWEDEN AND THE SWEDISH LOGGING RESEARCH FOUNDATION AND THE CANADIAN FORESTRY SERVICE

A simulation model was developed to simulate mechanized thinning. The model could simulate feller-bunchers, feller-skidders, feller-processors and stump-area processors.

Harvesting machines are expensive to develop and require exhaustive testing before production models can be placed on the market. The system or machine designer has only a slight idea of how a machine on the drawing board will operate when put into a real forest environment. The computer programs for simulating the various machines operated on stands that had been previously selected and carefully documented. Each tree had some nineteen characteristics or features measured and recorded. In addition to studying the effects of machine size and operating speeds, the effect of crown resistance of residual trees on the extraction of felled trees was simulated.

CANADIAN FORESTRY SERVICE - FOREST MANAGEMENT INSTITUTE

Since approximately 1966, the Logging Development Program, Forest Management Institute, Canadian Forestry Service, Ottawa, Ontario, Canada, has been developing models to simulate the operation of pulpwood harvesting machines in forest stands. The effort has resulted in a simulation model known as CANLOG. As information about new or existing machines becomes available, either factual or estimated, the CANLOG system can test the new operations over a wide range of stand conditions. Through simulation, improvements can be made prior to prototype construction or modifications to an existing machine.

CANLOG operates entirely on simulated stands and requires that the following information be known about each stand:

(a) Number of trees and volume per acre
(b) Spatial pattern of the trees
(c) Stand Table
(d) Mean d.b.h., total height, crown length and merchantable height
(e) Standard deviations for each of these variables.

Stands can be generated realistically even if only part of the above information is available. The CANLOG model has been used to simulate at least six types of harvesting machines. Some machine types and associated logging systems used in the tests are as follows:
The CANLOG simulation model can be used by both users and manufacturers of harvesting machines. The answers show the estimated productivity of the machines as they operate in stand conditions which are similar to the real thing.

AMERICAN PULPWOOD ASSOCIATION - HARVESTING RESEARCH PROJECT

The American Pulpwood Association - Harvesting Research Project is located in Atlanta, Georgia and is sponsored by fifteen pulp and paper companies.

One objective the Harvesting Research Project attempted was to compare one harvesting system on many stands of timber or many harvesting systems on one stand of timber. In the past, it has proved difficult if not impossible to be able to compare conventional harvesting systems, for example, against mechanized systems. Or the comparison of one mechanized system against another is very expensive to do on a field operational test basis--try to find two areas of identical conditions on which to operate two different harvesting systems.

Programs were developed and are continuing to be developed by the APA-HRP group. The APA-HRP simulation known as the Harvesting Analysis Technique (HAT) is now in the fourth stage of development. Phases I and II were preliminary proposals and pilot project efforts. Phase III resulted in a deterministic model. Phase IV, which will shortly be operational, will have the capability of a stochastic model.

The HAT technique has been three to four years in development and is a rather complex simulation. The system rests on a base using forest models which are one acre blocks of stands thoroughly described and measured. In Phase IV development, an artificial forest model can be created with certain input parameters. The HAT system generates forest harvesting chances, which can range from one to forty or more acres for the particular simulation on a computer, from the forest models.

The present system, Phase III, is composed of approximately ten different machine simulators.

The Phase III machines can be divided into two broad categories - (1) tree to tree machines, those requiring travel to each individual tree or package; (2) limited areas machines, those which can process more than one tree or package from a given location.

<table>
<thead>
<tr>
<th>Machine Type</th>
<th>Logging System</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feller-buncher</td>
<td>Full tree</td>
</tr>
<tr>
<td>Feller-delimber buncher - (2)</td>
<td>Short tree</td>
</tr>
<tr>
<td>Feller-delimber</td>
<td>Tree length</td>
</tr>
<tr>
<td>Feller-delimber</td>
<td>Tree length (thinning)</td>
</tr>
<tr>
<td>Feller-delimber buncher</td>
<td>Shortwood (thinning)</td>
</tr>
</tbody>
</table>
The tree to tree machines are:
1. Buschcombine
2. Grapple skidder

The following are the limited area machines:
1. TH-100
2. Beloit harvester
3. Prehauler
4. Choker skidder
5. Feller skidder
6. Mobile chipper
7. Limber debarker
8. Feller limber debarker

All of the above machines result in moving material from the stump to on board truck at roadside.

A HAT run permits you to compare one harvesting system on many stands or many systems on one stand because you can recreate or simulate the same harvesting condition over and over and then harvest it with the various system configurations desired. The results show times to harvest a given unit of production with each system. The solution gives the relative ranking of systems, for example, System A versus System B or C. Thus, HAT permits evaluation and determination of which one of several systems is best for a particular set of conditions. HAT can be used also to determine which set of harvesting conditions a system will best operate under. Optimum harvesting condition logic has been used by the Harvesting Research Project and their sponsor companies to test out certain mechanized systems. International Paper Company used HAT to test out the TH-100 and, as a result, further reinforced their decision to purchase a number of these machines. Owens-Illinois investigated the possibilities of putting their track-mounted processor onto a rubber base. OI now is considering further developments on their machine. St. Regis Paper Company analyzed a feller skidder and processor from Sweden. Each HAT model run permitted the companies to test and evaluate a prototype, an engineering design, or an on-going system to determine whether the equipment was suitable for the conditions under which it was to operate. Once a HAT simulation has been developed, if developed properly, it is very inexpensive to operate again and can be run in a short period of time. Also, a HAT system has flexibility - there are points at which various alternatives can be changed. For example, the shear limits on a processor, the stick length, the stand conditions, the timings that go in for processing and many other functions can be changed to test what would happen if conditions were in fact changed.

The Harvesting Analysis Technique can be used by the forest engineer, forest manager, procurement forester, corporate staff and the equipment manufacturer. Some uses of HAT can include the rapid evaluation of harvesting systems, more knowledgeable
selection of equipment, a better insight into the factors affecting harvesting systems and a sounder basis for management decisions.

APPLICATIONS

Criteria

The following general guidelines could be used in determining whether simulation is the appropriate tool for problem solving or decision making:

1. Simulation can be attempted whenever other tools are unavailable or inappropriate.

2. Simulation should be applied only when there is reasonable assurance that the concept, system or operation can be successfully simulated.

3. Simulation can be applied whenever there is an astronomically large volume of computations necessary.

4. Simulation should be tried after all other approaches have been considered and proven to be inappropriate.

5. Simulation should be applied whenever the process of model construction of a system can in itself be a beneficial experience in learning system processes.

Potential

Some of the potential applications of simulation as a tool in making forestry decisions are as follows:

1. Analyze and evaluate operations to determine procedures and integration of men and systems. Determine how human decisions affect operations.

2. Evaluate and analyze systems or machines that are in the conceptual or developmental stage.

3. Analyze and study transportation and traffic problems to select optimum routing. Assist in transportation planning and its impact.

4. Analyze business strategies, such as, business and market trends, cost reductions,
inventory control, resource allocation and product and market distribution.

5. Study problems in the biological sciences to determine the effects of fertilization, drainage, irrigation, genetics, and silviculture practices.

6. Apply to all types of forecasting techniques.

7. Evaluate problems in the engineering sciences, such as harvesting, site preparation and others.

Simulation is or can be used to study mechanization of forest management practices, such as, site preparation, planting, and harvesting. The technique can accept growth models to anticipate results from new and different cultural practices such as, genetically improved planting stock, fertilization, drainage, irrigation, thinnings and spacing studies.

Many simulation models are already available from universities, computer companies and other industrial sources. Some models, now in existence, may already apply to some problem which you are encountering.

Serious consideration should be given to using simulation as a tool in making forestry decisions if this is not the case at present. From past and present personnel experience, both with research and industry, simulation has proven to be a powerful tool in making forestry decisions.
LITERATURE CITED


A review of the meetings of the American Pulpwood Association for the last several years revealed that safety, and most recently the Occupational Safety and Health Act was our most popular subject.

Safety has always been an important topic and it is more important than ever today with the adoption of the Occupational Safety and Health Act (Williams - Steiger Act, 1970).

Passage of the Act signals a failure of voluntary safety programs. This is not to say that there are not many companies in which management has taken an active interest in promoting safety, and they have had effective safety programs, as shown by their injury statistics. But other industrial programs have not proven to be effective. So the Occupational Safety and Health Act was a recognition that all employers were not doing the job as it should be done. And so, in addition to the standard Walsh-Healy Act which used to govern industrial safety we now have the OSHA law added to our entire package of labor legislation.

Anticipating that such law would be adopted, our industry fought hard to have included in the Act some of the items we wanted, even while the bill was being considered in Congress. Our efforts were largely successful and we find now that industry is actually learning, for the most part, to live with the administration of the law. It is the labor unions which are really raising Cain about the way in which it is being implemented. They are complaining that the fines are too low and the inspections aren't as severe as they should be.

I hope you will make sure you're well informed about the law and will do your part to support it. The companies which are
already doing good jobs welcome inspections. Their safety directors consider it to be a consulting service because if the inspectors turn up something the safety department should have found they want to know about it. They want to be sure their company is doing what it should to support and promote safety.

The people at the other end of the scale - those who are not doing good safety jobs - need to be inspected. The attitude some of them have after inspections is amazing! Recently I was a panel member at a meeting in Alabama where this same subject was discussed. My three fellow panel members were all sawmillers who had been inspected and they implied that they should have been dressed in striped convict suits. Yet when they talked about their inspections they complimented the inspector on his attitude. In many cases those inspected said they appreciated learning about the safety hazards from the inspector; they had no complaints about the amounts of the penalties and their attitude was quite progressive.

The administrator of OSHA is George Guenther, a Pennsylvanian. This is the state where the American Pulpwood Association has been supporting an experimental safety program for the past three years, including the time Mr. Guenther was there. During that period we were able to bring about a reduction in the workmen's compensation insurance rate for loggers from $10 to $7 per $100 of payroll. This is a very considerable reduction and it was done on a purely voluntary basis. Mr. Guenther realizes that we can effect safety measures on this voluntary basis in logging - there's really no reason to wait for his inspectors to come to us.

Now for a quick review of the Occupational Safety & Health Act itself. First of all, it applies to all employers. There is no escape. The only persons who are exempt are self-employed persons or bona-fide partnerships with no employees. (Editor's note: President Nixon has vetoed an act which would have exempted firms with less than fifteen employees.)

The general duty clause is the most important part of the Act itself. It places the responsibility squarely on the employer to provide places of employment which are reasonably free of recognized hazards that can cause death or serious injury. And no one can complain about that! It further puts responsibility on the employer to comply with the safety standards promulgated under the Act. There aren't many of us who by now have not seen the standards as published in the Federal Register (1971). These are safety standards that are currently acceptable under the Act and we must be familiar with them. This is especially true for loggers or small sawmill operators.

During the development of the ANSI pulpwood logging standards I served as secretary for the group. It included trade unions, equipment manufacturers (who supply us with equipment), safety organizations, insurance companies and interested experts as well as industrial representatives. This is an example of a situation
where all the people who were concerned with the safety standards got together and helped to develop such standards.

It isn't enough to say "these are the rules and I think they are right." It is necessary to have participation from employer groups too.

The matter of standards is an all inclusive, continuing situation. Those who are involved in forest management and silvicultural activities may feel that not many of these apply to you at present. But there are two types of standards: one is called a horizontal standard and applies to all working circumstances wherever they are located and regardless of the industrial activity. The second type is the vertical standard; one set for each industry. Since logging is a target industry we have been advised by the Secretary of Labor to prepare standards for those areas which are within our sphere of activity.

We are going to begin again, this time writing standards for forest management and silviculture. Currently it appears that the Western Wood Products Association will furnish the secretary for this work, because the American Pulpwood Association is already working on a revision of the logging standards. Each organization that has any interest in these standards will have an opportunity to review them and to suggest additions.

Thus far the inspections have accomplished little except to get the employer's attention. There have been relatively few inspections and the penalties assessed have been small. But the lumber and wood products industry is a target industry because of its high injury frequency rate. Because the logging industry is lumped with sawmills, it is not being inspected as readily as the sawmills. This allows a little more time for us to put our house in order. And there is an important job of education which must be done by industry. One step in the direction is the booklet "What the Occupational Safety and Health Law Means to the Logger," published by the American Pulpwood Association. This booklet condenses all of the necessary information in language the logger can understand. Since there are few unions in the woods, industry has also elected to develop a leaflet to inform the workers of their rights.
DISCUSSION

Question: Does industry have any responsibility to its wood or log producers? Must we see that they comply with the OSHA Act?

Mr. Rolston: It all depends on what you call responsibility. There is certainly no legal responsibility, but a very real moral responsibility involved. Our Board of Directors has told our members in very plain terms that we have responsibilities to develop published material with which to inform the producers. Last year our members purchased 150 2" x 2" slide sets for use in an educational program. At last report they had made personal contact with 8,000 pulpwood producers. We know that 40,000 of our OSHA booklets have been distributed.

Question: As a matter of practical enforcement, considering the relatively small number of inspectors involved, does the small operator need to comply with the OSHA laws?

Mr. Rolston: He should comply as a matter of practical necessity. Small operators are assessed very small penalties. The OSHA inspectors are reasonable, responsible men whose average age is 53 years. Most of them have worked in industry and recognize the problems they encounter. As an example I cite one example of an inspection in New Hampshire. It was made in 40 below zero weather, the inspector was in snow with low shoes for the better part of two days of hard work in the field. The producer made notes of all violations as he was told about the items needing improvement. After the inspection he was fearful of the outcome, yet he was fined $25 on each of three counts. He commented later that the inspection was the least expensive job of safety consulting he had ever encountered.
LITERATURE CITED


Southern forestry practices as we know them today can trace many of their origins to outstanding foresters from the North who were attracted by the opportunities offered by our green pinelands. These conservationists were also good salesmen and they sold the general public on many plans and programs to increase the growing stock on these lands. These programs all required much labor and at that time there was a surplus of labor throughout the South. So these labor intensive programs operated to the advantage of the local people as well as to forestry.

If one were to characterize the Southern labor on which many of the past southern forestry practices rest, it would be safe to say that the labor was willing, that it was abundant and that it was cheap. It would also be correct to say that it was not mobile, in other words, you could not move it from one area to another, that it was poorly trained, that it had low productivity and a very high accident rate.

To summarize, forestry in the South has been based on labor intensive operations using poorly trained but willing labor.

At the present time we are seeing increased demand from the public for the products of our forests, such as for building materials and for recreation. We are also seeing increased demands from the government that woods workers be paid as well as, and
treated as well, as workers in other industries, primarily in factory-type employment. These pressures are coming in the form of social legislation such as the Occupational Safety and Health Act, Minimum Wage, Workman's Compensation Insurance and increased Social Security benefits. We can expect these pressures to increase further in the future and we cannot ignore them.

We must respond by upgrading forest workers and by making them more productive and we can do this only through mechanization and training. Many industry leaders feel that this will require a massive southwide program that will last for years to come and with the payoff being highly skilled and highly paid woods workers. Already in many European countries, primarily in Scandinavia, forest workers are among the safest, best paid and most highly skilled people in their country.

We are developing many new forest management and harvesting techniques that require additional training and skills over what was acceptable for forest workers in the past. Such things as prescribed burning, forest fertilization, aerial spraying and mist blowing, site preparation, tubed seedlings, and forest genetics in forest management and combines, shears, loaders, processors, field chippers, prehaulers and balloons, in our harvesting operations were unheard of a few years ago. On top of this as a result of the rural migration to the cities there is a dwindling labor supply with which we must meet the higher and safer production standards.

We can be proud of what we have accomplished but when we look at some of our operations now and see how hard our workers are working to produce so little and when we realize how hazardous some of these operations are, especially when compared with safety records in other type work that is potentially just as hazardous as our woods work, we realize the massive job ahead.

Now let's make some recommendations regarding safety in our forestry operations. Later on we will summarize our present status and try to pull out a "crystal ball" and predict what our operations in the future will be like.

Safety in the woods includes safe practices in both Forest Management and in Wood Procurement or Logging.

SAFE PRACTICES:

1. Are those practices which prevent accidents that might cause injury to personnel, equipment or property.

2. Include the use of proper clothing and personal equipment to protect us from any hazards.

3. Start with a good mental attitude and the use of proper work procedures.
4. Are a part of any good training program and with good training, plus proper equipment, accidents should not occur.

One of the most hazardous parts of forest management is fire fighting. Unlike most jobs, fire fighters should have loose fitting clothing which will give more protection against burns caused by radiant heat than close fitting clothing, which is normally used for most logging and other forest management jobs. Fire resistant clothing is preferable but if this is not possible, then cotton or wool clothes are preferable to the synthetics which burn more easily. Non-skid leather boots with cuffless trousers, long sleeve shirts, gloves and a hard hat will help protect the fire fighter. In case of bad fire flareups, or in high hazard areas, escape routes should be planned and prepared in advance and work units should have communication with the workers. Fire fighting work can be very strenuous and only men in good physical condition should be used for fire fighting. Rest periods should be provided when working long shifts. Fires normally travel faster up slopes than they do down. Backfires in hilly country often work more satisfactorily if they are started going up hill towards the fire, midway on the slope, in front of the fire. The man who follows the fire plow, setting backfires, should follow far enough behind the plow to allow any saplings that might be pushed over to spring up and to allow the fire plow to back up without being endangered by the backfire. Gasoline should not be used in backfiring torches and men who have spilled fuel or oil on their clothing should not use backfiring torches. In intensive heat situations, face shields are helpful. However, great care should be taken to avoid breathing in flames or real hot air because the lungs can be destroyed. On one fire fighting job a worker was using a back-pack-type torch and the back-pack leaked some fuel onto his clothes. His clothes caught fire and before he could get out of his back-pack and roll on the ground to put out the fire, he had breathed in some of the flames. The worker lived for only three days after the accident.

If you are caught in the field during a lightning storm, one of the best protected places would be the cab of a rubber-tired vehicle. If no other shelter is available, a dense woods or grove of trees will offer some protection. In open country sit or lie down, avoid grouping together, and stay away from any livestock. Avoid large or lone trees and keep away from wire fences, telephone lines and metal tools. If you are ever with someone who is struck by lightning or receives a severe electrical shock, administer mouth to mouth resuscitation, treat him for shock and get medical attention as quickly as possible.

In T.S.I. work where chemicals are being sprayed on brush, the spray equipment should be kept in good repair to prevent leakage. The manufacturer's directions should be followed in handling chemicals because many chemicals can cause burns or skin irritations.
When tree injectors are used, a shield made from a 1 1/2-inch diameter radiator hose can be used to cover the bit while the injector is not in use. Only one man should work on a tree. The injector bit should be kept sharp and when the bit is swung into the tree, the operator's grip should be loose enough so that the tool takes up the jar and not the operator's hands. The worker should be careful that he always has good footing and his swinging of the tool is not blocked by other trees and brush. There are cases where injector tools have cut into a worker's feet and legs when the tool glanced off a tree and twisted into the worker's foot. Injectors should be carried by the handle on the downhill side with the bit trailing to the rear.

Crews that are planting seedlings should wear suitable rain-proof or weather-proof clothing when needed. Care should be taken with planting tools so that they do not swing into toes, feet or legs. Workers should not work directly down hill from another worker in case the uphill worker might dislodge a rock or a stick that could fall and hit the worker below. Workers should be careful when working in brush areas and if necessary, eye protection should be provided.

In machine planting the planter should be guarded to the front and to the side but the back should be left open so that the operator can get out quickly in an emergency. If the planter is pulled through heavy brush areas, the tractor in front of the planter should be provided with a blade to clear the brush away. The man on the planter should watch for sticks or brush that may pole up through the openings in the machine. A buzzer arrangement which the man can push to warn the tractor operator to stop the tractor quickly, or an ignition cutoff switch, or a drawbar release will help protect the man on the planter from being impaled by a stick entering the planter. Exhaust pipes on the tractor should be upright and the exhaust gases directed away from the tractor and planting machine operators.

When scaling logs on loaded trucks, the scaler should make sure that the vehicle is stopped, the brakes are set, and if the motor is not turned off the driver should step down from the cab. If a scaling ramp or platform is not available, a safety ladder leaned against the load can be used in climbing upon the logs. The scaler should watch for any unguarded exhaust stacks on which he might get burned. He should also watch for loose bark, knots, limbs or slick poles that might cause him to fall. While scaling truck loads, the binders should be left attached to the logs.

When timber cruising or running land lines, work should cease when high winds are blowing and blowdowns are likely to occur. In snake-infested country snake protectors or high-top boots should be worn. Metal should not be handled during electrical storms, such as metal range poles, transits, or metal tapes. Caution should also be used when handling a chain or tape near power and telephone lines. Care should be taken when walking along swamped survey lines. Where the brush has been cut, there may be sharp
protruding stubs. In cruising, one arm and hand should be kept free of any equipment to protect against falls or obstructions. When cutting out land lines it is better to use some type of brush hook rather than an axe for clearing small brush.

The following table shows frequency and severity rates for the lumber industry compared with pulp and paper and all industries. The lumber subdivisions of forestry, logging, sawmills and wood preserving are also shown. The Frequency Rate is the number of disabling injuries per million man-hours and a disabling injury occurs when a worker is injured so severely that he cannot work the next full day (does not show up for work the next day at his regular time). If a Forest Management department works 350,000 hours and has three lost-time accidents during this period (usually one year), the Frequency Rate is \((1,000,000 \times 3)\) divided by 350,000 equals 8.57. The Severity Rate is the number of days lost per million man-hours of work. An Injury Index is an additional measure which combines Frequency Rate and Severity. The Frequency rate times Severity is divided by 1,000. This data comes from the National Safety Council pamphlet on Work Injury Rate.

<table>
<thead>
<tr>
<th>NUMBER OF REPORTING UNITS</th>
<th>FREQUENCY RATE</th>
<th>SEVERITY RATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUMBER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forestry</td>
<td>37</td>
<td>9.35</td>
</tr>
<tr>
<td>Logging</td>
<td>81</td>
<td>19.96</td>
</tr>
<tr>
<td>Sawmills</td>
<td>106</td>
<td>19.73</td>
</tr>
<tr>
<td>Wood Preserving</td>
<td>44</td>
<td>11.93</td>
</tr>
<tr>
<td>PULP &amp; PAPER</td>
<td>901</td>
<td>8.34</td>
</tr>
<tr>
<td>ALL INDUSTRIES</td>
<td>13,627</td>
<td>8.09</td>
</tr>
</tbody>
</table>

As of 1970 the longest no-injury record in Forestry was held by the Crossett Division of Georgia-Pacific Corporation. This record was 2,161,744 man-hours and was still continuing at the end of 1970. In logging, the Northwest timber operations of Crown Zellerbach Corp. had a no-injury record of 1,465,366 man-hours.

The American Pulpwood Association summary for 1970 of twenty-five companies which included 39 mill locations, showed that most woodlands injuries were cuts and bruises, with strains and sprains being the next most frequent type. Most of the injuries were to feet, legs, hands, eyes and head. Protective equipment is available for these parts of the body and greater use of protective equipment should help reduce the injury frequency rate.

Wood Procurement is mainly concerned with logging and the Occupational Safety & Health Act has a safety code which loggers must follow. The logger himself should have some protective equipment such as hard toed safety boots, a hard hat or safety helmet...
and gloves, when he is working with wire rope. Eye or face protection is required when chips or sawdust have a tendency to fly into the equipment operator’s face. Dust masks should be provided when dusty conditions warrant their use. Hearing protection shall be provided when sound levels exceed 90 decibels. This protection can be provided by improved muffling, a reduction in exposure time to high decibel noise, or by the use of earmuffs or ear plugs. Each logging operation should have a first aid kit and someone on the logging job proficient in administering first aid. Each logging operation should also have a big fire extinguisher, or better yet, fire extinguishers should be mounted on all the mobile equipment such as the skidders, loaders and trucks. Where equipment is used, the manufacturer's instructions should be followed. These instructions include practices which normally assure the greatest safety for the operator. All mobile equipment should have protective canopies to protect the operators from any falling timber or from limbs or tree tops which have a tendency to snap into the operator's cab when the skidder or prehauler is driving by.

Chain saw operations produce most of the injuries on a logging job. These injuries can be reduced if the chain saw operators will wear special chaps of ballistic nylon which will keep the saw from accidently cutting the operator's legs. Tight handles and guards will help and a good muffler is also necessary. A noisy saw and one that vibrates excessively will quickly tire the operator so that he becomes more prone to accidents. The saw should be held with both hands so that if the saw kicks the chance of hitting the operator is held to a minimum. Chain saws should not be used to cut directly overhead or extended so far in front of the operator that he loses a firm hold on the saw. When the saw is idling, the chain should not move and if the saw is being carried for a long distance it should be shut off. When trees become lodged they should be pulled down with animal or machine equipment. Cutting a second tree in which the first tree is lodged can be very dangerous. Even though the felled tree has hit the ground, it may be pinning some smaller trees underneath it. These trees act as spring poles when they are cut and they should be cut from the underside. If they are cut from the back side, the spring pole will split and the subsequent split may lift up and hit the saw operator. When cutting limbs from large trees, the limbs can spring back or cause the whole tree to shift when the limb is being cut. It is often more prudent to cut a limb two or three feet from the tree trunk to relieve some of the pressure on the limb and allow the tree trunk to settle to a more convenient height for cutting the limb off next to the trunk. When felling timber, large trees should be notched with a notch that cuts about 1/3 of the way through the tree and then the back cut should be a little higher than the notch. This will help the cutter to control the direction of the falling tree. Trees that are not notched and are match cut, (the first cut and the back cut made at the same height) may fall in all almost any direction. On steep slopes, trees should be felled across the hill and not straight up or straight down. Trees that point straight up the hill or straight down may start sliding down the hill at a later time. When bucking on a side hill the
saw operator should stand on the uphill side to reduce the possibility of the log breaking off and pinning him underneath.

When skidding logs, the choker setter should work from the uphill side of the log. He should set his chokers fairly close to the end of the log so that when the log is winched up to the skidder the front of the log will not be pulled into a tire or the back end of the machine. Since the choker setter is handling cable he should be wearing gloves. Where the choker setter is working with the skidder operator, they should have a set of signals that both men understand and the logs should not be winched into the skidder until the skidder operator knows that the choker setter is in a safe position.

Skidders, prehaulers and any other mobile equipment should have seat belts. If this equipment also has a good protective canopy, the operator should stay in his seat if the skidder or prehauler turns over. Most injuries which occur when a skidder turns over, occur when the operator tries to jump off the equipment.

Where hydraulic arm loaders are being used to load pulpwood or logs, the operator should watch for other personnel and he should not load any wood if anyone walks between the equipment and the wood being loaded. When picking up long logs, the operator should be careful not to pick up a log so that the log is higher than his seat and he is sitting directly in line with the log. If the operator should happen to release his grapple grip while the log is in this position, there is a possibility that the log could slide back towards him.

We are not discussing hauling safety in this paper because motor vehicle safety is another safety program in itself.

SPECIFIC RECOMMENDATIONS

The accepted formulas for frequency rates and severity rates that we use show the number of injuries over a given time such as man hours and do not take into account production figures. Therefore, the statistics we have make no valid comparison of the hazards involved in a particular operation and the number of injuries on a per cord basis or some other production standard such as thousand board feet produced or number of trees planted.

A government study developed sometime ago indicates that the injury frequency for all logging in this country is 76.2 accidents per million hours worked. This is an out-of-date figure but we have nothing later to report on this on an industry-wide or country-wide basis. For the past four years the American Pulpwood Association has been collecting statistics on various southern forestry and harvesting categories. These figures develop an injury frequency of 25 for our company harvesting operations. This, in itself, is a terrible frequency but when compared with the frequency
of 76.2 on all logging operations it is much better.

If we could carry this a step further and compile some figures showing the industry frequency rates on highly mechanized operations on a per cord or some other production basis rather than on time, we believe the spread would be even greater. Even though our mechanized operations using highly skilled crews are still hazardous they are much safer than unmechanized operations, but at this time we do not have the information to compare them.

There are many reasons for this widespread disparity in safety but most of them are involved with the professional or full-time logger who is highly trained and highly motivated and is using good equipment as opposed to the part-time logger who is using poor equipment and who is only doing woods work when there is nothing else available to him.

In our opinion, to get our forestry operations in line with the general public's expectations as well as what the government is demanding, our future operations will be highly mechanized. They will either be company-owned or be operating under long-term contracts which provide stability for the labor and for the equipment.

The cost of social legislation will continue to increase the production costs and this will open up more avenues for mechanization and we will continue to reduce the labor input by substituting machines for men.

Our labor will of necessity be better educated and better trained. Many programs such as the two-year program at Northwest Alabama Jr. College and the various high school and industry programs will be training many of the supervisors for our operations. We can expect to see more of these in the future. The JOBS 70 program referred to by Fred Berger has promise of supplying the trained workers we need.
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HEALTH HAZARDS IN SOUTHERN WOODS OPERATIONS

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Considerable interest in health hazards in the forestry industry has been generated by the William-Steiger Occupational Safety and Health Act of 1970 (public law 91-596). Employers will be taking a penetrating look at hazards to their employees. Records and reports of injuries and illnesses that are occurring in the United States will be reported. This research and educational information will be used to prevent occupational hazards associated with forestry operations.

The Occupational Safety and Health Act involves businesses which, within a year, suffer 14,000 deaths and 2,000,000 disabling injuries. The medical profession is involved because of these deaths and injuries and is interested in reducing these figures.

The focal point of medical science advancement has been prevention and not the treatment of acute catastrophic illness. Infant deaths from diarrhea no longer occur, because people wash their hands and practice terminal sterilization of milk. Whooping cough, diphtheria, tetanus, polio and, more recently, measles, are being wiped out because of vaccines. We are hoping that something in this direction will be forthcoming for cancer. Drugs, tobacco, and alcohol are being combated in the field of prevention.

Prevention can reduce society's burden of rehabilitation, compensation, welfare costs, and can eliminate many human tragedies to workers and their families. One of my few personal encounters with logging operations concerns a man with a broken neck, with no insurance provisions for him to obtain treatment.

What are the hazards in southern woods operations? The literature, which had to be my source of material, indicates that either there has been very little study of health problems in southern woods operations or that very few problems exist. Yet,
the logging business has one of the worst possible records in accident frequency and severity, according to National Safety Council records.

The usual hazards are those that occur in any type of business. The common illnesses such as colds, flu, appendicitis, etc., affect the woods workers. "Back injuries" and "hernias" have been employer and employee problems for ages. The man who comes to work for you with a hernia, which is not discovered until later, usually becomes your liability unless a pre-employment physical examination had excluded its presence. The same situation exists with previous back pain or disease. The teaching of proper lifting and working techniques are helpful in preventing these two conditions.

Your most frequent hazard is probably related to injuries, from cuts and bruises to broken bones and accidental death. Prevention in the form of safety procedures, hard hats, safety shoes, etc. are extremely important. In heart attacks and in serious accidents the administration of competent first aid at the scene, and proper handling of the evacuation is the beginning of reducing liability. Forethought, education, and supplies have to be present when the accident occurs.

Norwegian forestry studies say that woods workers average only 10 to 15 per cent higher oxygen consumption (work exertion) than a person doing a sit-down job. An interesting statement by one writer was that such a surprisingly small difference raised questions in his mind that woods workers must have some other physiological superiority which makes them more fit for prolonged muscular work. This makes me think that perhaps forestry people still have Paul Bunyan as their ideal. In the 1930's it was thought that the "easier" your work, the longer you lived. Dr. Morris, in England, compared heart attacks of the sitting bus driver on London buses with the conductor who ran up and down the two-deck buses taking up tickets. The heart attack rate was two times greater in the sitting job. So increased muscular activity is not necessarily bad and certainly not excessive in this day and time. I did not find information concerning heat exhaustion or stroke. Essentially, this is a problem of acclimation.

There are unusual hazards occurring in forestry operations. These may not occur in southern forestry areas. A considerable amount of attention in the literature has been given to Raynaud's disease or phenomenon, vibration induced white finger (VWF), or as it has more recently been labeled, vibration syndrome (Barnes, et al., 1969; Taylor, et al., 1971). Raynaud's disease was described in 1862 and is idiopathic, (from unknown causes), bilateral, with paroxysmal contraction of the arteries and arterioles of the digital vessels, usually without local gangrene. It is felt that it is a local sensitivity of the finger vessels to cold and attacks may be precipitated by immersing the hands in cold water or exposing the body to cold weather.
Raynaud's phenomenon is evidenced by paroxysmal attacks of ischemia of the digits occurring in the course of other illnesses. Such illnesses are scleroderma, thromboangiitis obliterans, cervical rib, arteriosclerosis, crutch paralysis and pneumatic hammer disease. Pneumatic hammer disease was reported in 1911 in Rome, Italy, by Loriga. The diagnosis of Raynaud's disease is made more often in females than males, more commonly between puberty and age 40. It occurs more frequently in the hands than in the feet. It usually occurs bilaterally and symmetrically. The pallor or dead finger look can be reproduced by cold water immersion. Small superficial gangrene may develop at the tips of the fingers after years of duration.

Vibration syndrome, which includes vibration-induced white finger (VWF), has been associated with the use of a chain saw. The Swedish Royal College of Forestry reported 54 per cent of their tree fellers and 49 per cent of the haulage workers reported possible symptoms of the vibration syndrome.

The use of the chain saw has increased steadily since the 1950's. By 1965, 40,000 power saws were sold in Sweden alone and the utilization time had increased up to four to six hours a day. Since the 1960's increasing numbers of blanching of the fingers, sensory feeling loss in the fingers and palms of the hands, coarse tremor of the hands, pain on returning circulation, cyanosis of the fingers, soft spots appearing in the bones of the fingers and cystic areas in the carpal bones, and elbow and shoulder joint pain have been reported. Cold weather or cold objects in the hands contribute to the problem. It was also felt that the prolonged "death grip" on the instrument promoted symptoms. In other words, the intensity of the effort in the hand contributed to the illness. Apparently the greatest risk is at vibration frequencies between 50 to 500 cycles per second with amplitudes that are greater than 0.08 millimeters, particularly for more than four hours a day. Poor maintenance of the chain saws makes vibrations worse. Cold weather has to be a major factor. Smoking increases spasm of the vessels; therefore, may also play a part. There are a number of things that can be done, such as changing the engine to increase the frequency above 500 cycles per second; or reducing the amplitude of the vibrations below 0.08 millimeters; using padding or, preferably, gloves; and elevating the handlebar; or putting antivibratory mechanism on it.

There are still many questions to be answered in relation to this illness. In England a commission recommends what illnesses will be prescribed as a compensatory or occupational type of disease. Vibration induced white finger (VWF) has not yet been prescribed as an occupational disease, although there is much clamoring that this be done. It is felt that if it were to be prescribed, the unscrupulous or misguided workman might abuse the act's provisions since there are so many possible causes. There is, of course, an idiopathic form.

The Forestry Commission in England has made the following
guidelines (Taylor, et al., 1971):

1. Good techniques for felling, crosscutting and snedding (limbing) with lightweight saws, include resting the saw as much as possible on the tree (or occasionally on your thigh when not in operation). Holding the saw as lightly as possible when it is at full throttle (without, of course, reducing effective control of the saw) will reduce the vibration absorbed into the hands;

2. Wearing chain saw gloves spreads the grip over a larger area of your hand;

3. Good blood circulation into the arms and hands gives maximal protection to the flesh, nerve and bones in the hands and this is achieved by warming up before starting the saw and wearing suitable clothing and gloves. It is better to be too warm than cold;

4. Sprockets, guidebars and chains should be well maintained. The chain should be correctly sharpened with the recommended clearance for the depth gauge. Poor maintenance increases vibration;

5. The "safe" limits are based on continuous use of the saw and every time the saw is idling or stopped it gives your hands and arms a chance to recover from the effects of vibration. In other words, there is an element of fatigue. The more evenly breaks and saw usage can be spread throughout the day, the less the risk of any discomfort in the hands. Try to organize stops for fuel, sharpening, meals, piling of timber or other work so that the saw is switched off for at least 10 minutes as often as possible during the day rather than a few longer stoppages.

No reports in southern woods operations were encountered of a case of vibration syndrome. I do not know whether this is poor reporting or whether the temperature prevents its occurrence. There has been a recent case in the courts in Louisiana of a male who had been working with a vibrating screen to separate different sized sand particles and had developed the vibration syndrome. Some of you may know whether or not this condition is occurring in the forestry business. I would assume that it is not prevalent because of the warm weather. Dockworkers using a drill in Britain developed vibration syndrome whereas workers using the similar drill in Singapore did not.

Noise is another accompaniment of the chain saw and machinery in woods operations. There has been considerable study of noise levels, which was precipitated by the now commonplace use of jet aircraft. It has been shown that loud bands will cause hearing loss in young people and this is also true of the chain saw. The most sensitive frequency of our ears is 1,000 to 3,000 cycles per second. The ear receives vibrations on the tympanic membrane which is concave on its outside surface and sets up vibrations in this membrane which is then transmitted to the malleus and from that to the incus and the stapes. The footplate of the stapes fits on an oval window in the middle ear. Muscles attach to these bones
Health Hazards in Southern Woods Operations

(malleus, incus, stapes) which control vibrations of noises of higher frequency. The cochlea, or inner ear, is a spiraled shape organ filled with fluid. Sound waves are converted at this oval window into a fluid wave and this fluid wave is transmitted through the cochlea. Hair cells respond to the frequency of the fluid wave and this is converted to a nerve impulse which is sent to the brain and interpreted as a sound or speech or whatever it may be. The first sign of hearing loss occurs when people complain of inability to understand clearly high-pitched female voices, inability to follow conversation in a group or to hear telephones and other ringing signals. People get annoying ringing in their ears as their loss gets greater. As one hears his own voice less distinctly he begins to start speaking with a loud, modulated voice characteristically associated with the hard of hearing. One can pick up a loss of hearing on an audiometer long before it is detected by the individual. Noise trauma destroys these hair cells on the organ of corti. The first damage is usually noticed around 4,000 cycles per second. This is the so-called "boilermakers notch" and it is at this frequency that hearing loss begins to occur from noise.

Chain saws, at working speeds, are usually producing noise between 100 and 125 decibels. The loudest sounds are in the 600-1,200 cycles per second frequency range. A decibel is usually defined as the smallest difference in sound a human ear can detect. The Walsh-Healey Act specifies that 90 decibels is the maximum permissible noise level for near-continuous eight hour per day exposures at work. At 90 decibels, 22 persons out of 100 in the age group of 46 to 56 years would have their hearing impaired. This is seven more than non-noise exposed groups exhibited. A level of 90 decibels would protect all but seven per cent of this group. It is not only the level of sound in decibels but its frequency and the length of continuous sound that is important. In other words, there is an individual sensitivity to noise that varies in individuals and their ages. At noise levels greater than 100 decibels, 40 hours a week, 50 weeks a year, for five years, 78 per cent of all individuals would not be affected; 12 per cent would have their hearing level raised 25 decibels or greater.

What can be done about this? With the use of earplugs or muffs, one can decrease the level of noise to below 80 decibels which will eliminate the problem. Another thought is to increase the efficiency of silencers (mufflers) that are being used. Organizing the work so that noise is not continuous is an important but overlooked benefit.

Another group of diseases which have current popularity because of their ecological implications are the pneumoconioses. These are changes in the lung produced by prolonged inhalation of dust, usually of a nonliving character - silicosis, asbestosis, coal worker's disease, siderosis (iron ore dust) and byssinosis (cotton dust).
Particles in the air do get into the lungs. Usually particles over 20 microns in diameter settle out of the air fairly rapidly. (A micron is one millionth of a meter.) Particles larger than ten microns are removed by the nose and throat before they reach the larynx. Eighty per cent or more of the particles larger than three microns in size are deposited in the upper respiratory tract before reaching the air sacs of the lungs and fall on the mucociliary apparatus of the nose, nasopharynx and bronchial tubes. These little cilia and their mucus incorporate the particles and through their continuous action, sweep them back upward and you either swallow or expectorate them. Particles less than 0.3 microns in size usually have to be phagocytized (absorbed) by macrophages. These macrophages are large cells that essentially eat the foreign material. These cells are either swept up the bronchial tubes or a portion of it is taken to kernels around the lungs where it remains. Particles greater than one micron in size are removed in hours. Particles smaller than this take days to remove and it is felt that a very small residue of the finest particles may remain permanently.

Pneumoconioses of vegetable origin include farmers' lung from moldy hay; bagassosis from sugar cane pulp; mushroom compost workers' diseases. Silo fillers' disease is caused by inhaling oxides of nitrogen within seven to ten days after a silo is filled. Maple bark disease is a disease similar to farmers' lung and bagassosis in that it is caused by a spore from a fungus, Cryptostroma corticale. This fungus disease produced an epidemic of a pneumonia-like condition in 1962 in a papermill in northern Wisconsin. The spores of this fungus are four to five microns in size and in the room where the logs were being debarked and chipped, the concentration became tremendous and the men inhaled this spore and half of them became sick. By changing the debarking drums so that they would handle 100 inch logs, by spraying the drums with water and detergent to keep the spores from getting into the air and putting the chipman up in a glass box in a positive pressure room to keep the spores from getting to him, the problem was eliminated. It is suggested that possibly redwood tree sawdust might produce a similar reaction but it is not proven.

Asthma and rhinitis (runny nose) have been implicated with the inhalation of dust of the western or Canadian red cedar (thuja plicata) Donn (Gauderia, et al., 1970). The dust of this particular tree is in itself irritating but an allergic or hypersensitivity type of reaction occurs also. Difficulties with this disease, however, have largely been in the furniture factories where the red cedar dust is present in high concentrations. Men who have worked with other woods have had no particular problem but would develop asthma and rhinitis when they began working with red cedar dust.

Basophilic particles of wood dust have been found in air sacs of lungs of furniture workers in Canada who have died from other causes. These particles are believed to represent small particles of wood in the lungs of the patients. There was no proof that any lung disease had resulted. In Oregon, someone reported 50 to 60
per cent of the compensation claims were caused by dermatitis and 25 per cent of these came from the wood and paper industry. It was determined that this was not true and most of the skin problems that were being attributed to "wood poisoning" turned out to be bacterial or fungus infections, contact dermatitis from poison oak and other types of dermatitis not related to wood. There was, however, in the study, evidence that the irritating effect of wood and wood products on the skin was increased and the skin made more vulnerable by moist humidity and continuous wetting of the skin. It was felt that this moisture increased the permeability of the skin, and irritation by materials of low irritant potential was enhanced. I know of no particular occurrence of dermatitis in southern woods operations.

Around 1967 in England, a statistical survey of the years 1956 to 1965 was reported. In Wycombe, the incidence of Hodgkin's disease, which is a type of lymphoma (in the same family as leukemia), was extremely high, and comparable to that of lung cancer in males and breast cancer in females. This was felt to be related to inhalation of wood or adhesive products used in machining in the furniture business. Around the same time a study was done in New York state which suggested that Hodgkin's disease had an increased incidence in woods workers and particularly in Italian-born woods workers. They reported that this incidence was twice that of other people. In 1969, Spiers reported that Hodgkin's disease was possibly being caused from pine pollen. His studies, which took the form of a statistical analysis, suggested that only the workers East of the Rocky Mountains have an excess risk of Hodgkin's disease and he thought that the degree of risk would be dependent upon the extent of the persons' exposure to pine pollen. He may be right, but the input data on how much land was in pine timber and the vital statistics of death from Hodgkin's is not conclusive, as he admits.

In England in 1967, carcinoma of the nose and sinuses adjacent to the nose was reported increased in the furniture industry in Buckinghamshire and Wycombe. This was attributed to the high wood dust deposits on the anterior aspect of the nasal septum and the anterior part of the middle turbinate of the nose. It was felt that the carcinogen was the wood dust, producing a chronic irritating effect. High Wycombe is the largest furniture manufacturing town in England. If you were a wood worker outside of the furniture factory, you did not have an increased incidence of nose cancer.

I did find evidence in the newspaper of a danger lurking in the northern parishes of Louisiana of which you all should be aware. Two-thirds of the confirmed cases of animal rabies in Louisiana in 1971 were in foxes. This occurred in seven north Louisiana parishes. The dogs in these parishes also are affected. There were no human cases. Skunks, coyotes, and bats harbor rabies also. Twelve rabid dogs were found in Louisiana last year. The disease is fatal to the animals except for bats and, as you know, approximately a year ago a boy in Ohio became the first survivor of rabies. Rabbits, rats, squirrels, and hamsters usually do not
contract rabies. If an animal bites someone and you cannot capture it but have to kill it, try to preserve the head for analysis.

The Occupational Safety Act has already stimulated interest and concern for the health of the workers. Physicians can be found to help and advise you if you need assistance. Prevention is certainly the key to reducing disabilities from hazards found in woods operations.
LITERATURE CITED


"The waters deluge man with rain, oppress him with hail, and
drown him with inundations; the air rushes in storms, prepares the
tempest, or lights up the volcano; but the earth, gentle, and in-
dulgent, ever subservient to the wants of man, spreads his walks
with flowers, and his table with plenty; returns, with interest,
every good committed to her care; and though she produces the
poison, she still supplies the antidote; though constantly teased
more to furnish the luxuries of man than his necessities, yet even
to the last she continues her kind indulgence, and, when life is
over, she piously covers his remains in her bosom."

A writer today could hardly improve on these words written
almost 2000 years ago by Pliny, The Elder, describing man's en-
vironment (Edwards, 1957). Through the years as man has gained a
better understanding of Planet Earth, he has also projected an
almost instinctive drive to own, control, possess, develop, and in
most cases, improve the part of Earth's surface for which he feels
a responsibility.

My ideological concept of a fully qualified commercial timber-
land operator would be a person with credentials in forestry,
engineering, law, accounting, psychology, entomology, sales, and
public relations. Since my formal educational qualifications in
the aforementioned "prerequisite" fields are limited, I can best
speak with the authority which arises from some actual experiences
in these areas acquired in twenty-five years as a timber dealer
and forest landowner. To verify the legal authenticity of this
paper, I have called on my friend Thomas Gaughan, Attorney at Law,^,

^Partner, Gaughan, Laney, Barnes, Roberts and Harrell, Camden,
Arkansas.
and a prominent timberland owner and tree farmer in South Arkansas who has taken a keen interest in this matter of the public liability of Southern forest owners.

One of the most rewarding dividends of a career in the timber industry has been the opportunity to acquire timberlands and accept the challenge to apply the techniques of maximum management to them. However, the owning and managing of timberlands has become a responsibility of ever increasing magnitude. Just in the last decade, the population has continued to increase, more leisure time is available, and more people are searching for outdoor recreational opportunities. Transportation facilities have been greatly improved and more Americans have better jobs which enable them to escape the metropolitan areas seeking recreation. In turn they spend millions of dollars on recreational equipment to seek the contrasting advantages of the forest environment. This influx of additional people on forest lands causes an ever increasing liability exposure to the Southern forest owner. Therefore the landowner must recognize his liabilities and assume his responsibility to prevent injury to persons who may be on the land whether authorized or not.

The law defines the liability of the landowner in three categories according to the descriptions of those people who may be on the land:

1. The "invitee" is a person who has been invited on the land by the landowner. The invitation may be specific or implied. In such instances, the landowner has a duty and obligation to exercise reasonable care that the land does not contain dangerous hazards, pitfalls, or conditions that would result in personal injury. If such conditions exist, the landowner must warn the invitee.

2. The "licensee" is a visitor to a landowner's holdings who is permitted by the landowner to use the property, as a person requesting the right to cross the land on a path or roadway. Other examples would include persons on the property pursuant to timber deeds, oil and gas leases, or visiting a deer camp not necessarily owned by the landowner.

3. The "trespasser" is a person on the property without invitation or authorization of the landowner. The law takes the same basic approach to "licensees" as to "trespassers." The landowner owes these people no duty of protection except to refrain from acting in any manner which would cause injury to the persons after their presence has been discovered, nor to willfully or wantonly injure
them. He must exercise reasonable care, including the duty to give fair warning under the circumstances, to avoid injury to the persons after discovering their presence and the risk involved.

The courts would probably find exception to the rule that there is no liability to a "licensee" or "trespasser" and could find a way to hold a landowner liable for damages or injuries resulting from a dangerous condition on private property when the public generally uses a particular part of the property with the landowner's knowledge. For example, if the dangerous condition is adjacent to the roadway, then the court might well say that the landowner should have known that the "trespasser" or "licensee" might leave the roadway and venture onto the adjoining land containing the peril.

Recently, our company purchased timber located where the only hauling road ran next to a 15 foot steep bank of the Ouachita River. Necessarily the trucks hauling this timber came within a few feet of the bank and during a period of high water, the landowner became concerned with his liability in the situation and requested that cutting operations be stopped until a safer condition existed.

Another cause for concern to landowners is the existence of old wells on their land. Arkansas Statutes (Section 41-401) state specifically:

"It shall be unlawful for any corporation, company, individual person or association of persons to leave any shaft, well or other opening uncovered on any unenclosed land. Every corporation, company, individual person or association of persons who shall dig any such shaft, well or other opening, whether for the purpose of mining, or other purpose, shall be required to securely enclose the same, or cover and keep covered with strong and sufficient covering."

The following section (Section 41-402) provides a fine of $25.00 to $100.00 for violation of the statute and further provides that the landowner is liable to any person who may lose any stock by such opening for twice the appraised value of the stock. In regard to people who may be injured by an open well, the law would hold that the violation of this statute would be evidence of negligence, and as a result, the landowner would probably be held liable for any personal injuries to anyone on his land.

A cattleman near Camden, Arkansas recently missed one of his prized thoroughbred cattle. He reported the loss to the law enforcement officials who were unable to locate it. But it was not until several weeks later when buzzards were noticed flying over a particular area that the cattleman discovered his prized cow had
fallen into an old abandoned 40 foot well. This was on land that
had been abandoned in 1941 and sold to the Federal Government for
use as a naval Ammunition Depot and returned to private use in
1961. In all of the intervening years, this old abandoned well
had not been discovered.

It should be pointed out here that the law is different when
it concerns children, and courts apply the doctrine of "attractive
nuisance" to injured children. When this doctrine applies, it
does not matter whether the child is a trespasser, licensee or
invitee. The courts will usually hold the landowner liable for
injuries to children when the landowner has "dangerous instrumen­
talities" on his property that would be attractive to children and
the landowner knows the children are accustomed to go on his land
and that the "dangerous instrumentality" is the kind of thing
attractive to children. The law reasons that the landowner should
have reasonably anticipated that an injury might occur to children
on his land. The extent to which this doctrine is applied usually
depends on the age and maturity of the child involved. Generally,
artificial or natural bodies of water are not held to be attractive
nuisances, at least in the absence of some unusually dangerous
feature, hidden hazard, or a trap. The doctrine has been applied
to situations resulting from fires, caves, tunnels, leaks in pipe­
lines, sandpiles near banks of rivers, bridges, scaffolds, explo­
sives, machinery, and stacked lumber or logs. This doctrine would,
of course, apply to motor patrols, skidders, bull dozers, tractors,
and other logging equipment left on the land that could be con­
strued to be an "attractive nuisance" to a child.

The last decade has brought an increasing awareness among the
American people of their Constitutional rights. The public is
exposed to many hours of television each week including dramatic
presentations of legal cases where large judgments are given to
victims of negligence. Television, radio and the other mass com­
munication media give prominent coverage to actual liability case
awards encouraging people to seek similar settlements when they
have "their day in court."

Many timberland acres have been invaded in recent years by an
ever increasing number of dune buggies and trail bikes which carry
their riders farther and farther into previously inaccessible areas.
And the first rider is followed by a second rider and a third who
often destroy grassy slopes and rut out roads causing erosion and
washouts and other damage, plus the destruction that is done to
young growing timber. And yet the landowner may be found liable
for injuries occurring on his lands from this increased exposure.
Landowner liability is likewise increased by the practice of many
citizens who dump their trash and waste indiscriminately on forest
areas with no regard for the rights of the landowner. Here again
the landowner may be found responsible for injuries to persons com­
ing on his land for the purpose of dumping trash.

The question of ingress and egress is one of increasing im­
portance to landowners. If the land is located adjacent to a well
established public road, or if a seldom traveled country road is
an established dedicated road, or if the County Court has entered
an order declaring the road to be a county road, then there can be little question about the right of the public generally to use the road. In addition, the public may obtain an easement across a person's property by prescription ... that is, actually using the road for a period such as seven years. Certain persons may acquire private easements by the use of a roadway across another's property for a period of several years. By private easement, we mean one that the particular person may use but is not opened to the public generally. An easement acquired by prescription may be lost if gates are placed across the roads and permitted to remain across the road for a period of years (may vary in other states) regardless of whether the gates are kept closed at all times or whether the public is barred from using the road during this period. The public could continue to use the road, closing the gate each time, but after the legal time limit had expired, the court would probably declare the road closed. Other factors that tend to show if a road is a public road are whether counties have worked the roads, whether they are mail route roads, or school bus routes. To further clarify the question of obtaining prescription easement by adverse use, it should be remembered that adverse use means that it is used by a person irrespective of the landowner's rights and without permission. If the landowner can establish that the person using the property obtained permission and acknowledged that he was not using the roadway with any intention of continuing to claim a right to use it, then the seven year statute will not run and the person using the roadway will not acquire the prescriptive right to continue to use it. It is questionable whether many old "log roads" can be classified as private or public easements and the landowner probably could close them at any time.

Arkansas has an interesting statute which was passed in 1871 and, though rarely used, is still occasionally resurrected when a landowner owns property located away from a public road and accessible only by crossing the property of an adjoining landowner. In such a case, the remote landowner may file a petition with the County Court (Arkansas Annotated Statutes, Section 76-110) who shall appoint "viewers" to study the property and to lay out a road across the adjacent property in a manner so as to produce the least inconvenience to the adjacent property owner. The court may then declare that this is a private road for the benefit of the landowner who did not have access. The "viewers" also established damage costs for taking of the property. The word "necessary" in the statute does not mean an absolute necessity, and the court is supposed to take into consideration the convenience to the restricted landowner and the inconvenience and injury to the person whose lands it will cross. A road established under this statute would not be a public road and the county would not be obligated to maintain it.

A legend of landowner liability in South Arkansas was verified through interview with Mr. B. H. Stegall, 84, of Lawson, Arkansas.  

who personally knew the parties involved. Frost-Johnson Lumber Company had a reputation for being very strict in penalizing timber trespassers on their land. The land concerned is located near Huttig, Arkansas, and was owned by Dr. Elmore Roland who was a country doctor living in Huttig and practicing medicine in the area in the early part of this century. In 1907, according to Mr. Stegall, the Frost-Johnson Lumber Company, using their own logging crews, inadvertently cut a strip of timber belonging to Dr. Roland. Dr. Roland discovered that his timber had been cut and, knowing the notorious penalty policy of the Frost-Johnson Lumber Company, proceeded to engage timber cutters who went with Dr. Roland to the adjoining lands of Frost-Johnson Lumber Company and willfully cut one of their largest pine trees. The trespass on Frost-Johnson property was discovered by one of their woods men, a Mr. Seaman, who reported the violation to Mr. Francis W. Scott in the Company office at Huttig. It was also determined that Dr. Roland was responsible and Mr. Scott sent for Dr. Roland to come to his office. He advised Dr. Roland that he owed Frost-Johnson Lumber Company $50.00 for the tree that had been cut. Without argument, Dr. Roland gave a check payable to Frost-Johnson Lumber Company in the amount of $50.00 as settlement in full of his obligation. When the check had been deposited and paid, Dr. Roland then submitted his bill to Frost-Johnson Lumber Company for the number of trees they had cut on his land figured at the rate of $50.00 per tree. Mr. Scott attempted to settle with Dr. Roland on the basis of the actual volume of timber cut, but Dr. Roland insisted that his trees were just as valuable as Frost-Johnson trees and he eventually received settlement in full for the violation to his land on the basis of $50.00 per tree.

An interesting example (Rucker v. Rhodes, et al, 1970) of forest landowner liability occurred in the Fall of 1970 when log cutters were cutting timber adjacent to a county road. The tree had been properly notched to fall away from the road, but when the cutters attempted to complete the cut, the tree was caught by a sudden gust of wind which caused it to fall with the top lying partly in the county road. Almost immediately, an elderly retired man driving a pickup truck drove into the top of the tree before bringing his truck to a stop. The actual damage to the truck was $80.00, but when the loggers who were cutting the tree saw what had happened and ran from the woods to the truck, the man was apparently startled and immediately lost consciousness. He revived in a few minutes and instructed the timber cutters to reach in his pocket and get the pills that were necessary for him to use because of his heart condition. They administered the pills as requested and then rushed the patient to the hospital. The man has now brought suit against the cutters and the lumber company which was buying the logs from an independent contractor who subcontracted the cutting on a per thousand basis. One wonders what liability might have existed if the tree had been a dead tree killed by insects or lightning and blown into the path of the pickup truck.

3Sections 4, 8, 9, Township 19 South, Range 11 West, Union County, Arkansas.
Southern Pulpwood Company has recently suffered a $700.00 loss resulting from vandals shooting out the 650 watt light and red blinking beacon on top of our 320' radio transmission tower. This tower is located on a 480 acre tract which has been open without restriction to hunters and others for a number of years. The four acre site where the tower and the radio equipment building at the base of the tower is located is completely fenced by a cyclone-type fence that is properly posted with "danger-high voltage" signs. However, the damage to the beacon was apparently accomplished by the use of a high powered rifle fired from the county road adjacent to the property, and the vandal may have done his damage without setting foot on our land. To date, no suspects have been located and no action has been taken. But in consideration of this case, we ask the question, would this tower be considered an "attractive nuisance" if young children climbed the fence and attempted to climb the tower and were injured in so doing?

Our company has had quite an extensive TSI program in effect using 2-4-5-T applied by a mist blower unit mounted behind a crawler tractor. On three different occasions, the spray from our operation has drifted on gardens of adjacent landowners, and we have paid damages through our insurance company for the loss of these gardens. Fortunately, that was the extent of the damage claim against us. But in an atmosphere of increased concern with ecology and the effect of chemicals on foods, what might have been our liability if a sympathetic jury had decided that our spraying operations had caused suffering to persons who had eaten the affected vegetables?

The forestry practice of controlled burning has also resulted in damage claims by adjoining landowners when the fire has become "uncontrolled."

We have examined briefly in this study some of the liabilities of Southern forest owners. The operators who harvest the timber from Southern forests are exposed to even more liability. But regardless of these risks, the value of forest land continues to increase as more buyers show an interest in acquiring ownership. As the demands for the products of the Southern forest continue to grow, governed by a world wide supply-demand influence and other economic factors, the forest landowner will experience a proportionate increase in his responsibilities. But with the greatly improved availability of top quality managerial assistance, and a newly awakened interest and awareness, I am confident that the challenges will be successfully resolved by Southern forest owners.
LITERATURE CITED


PART III

MANPOWER IN SOUTHERN FORESTRY
This is a field of law which is becoming increasingly important to all of us in the forest industries. It will be hard to do justice to the subject without occasionally using legal terms. For the sake of clarity they will be kept to a minimum. It should not be inferred that this is condescension, for all professions have their own terminology...forestry, of course, and the law particularly so. I have always held that clarity of communication is pre-eminent or, to paraphrase effective writers one should speak to express...not impress.

Let me say at this point how much I appreciate the opportunity of appearing here today. The LSU Forestry Symposium has now reached, in human terms, its legal majority of 21 years. During that time, these meetings have added much to the total knowledge of Southern forest operation and have performed a great service for the South's practicing foresters. Director Paul Burns of the School of Forestry and Wildlife Management and his staff are to be commended for the excellent job they are doing.

The program content over the years has changed as the times have changed. Consequently, the papers presented here have always been current and topical. This is noteworthy because we live in a changing society; in every area...law, forestry, and education included, and it doesn't take an overly astute observer to note these changes. Connotations and interpretations change, too - even the subject under discussion today. I can remember when I was a student at the University of Arkansas "class action" meant an uproar in the classroom.

But class action in the context of today's discussion has nothing to do with pranks and is, quite to the contrary, certainly
So, for this section of the program, we are going to be looking at some selected class action legal suits in the timber business and examine the surging importance of this type action.

WHAT IS A CLASS ACTION?

A basic acquaintance with this field might well be worth our time. Accordingly, for our purposes let's define class action in these general terms:

A class action suit is one in which the number of those interested in the subject of the litigation is so great that their joinder as parties is impracticable. In this situation the injured parties may sue on behalf of all, and the remaining members of the class may exclude themselves if they see fit.

In other words, it is a group of people getting together to sue one person or one firm, or many people or many firms at one time. Now, this isn't a new concept of law...there has always been provision in American jurisprudence for these actions. But while the law has not changed, its implementation and concept in this area has; particularly in the past two decades and more specifically since 1966.

The courts, in a variety of rulings (Environmental Defense Fund, Inc, v. Hardin, 1970) have extended the definition of "class," making it easier for supposedly aggrieved parties to bring suit. Originally, under the common law, parties could sue jointly only when their right of action was jointly owned; such as joint ownership of real property or joint contracts. Under proceedings in equity, however, class actions were available.

In 1938, with the adoption of the Federal Rules of Civil Procedure, the old Federal Equity Rule 38 from 1912 was restated to apply in all cases, and became in effect Rule 23.

Originally, class actions under Rule 23 permitted a representative group to sue on behalf of a class where the claim was joint or several and common questions of law or fact existed.

Well, there was criticism of this on several points, including the fact that members of the class could elect to join as parties if they desired. If they chose not to join they were not bound at all by the results. Then, too, there were difficulties with the definition of some of the terms, such as "joint" and "several."
IN 1966 CAME SOME SWEEPING AND LANDMARK REVISIONS AS FAR AS RULE 23 WAS CONCERNED. THE PROCESS WAS REVERSED AND MEMBERS OF A CLASS MUST SPECIFICALLY ELECT TO BE EXCLUDED FROM THE CLASS OR THEY WILL BE BOUND BY THE RESULTS OF THE LITIGATION. THE 1966 AMENDMENTS TO THE FEDERAL RULES ALSO ABANDONED THE DISTINCTION BETWEEN "JOINT" AND "SEVERAL" AND DEFINED THREE AREAS IN WHICH CLASS ACTIONS WERE ALLOWED:

1. WHEN SEPARATE ACTIONS BY INDIVIDUALS OF A CLASS MIGHT LEAD TO DIFFERENT RULINGS.

2. THE PARTY OPPOSING THE CLASS HAS ACTED OR REFUSED TO ACT ON GROUNDS GENERALLY APPLICABLE TO THE CLASS. THIS IS GENERALLY APPROPRIATE IN CIVIL RIGHTS CASES.

3. WHEN THE QUESTIONS COMMON TO THE MEMBERS OF THE CLASS PREDOMINATE OVER ANY INDIVIDUAL QUESTIONS.

THE LATTER CATEGORY [RULE 23(B)(WEST VIRGINIA HIGHLANDS CONSERVANCY V. ISLAND CREEK COAL CO. 1971)] IS THE PROVISION UNDER WHICH THE MOST SIGNIFICANT NUMBER OF CLASS ACTIONS ARE BROUGHT. IT WAS THE CLARIFICATION OF THIS CATEGORY IN 1966 WHICH HAS BROUGHT ABOUT RENEWED INTEREST IN CLASS ACTIONS AS A LITIGATION TOOL.

LET ME STRESS HERE AGAIN THAT A CLASS ACTION IS MERELY A PROCEDURAL DEVICE. IT CREATES NO RIGHTS IN ANY LITIGANT WHICH HE DID NOT OTHERWISE HAVE. IT MERELY CREATES A SITUATION IN LAW WHERE ONE OR MORE PEOPLE MAY SUE AS REPRESENTATIVE OF A CLASS OF OTHER PEOPLE.

PROS AND CONS

THOSE WHO FAVOR THE CLASS ACTION DEVICE SAY IT ENABLES A SINGLE LITIGANT OR A SMALL GROUP OF LITIGANTS - WHOSE CLAIM MAY NOT JUSTIFY THE EXPENSE OF TRIAL - TO LUMP TOGETHER A LARGE NUMBER OF CLAIMS. THEN IT WOULD BE ATTRACTION TO A LAWYER WHO WOULD TYPICALLY BE PAID ON A CONTINGENT FEE BASIS RANGING FROM ONE-THIRD TO ONE-HALF OF THE RECOVERY. OR, IN SOME LARGE CASES, IT WOULD BE AN AMOUNT SET BY THE COURT.

SOME PRAISE THE CLASS ACTION EFFECT IN CONSUMER, ENVIRONMENTAL, ANTITRUST AND SECURITY LAW LITIGATION. BUT THE RISING TIDE OF CLASS ACTION HAS ALSO CREATED A VOCAL OPPOSITION IN THE LEGAL PROFESSION. THESE LAWYERS ARGUE THAT THE CLASS ACTION IS MERELY A DEVICE WHEREBY LAWYERS CAN SOLICIT CLIENTS WITHOUT RUNNING AFoul OF BAR ASSOCIATION RULES OF ETHICS.

THERE IS PROBABLY A LITTLE BIT OF TRUTH IN EACH OF THESE POSITIONS. THERE HAVE UNDOUBTEDLY BEEN LARGE NUMBERS OF BONA FIDE SUITS BROUGHT AS CLASS ACTIONS WHICH COULD NOT OTHERWISE HAVE BEEN
brought as a practical matter. On the other hand, even the most ardent supporters of the class action device privately concede that the primary consideration in settlement negotiations with a plaintiff's lawyer is going to be the amount of his fee. For this reason, the class action procedure requires the approval of the court with notice to all members of the class in the event a settlement is reached. All of this portends a new era in forestry when we might find the courtroom as vital to our business as are the forests themselves.

With that background, then, let's see how - in some selected instances - class action suits have affected the timber business.

**Sierra Club v. Hardin**

One of the leading cases is Sierra Club, et al, v. Hardin, et al, (1971) decided by the United States District Court of Alaska last March. The action was brought to enjoin the sale of timber located in the Tongass National Forest and the sale of land for use in the processing of timber harvested pursuant to an agreement with U.S. Plywood-Champion Papers, Inc. (now Champion International). The contract involved the sale by the Forest Service of an estimated 8.74 billion feet of timber over a 50-year period together with 201 acres of land to be used as a mill site. It would have required of the purchaser an investment of about $100 million. Up to the time of trial Champion International had spent, or committed itself to spend, more than $3 million in performance of the agreement.

The Court designated the case a class action with plaintiffs representing all persons interested in the conservation, preservation and use of the national parks, game refuges, forests, natural and scenic resources and wildernesses, including the air, water, watersheds, wildlife, fish, and all other aesthetic and recreational values in the Tongass National Forest in the State of Alaska.

The Court held that it is generally recognized that the type of injury which will support standing to sue in the public interest need not be economic but may be "aesthetic, conservational or recreational." The Court further ruled that the injury need not result in destruction of property values to justify standing; that under the circumstances of this case, the Sierra Club and Sitka Conservation Society have standing to assert the aesthetic, conservational and recreational interest of local members and users who are directly affected by the timber sale and the proposed pulp mill complex.

After reciting the above the Court did not grant the injunction because of the failure of the plaintiffs to exhaust their administrative remedies and other reasons which are interesting but not relevant to the issues discussed in this paper.
West Virginia Highlands Conservancy v. Island Creek Coal Company

Another case of interest and along the same lines is West Virginia Highlands Conservancy v. Island Creek Coal Company, et al, (1971). The suit alleged, among other things, that no mining or timber cutting activity could be undertaken in Monongahela National Forest without submission of an environmental impact statement claimed to be required by the National Environmental Policy Act of 1969. The plaintiffs in this case, the West Virginia Highlands Conservancy, were a non-profit membership corporation dedicated to preserving scenic natural and historic areas in the West Virginia Highlands. The court held there was sufficient evidence to authorize issuance of preliminary injunction halting certain mining and timber cutting activity in such areas. The preliminary injunction granted by the District Court was affirmed by the Fourth Circuit Court of Appeals of which Clement Haynsworth is the Chief Judge.

Parker v. United States

Another noteworthy case involving timber sale from federal lands was that of Parker v. United States (1969) in Colorado. Plaintiffs in this action were a group of local townspeople, a guide who conducted wilderness trips, and the Sierra Club. They attacked the sale on grounds that provisions of the Wilderness Act of 1964 (16 U.S.C.A.) and the Multiple Use - Sustained Yield Act of 1960 were violated in that these acts were designed to protect public interest in scenic and recreational values of public lands.

In this case, and to the moment, the plaintiffs have carried the day as the 10th Circuit Court of Appeals ruled against a motion to dismiss. The decision cited provisions of the Wilderness Act which the court said entitled the plaintiffs to show further why the sale in question should be held up, pending the possible inclusion of the area into statutorially defined wilderness. The sale was hence enjoined, but at this date the Supreme Court is being asked to hear the case.

Black Bear Ranch v. The United States

Here's another case where the net effect might be the same although the money involved is smaller and the plaintiffs are of a somewhat different nature than we've seen before. The case is Black Bear Ranch, et al, v. The United States (1971) and was filed late last September in the U.S. District Court for the Northern District of California.

This case is also a class action suit against a number of parties, including the Crown-Zellerbach Corporation, and the issue again is a contract by a private company to cut timber off of a national forest.
This might sound, on the face of it, similar to those mentioned earlier, and to some extent it is. But this, like the others, is well worth examining. One reason is because while it is true our Western counterparts rely more heavily on publicly-owned forests for a part of their raw material than we do in the South, I understand the cut from federal forests in the South is increasing. In all likelihood, these forests will play an even greater role in supplying the South's needs in the years ahead. The "Third Forest" concept itself indicates this. Therefore, precedents set in this sort of litigation may quite well have a direct bearing on us in increasing measure.

COMMUNE PLAINTIFFS

The plaintiffs in this case are from somewhat of a different mold than we have discussed previously. Black Bear Ranch is an unincorporated association comprised of 41 adults and 20 children. At the ranch, livestock and food crops which sustain the members are grown on the property. In other words, this is, to all appearances, a classic commune. As I mentioned previously, "class action" suits now attract a diverse group of litigants, and this is a good example.

The ranch, 120 acres large, is situated in Klamath National Forest in Siskiyou County, California.

The contract, between Crown Zellerbach's subsidiary Cal-Pacific Manufacturing Company and the United States Forest Service, was entered into in the middle of February, 1971, and was known as the Daggett Timber Sale. The area of most interest to the Black Bear Ranch group is a relatively small acreage called the Callahan Creek cut, next to the ranch property. Logging activity was set to begin around Callahan Creek on October 1, yet the suit was not filed until September 29. As the suit asks for injunctive relief, you can see the concern the logging company must have felt. They were in fact constructing a road to the site when the suit was filed.

The charge reads as follows: "The construction of roads and the cutting of timber as proposed by the Federal defendants in the Daggett Timber Sale contract threatens to and will cause serious irreparable harm to plaintiffs herein by reason of adverse environmental effects resulting from the failure of the Federal defendants to comply with the National Environmental Policy Act. Similarly, the plaintiffs will be adversely aggrieved and injured in fact to their property, both real and personal, and to the rights of their persons from the activities of the road construction and the tree cutting proposed by the defendants."

They become more specific when they claim they "will suffer injury to their persons and property and to their water rights through landslides, rockslides, pollution of certain streams, and diminution of water supply to these streams which plaintiffs have
Class Action Suits

riparian rights and which plaintiffs use for domestic purposes including drinking, sanitation, watering domestic livestock, and irrigation of domestic crops."

Further, they claim the cutting "will impair the aesthetic enjoyment and recreational activities" of their property and the public lands surrounding their property.

As you can gather, this was a scattergun load of accusations, ranging from rockslides to besmirching their aesthetic sensibilities. The restraining order was denied, although as of last week a decision in the case was still pending. So to this point we don't know how the Judge in the case will rule.

ARE ALL PLAINTIFFS SERIOUS?

At this juncture you might be asking yourself: "Are these cases frivolous crank actions?" Some obviously are not, but some are open to question.

You have noticed that in these cases there is no action against a governmental agency alone. What seems to bring them forth is a contract, license, or permit by the government to a private company. Oft times, these private firms then commit great sums of their capital to the project.

But, should a suit be filed in protest, a bare minimum of financial prudence dictates a halt on the part of the company. To go forward, in the face of financial risk, until court proceedings have finished, would be consorting with disaster in the view of many companies.

What happens, then, is that the private firm is hamstring in its efforts to conduct normal business operations. It might well find the success of its efforts in its line of work not just limited to how well it can compete in commerce; but how well it can wage courtroom battles against ecological interests.

Will there be a tapering off in the number of these suits? Some of us might hope so and there are some indications that even the most active in the field might be questioning the mushrooming number of ecologically-oriented suits.

The Sierra Club alone has filed over 70 lawsuits in the past two years "to protect the environment." But perhaps these comments by James Moorman of the Sierra Club Legal Defense Fund and published in the Sierra Club Bulletin in the January, 1972, issue indicate they might be having second thoughts on the plethora of litigation.

Says Mr. Moorman: "Enough victories have been won to demonstrate that the lawsuit is a useful device to achieve conservation goals. As a result, the Club is now receiving a large number of
requests to bring new suits. It is appropriate, therefore, for us all to consider how much the Club should rely on the lawsuit as opposed to other types of action in any given conservation fight.

"In my opinion, no lawsuit will, ultimately, win any conservation issue. Ultimate victory requires political victory."

Further on in the editorial, Mr. Moorman seems to bear out my earlier comments on hamstringing businesses when he says: "Lawsuits, of course, are very useful and often are decisive. The lawsuit can buy the time necessary to rally support." He also states that "...a favorable decision often creates a major obstacle for our opponents by giving them the burden of having to obtain passage of a bill by Congress if they still want to prevail." His closing statement is what gives rise to the thought that perhaps, at least in the case of this particular organization, there will be greater selectivity in filing suits:

"Ultimately, the environment can be protected and saved only if we persuade our fellow human beings that protection is necessary. In the long run the attitude of the courts toward environmental problems will simply reflect the consensus of society as a whole. Thus, our hope depends on educating and persuading enough people. Our success depends upon popular interest in and sympathy for our goals."

**Bass Anglers Sportsman Society**

Getting back to actual cases, we will leave the timber cutting issue and discuss one of a different tack. The case is entitled Bass Anglers Sportsman Society v. Avondale Mills, et al (8). In this case, BASS filed suit in the U.S. District Court for the Southern District of Alabama to enjoin 216 companies operating in the state. These businesses, they claimed, were dumping pollutants into the state's waters without permits. BASS, describing themselves, said they were an organization of 11,000 members nationwide, five percent of whom were in Alabama and with headquarters in Montgomery, Alabama. BASS was formed in 1968 to "preserve bass fishing, clean waters and maintain adequate water conservation and navigation standards."

The defendants listed represented a variety of businesses, large and small, throughout the state who apparently had operations on or near navigable bodies of water. The list included Scott Paper Company, International Paper Company, Gulf States Paper Company, Baldwin Pole and Piling Company, Hammermill Paper Company, McMillan-Bloedel United Company, Seaman Timber Company and Walker-Williams Timber Company. This unwieldy group of defendants was later reduced from the original 216 to 14, all of them large companies. Paper companies left in the suit were Scott, International, and Gulf States.

The suit, brought under the Refuse Act of 1899, asked for a
permanent injunction "prohibiting defendants from depositing refuse or waste of any kind or description into any navigable waterway or tributary..." Obviously, if an injunction of that nature should be granted it would halt operations of these mills completely. Also claimed was that the Rivers and Harbors Act of 1899 had been violated. This calls for a fine up to $2,500 for each violation, half of which would go to BASS and half to the federal government. That would have been quite a payoff on top of closing off some very substantial payrolls.

After involved litigation, which we haven't the time to discuss now, the court dismissed the action on grounds that the suit sought to enforce a criminal statute with a civil suit.

ECOLOGICAL SHUTDOWN OF PUBLIC PROJECTS

To show you the clout ecologically-oriented groups can have on major public projects we need only look at the Cross-Florida Barge Canal and the Tennessee-Tombigbee Waterway.

The Cross-Florida project is classic in that some $25 million had already been spent over nearly a decade to build a series of locks, lakes, dams, and the canal proper across Florida. Construction was well underway when, by the mid-60's, ecologists started attacking the canal in earnest and by 1970 had succeeded in having the plan completely abandoned, on ecological grounds alone, by the unusual procedure of an executive order issued by President Nixon.

Then, currently in court, is a suit by the Environmental Defense Fund of Stony Brook, New York, who are seeking to block construction of the Tennessee-Tombigbee Waterway.

One of our interests, among others, in both of these waterway developments is that they would, in many instances, have provided cheaper and more efficient movement of wood and wood products in their respective areas. Well, the Florida project is for all practical purposes completely dead. The Tennessee-Tombigbee Waterway might well be also if the Environmental Defense Fund prevails.

CIVIL RIGHTS ACTIONS

We should mention briefly actions in the civil rights field, the impetus of which stems primarily from the Civil Rights Act of 1964. As I mentioned earlier, the class action vehicle is used quite frequently in civil rights litigation.

A great deal of publicity has been given the civil rights "movement" in schools, public transportation, and accommodations. For us, the area of racial discrimination in employment (Title VII of the Act) is another hot potato. It affects every employer in our business and although emphasis at this stage of the game has been on the manufacturing side of the business, it could easily become a thorny problem on the purely "forestry" side.
Litigation in these cases is oft times lengthy, complex, and expensive. Here, the class action device is being used, and used effectively. The increasing frequency of litigation is a matter of concern to all employers, and our industry is no exception.

**Grossman v. Playboy**

The discussion on class action suits should not be closed without mention of an interesting case which re-emphasizes the implications to business and the high stakes which can characterize these actions. This one doesn't involve the timber business, per se, although some of you here today might have been parties to the suit without knowing it. It involved Playboy Clubs International (1966), who were sued in a class action brought by one Marshall B. Grossman in California on behalf of himself and some 460,000 others. The circumstances revolved about a service charge of $5 per year Playboy Clubs tacked onto keyholders in 1966 for the extension of credit at the clubs. Prior to that time, holders of the memberships in the clubs were under the impression their memberships did not require any such charges. The court agreed that some members of the keyholding class had indeed been discriminated against.

The settlement amounted to $3,700,000 in purchase credits at the clubs...or about $8 a head for every member in the class. In addition, the attorneys for the plaintiff were awarded a fee of $275,000, which isn't exactly chicken feed...or should I say "bunny feed."

**WHAT LIES AHEAD?**

In conclusion, let me quote from the preface to last year's compilation of the papers presented at this very symposium. The remarks are by Professor A. B. Crow of the school, and one comment of his is particularly appropriate (1971). Professor Crow says: "At precisely the time when the techniques of growing pine rapidly and profitably have come of age, forest managers find themselves on a collision course with the environmentalist. Practicing ecologists that they are, they must now not only grow more timber in less time than ever before but do it so that public sensibilities are not offended."

As you can tell by the cases we have discussed here this morning, some "public sensibilities" were obviously offended. The result, in many cases, was that device we've examined, the class action suit.

Let me close with an observation made by Judge Frederick B. Lacey (Federal Class Action Digest, 1971) of the United States District Court of the District of New Jersey in Smith v. Beneficial Finance Company of East Orange (June 28, 1971), in which I heartily agree. He said:
"...unless prudence and caution are exercised soon by the Bench and Bar the class action device can be transformed from a useful tool to an engine of destruction."
DISCUSSION

Question: When a plaintiff loses a class action suit can he be held liable for any part of the defendant's costs? If not, is this fair to the defendant?

Mr. Allen: The answer is no, the plaintiff is not liable for such costs. The court assesses the cost of litigation in these suits in just the same manner as in other suits. Perhaps a part of your question implies a recovery by the defendant of the cost of attorney's fees. Again the answer is no. This like other litigation requires that you obtain a lawyer and pay his fee. Whether it is fair or not depends on whether you are the plaintiff or the defendant -- your point of view. This is the same situation we always encounter in litigation; you simply have to defend yourself. [Editor's note: an interesting sidelight to this discussion has developed in California where a $20 million damage suit has been filed against the Sierra Club by 12 forest products associations and manufacturers. This suit seeks $10 million in actual damages and $10 million in punitive damages in response to a Sierra Club suit seeking to block the awarding of timber sale contracts in "de facto" Wilderness Areas of certain national forests.]

Question: Do you know of any class action suits relating to timber cutting or prescribed burning on forest lands in the South?

Mr. Allen: I think some have been threatened, but as far as my research has revealed, no suits have been actually filed on these questions.

Question: I assume that Bass Anglers v. Avondale referred to mill pollution basically, not timber harvesting. Will you comment on any implications which may arise here?

Mr. Allen: The suit did involve mill pollution only, but I see no reason why a suit of the type you mentioned might not be filed if someone had done some prescribed burning and a following heavy rain had washed the ash down into a stream. The allegation in the suit was that the practice caused pollution of the stream. I think that other forestry practices might also be joined
to litigation. I know of one situation where it was threatened as the result of logging debris which caused the water to back up and flood some lands. In this instance the logger was required to remove the debris.

Question:
The present policy of the Forest Service includes holding public hearings on timber management and harvesting, in which all interested parties are invited to attend and participate. In your opinion, will this policy reduce the basis of class action suits involving Forest Service lands?

Mr. Allen: I think not. Perhaps it should because conflicts of interest would be discussed. But I believe that when the Sierra Club—or a commune, for that matter—considers a Forest Service timber sale to be an invasion of rights there will be litigation.

Question: What about the current class action suits in Alabama and Mississippi in which pulpwood producers are involved as well as several paper companies, including your own. Was this avoided in your paper for specific reasons?

Mr. Allen: In fact it was. I had considered at first that this might be the basis for my paper. But our general counsel objected to its inclusion because we are a party to the suit. The suit mentioned is pending in the U.S. District Court for the northern district of Alabama, under the title of Bennett v. American Company plus a great many other paper companies and pulpwood dealers. I was asked not to comment on it because at this time it is simply a complaint which has been filed alleging certain violations of the antitrust provisions. An answer has been filed denying these allegations, so there has been no legal action at all. I agree with our counsel that any discussion at this time might prejudice the case in some way.
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THE CHANGING NATURE OF THE WORK FORCE IN SOUTHERN FORESTRY

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In the three years since the monumental report of the Southern Forest Resource Analysis Committee, "The South's Third Forest," has been in circulation, we all have discussed numerous ways and means of meeting future requirements for forest products outlined in that report.

From the Third Forest, it is estimated that timber cut in the South in the year 2000 will be 2.3 times the current harvest. Annual growth must be increased. The quality and quantity of growing stock must be improved.

Our various industry task forces have devoted exhaustive study to such factors as planting and T.S.I., protection, utilization, markets, taxation, government control, land use, public relations, state agencies, research and development, financing and organization. And this is all to the good.

For, if we are going to have the trees to meet the needs of people in the years ahead, we must start now to grow that timber. We must also begin to concern ourselves with the development of the one most important resource that will be necessary to develop and maintain this Third Forest--People. For, while mechanization holds great promise in the South, it is obvious that we will always need people to operate the machines, with skill and efficiency. We are growing the third forest--we are developing mechanized equipment, but, as Dr. Bruce Zobel has observed: "If the timber can't be harvested economically, it is really of little importance how much wood we grow."

It may well turn out that the labor supply, rather than the timber resource and its availability, will be the controlling factor in the industry's ability to meet projected timber needs--not
only in the year 2000, but in the more immediate period of 1975 to 1980.

I appreciate this opportunity to discuss with you some of my impressions of "The Changing Nature of the Work Force in Southern Forestry" and its impact on your future and mine.

During the next few minutes, we shall look at some of the historic changes that have already taken place in the Southern work force, review trends in our industry, explore factors affecting the work force and attempt to identify the quantity and quality of labor our industry will need in the years ahead.

We all recognize that forest products have been an integral part of our nation's economy since Colonial times. The forest work force has been subject to frequent change throughout this period.

With each change, more skills have been required, with increased productivity necessary to meet changing economic conditions. The industry's labor needs have grown, but until quite recently, there always seemed to be another untapped reserve of labor to turn to--to meet the needs of the moment, and to postpone again the need for developing a permanent, professional, prideful work force.

From the time of the first settlement, lumbering was an important activity in all the colonies. Lumber products ranked among the chief exports.

While the first boards manufactured in the colonies were hand sawed over open pits, it wasn't long before the first sawmills appeared in Maine and Virginia between 1608 and 1620. The earliest ones were crude, water powered mills, but steam power replaced water in the mills about 1830.

During this period, immigrant labor manned the industry--particularly in New England, New York and Pennsylvania.

With the exception of a few small mills near the coastline, lumber manufacture in the South was not a major enterprise prior to the Civil War.

In the 1860's the lumber industry centered in Pennsylvania. By 1870 it had moved to Michigan and development of the railroads vastly expanded the market for lumber--and the need for woods labor.

That need was easily satisfied by the waves of European immigrants who came to this country--Germans, Swedes, Norwegians, Slavs, Irish. These were men accustomed to working outdoors. For many, the isolated life of the logging camp was a welcome opportunity to earn enough money to get established, then to send for other family members. It was not at all uncommon for one good forest
Changing Nature of the Work Force

worker to recruit dozens more—brothers, cousins, friends, who wanted to come to America.

Beginning in the 1880's, the recruitment of a large labor force was necessary with the development of the lumber industry in the South. In Mississippi, for example, there were 16,241 sawmill workers in 1899. By 1909, that number had swelled to 37,178.

This mushrooming demand in a sparsely populated area, where few of the inhabitants possessed the skills to operate the machines of the modern sawmill, produced an acute labor shortage.

The older lumber regions in the North and East provided not only most of the managerial skills for the industry, but also most of the key workers.

Generally, the local population both Negro and white, provided the bulk of the unskilled common labor.

For most of the years 1898 to 1907, there was an acute shortage of both common and skilled workers that could not be filled with the local labor supply. Agriculture was still a dominant factor in the Southern economy, and many of the local workers preferred the farm to the forest.

Once again, abundant immigrant labor filled the gap—this time from the Mediterranean countries of Southern Europe and the Near East. Finding their way to the Gulf Coast ports, these workers flocked to the new mill towns, often working for as little as 25 cents a day, plus food and lodging.

With a virgin supply of 325 billion feet of yellow pine, some 20,000 sawmills were in operation in the South at the peak of the lumber boom, employing more than 400,000 workers.

Joe McCaffrey, who operated many logging camps during that period, recalls that logging in those days was highly mechanized, even more so than it is today. Except for some scattered team logging, logs were skidded to a railroad track with steam-powered skidders, loaded on cars and delivered to the mill. They were unloaded and taken into the mill mechanically. There was no handling of the material until it was pulled off the green chain on the lumber dollies or was stacked in kilns.

In 1909, lumber production in the South reached its peak, and began a gradual decline. As large timber blocks were harvested, the big mills moved west, leaving only the small "peckerwood" mills—some 24,000 of them that employed as many as 500,000 workers.

The small sawmills of the South could not compete with the big timber and mechanized efficiency of the West Coast mills. They declined both in number and in production.

But the burgeoning Southern paper industry continued a healthy
expansion. Second growth timber, ideal for pulpwood, was growing abundantly. Protected from fire, it offered an assured source of raw material.

And labor to produce the wood was also available in great numbers—refugees from the farms that had turned to mechanization.

Much of this labor was part time—between crops on the farm or between other employment in town. Size of crews fluctuated from day to day and week to week. Unfortunately, there was little buildup in skills, or in pride of doing a job well.

In 1964, it was estimated that there were as many as 7,000 localized small pulpwood crews and 4,000 small logging operators in the South.

Prof. R. W. McDermid has observed (1968) that: "In past years Southern loggers have employed labor which would hardly be acceptable under more careful supervision ... We have said that the woods worker is an individualist who did not want to work in the city in a factory, that he did not want to join a union, that he wanted the freedom from supervision that prevailed in the woods, that he could be his own boss. Perhaps all of these facts are true to a degree. They may still be partly true. But there are other factors which should have been added to our description:

"1. He could not find a plant job because of his (a) lack of training and useful skills or his (b) physical condition.

"2. He was willing to work at or below minimum wages and this less than minimum wage was legal because of the agricultural exceptions in the Fair Labor Standards law.

"3. He was willing to work part-time, i.e. if his job was shut down because of weather or excess supply. As the saying went, if he earned too much money per day, he would work only long enough to buy groceries for his family needs and a bottle for himself."

In 1968, the American Pulpwood Association surveyed pulpwood producers across the South. The report of that survey shows the plight of the small producer who suffers high harvesting cost due to low manpower productivity.

He also carried a high capital investment replacement value per cord due to low annual production and low machine utilization. When all of the elements of harvesting and hauling costs are compared, the economic problems of the small producer is seen to be centered primarily with the high harvesting labor cost, and with spreading miscellaneous costs over low production.

The paper industry, particularly, has depended on this small producer to provide a substantial portion of its wood. It has been estimated that 39 percent of all Southern pulpwood is produced
by part-time producers, 27 percent by full-time producers, and 9 percent by paper company crews. Residuals make up the difference.

What assurance does the industry have that these part-time producers will continue to be able to meet their needs? What is the possibility of recruiting additional labor to meet expanding needs?

This is a critical situation, and one which has no easy answers. Mechanization offers some hope, as does the increased use of residuals as pulping material. It is estimated that Southern pulpwood consumption will grow by eight million cords in 1974 over the 1969 level of demand. Fortunately, chips and sawdust will account for much of this increase.

But increased chip production will be a by-product of greatly expanded lumber and plywood production. Larger, more skilled, more productive logging crews are going to be needed to produce this material.

Today's Southern Labor market is vastly different from a few years ago.

Rural populations have declined. Urban populations have increased.

There are fewer family farms, and modern agriculture has dramatically reduced the number of farm workers.

Negroes have migrated away from rural areas and away from the South.

The educational attainment of both whites and blacks has risen, and they want a better, more comfortable way of life.

The number of individuals who will desperately take any kind of work regardless of pay or working conditions is steadily declining, the result of a variety of social reforms.

And young people are setting their goals high.

A recent study conducted by two LSU sociologists gives some insight into the changing attitudes of rural young people in Louisiana toward their career choice and their future life styles.

High school seniors in rural areas, black and white, were interviewed in depth. The LSU study finds an almost overwhelming priority and concern for education among the youngsters. Getting married and raising a family holds lesser appeal. They're less interested in big money earnings. Instead, they want to be able to enjoy their free time.

Only one male student in the entire survey planned to work as
a farm operator. Less than six percent planned careers as unskilled workers.

It was found that 77 percent of both Negro and white males planned to continue their education past high school in one form or another. Almost half of all rural males planned to obtain at least one college degree, while 26 percent of both black and white males indicated that they planned some formal type of vocational training after high school. Most of these students undoubtedly plan on pursuing a skilled occupation in the future.

This same study points out, however, that most people leave rural areas in order to secure better jobs—not because they crave city life.

It's significant to note that of the male students involved in the LSU study, 46 percent of the whites and 33 percent of the blacks showed a preference for living in a small city, while 30 percent of the whites and 29 percent of the blacks indicated a preference for an open country non-farm residence.

In other words, if we can offer attractive, meaningful, financially rewarding jobs in rural areas, we have an excellent opportunity to recruit a competent, productive work force across the South.

These young people are not going to be interested in part-time work. They want decent jobs, with regular hours, good pay and ample leisure. They don't want to swelter in summer or freeze in winter. They want to be able to enjoy their leisure.

Given these conditions, young people can be recruited to join the forest work force in the South.

Changing economic conditions are going to hasten the need for upgrading forest employment to attract these youngsters:

Competition for skilled labor is growing, and we can no longer afford unskilled labor in the woods.

Changes in state and federal laws regarding minimum wages, working conditions, workmen's compensation and other factors are forcing many small producers out of business, and forcing those who remain to substantially upgrade the quality of their work force.

In addition, enforcement of the Occupational Safety and Health Act, which we have discussed earlier on this program, will have a sweeping impact on the ability of small producers to continue to operate. Safe operation and a well-trained productive work force go hand in hand.

Every change in technology and mechanization brings related changes in our manpower requirements.
Changing Nature of the Work Force

With all of this mechanization, however, productivity per man hour in our industry has not kept pace with others. The index of output for a man hour in the total private economy has gained steadily since 1890. Output per man hour increased at a rate of three percent per year from 1946 to 1970. About four-fifths of the growth in output since World War II has resulted from the increased productivity of American workers.

Unfortunately, the productivity increase in the woods has not kept pace, although some progress has been made. Production costs have continued to rise, while prices for forest products remained prohibitively low.

We must concern ourselves with making better use of the labor we have—and find ways of keeping the work force productively employed.

In the past we have been accustomed to hiring seasonal labor for planting, for timber stand improvement, for fire protection. How much better would it be to plan our work to use these people year-round? People are a resource, just like timber, and we're going to have to plan to use them wisely and productively.

Changing timber marketing methods are going to have a significant effect on labor requirements during the next few years.

The pulp and paper industry will get more and more of its raw material in the form of chips and other residuals—a direct outgrowth of utilization systems that bring more of the tree in from the stumps.

These utilization systems demand entirely different skills in the woods. Shortwood pulpwood called for a feller, a bucker, a loader and a truck driver. Usually, all of these functions were performed by the same people. Labor cannot be fully utilized, since one function depends on the performance of others.

In a mixed logging show, you are at the mercy of the man at the stump to determine if a pole is going to be bucked into pulpwood, or if a sawlog is going to be wasted.

With mechanized felling, followed by tractor or cable yarding, each unit works at its own pace. Each individual develops a high level of skills, and pride in doing his work well.

And we can delegate to another specialist, at the landing or in a mechanized sorting yard, the responsibility for getting the best possible use out of each stem to be processed.

Increased efficiency in harvesting and utilizing timber offers a real opportunity for meeting our projected timber requirements. It will also make it easier for us to attract and hold good workers.

The saw hand is no longer the least common denominator in the
woods. Consider the possibility of hydraulic shear operators, cable yarder operators, heavy equipment mechanics, loadermen, truck drivers, automatic timber sorter operators, group foremen, area supervisors, district managers. These are the kinds of jobs we must develop to be able to attract and afford the work force we will need.

Transportation systems will play a key role, with as many or more forest employees being involved in transportation of material than in production and forest management.

The forest must also become more closely integrated with the over-all manufacturing process—with less labor at the stump, and more automation in the converting plant.

What kind of work force—both technical and professional—will the forest products industry be looking for in the years ahead? How do we go about recruiting, training and keeping that work force?

Since most of you are professionals in the truest sense of the word—let's look first at the professional side.

Will we still need foresters in the coming decade? Emphatically yes, but they will come equipped with a far greater range of skills and specialties than were offered in forestry schools only a few years ago. Silviculture will take on added dimensions as we rely on computerized technology to analyze the selection of genetically superior planting stock, the effects of site, climate, fertilization, spacing, rotation—and most important—utilization of timber to its highest possible use.

Engineering skills will play a more significant role. Not just for grading roads, placing culverts and basic survey—but also equipment design, systems development, electronic communications, testing and measurement devices, even the laser for harvesting and manufacturing equipment.

I'm sure some of my fellow loggers in the Pacific Northwest never dreamed, when they were in school, that knowledge of aerodynamics would be helpful to a logger. But these same foresters are today using helium-filled balloons to transport valuable timber from previously-inaccessible mountain sites in eastern Oregon.

Speaking of aviation, you have all had experience with aerial photomapping, aerial seeding, spraying and fire protection. You realize the contribution these techniques make to our daily work.

But consider for a moment what further benefit we can expect from remote satellites, circling the globe many times daily. The new EROS satellite—Earth Resource Orbiting Satellite—will be able to inventory timber stands, by species, anywhere in the world; detect fire or insect attack, determine weather factors and provide countless additional data.
Are today's foresters really equipped to make full use of this new tool, and others yet to come. Certainly, they have the talent to learn—but future employees will be expected to bring these skills to the job with them.

We can expect to be competing more directly with other sophisticated industries for the best technical talent that is available—and to be paying accordingly.

In the area of business management, we will need greater skills in accounting, business administration, business law, public relations, industrial engineering, training and safety.

I think you get the picture. More professionals. Greater specialization. Unlimited opportunity for the talented forest manager to make a real contribution to the organization he or she serves.

No longer will it be a simple matter of foresters growing trees. They must recognize that growing trees is only one part of a terribly complex system that includes many other factors. How does this crop fit with the next rotation? Are the species suitable? What is the environmental impact of the harvest method selected?

Insofar as woods labor is concerned, here again we are concerned with rapidly changing requirements for better trained, more versatile personnel. Manual skills are becoming obsolete, and there will be little need in the future for the man who brings nothing more than a strong back to the job.

This trend is being forced on the industry because men are looking for something better to do with their lives than eight hours of sweat and strain at the stump. This is a trap we have unfortunately built for ourselves, by not doing more to make woods work attractive and satisfying to the man who has to do it.

An increased emphasis on comfort and safety will go hand in hand with more emphasis on productivity per man hour. Skilled crews will work in air conditioned vehicles. Their hands will seldom touch a tree. They must be capable of constant re-training to keep pace with changing technology.

In some of our own logging operations in the South, for instance, we already have air conditioned the cab of the feller-bunchers, the loaders, the skyline yarder, and the haul trucks. Portable lighting equipment permits us to work two shifts a day for better equipment utilization.

Are we going to be able to recruit the labor we need to do this job?

The American Pulpwood Association conducted a study last year that was described as "one of the first systematic attempts to
determine why there is a shortage of labor in the woods today."
The study asked many of the questions we've discussed today—To what extent is population movement to the cities affecting the supply of labor? How knowledgeable is community leadership to the pulpwood industry? What are the attitudes of these people to pulpwood harvesters? Are high school students aware of pulpwood harvesting as a means of earning a livelihood? Does pulpwood harvesting provide job satisfaction for its workers? Are welfare programs affecting the current supply of labor?

The study found that community leadership did not have a very favorable impression of woods workers, as you might expect, and that pulpwood harvesting does not provide job satisfaction for its workers in terms of actual job duties, physical working conditions, pay and interpersonal relationships.

The young and better educated individuals in that Georgia county studied believe that all jobs in pulpwood are unattractive—and it is doubtful that any of them would want to go to work for our industry right now.

By way of contrast, it's my impression that loggers in the Pacific Northwest do enjoy a higher community status and have more pride in the work they do. Just last year, we sent one of our Livingston Parish equipment operators in Mololla, Oregon, for familiarization with a new machine we are bringing South. When he got back, I asked him about the trip.

He was naturally impressed with the big timber. Next, he mentioned breakfast at the local cafe—and the fact that loggers, bankers, storekeepers, and lawyers there all seemed to have so much in common—and to respect one another.

Now, that young man's goal is to earn that same degree of mutual respect down here.

It's up to us to upgrade his job, and those of others, so that they can and will take pride in the work they do.

We're also going to have to go to work to attract workers into this field. Some steps that have been suggested include:

1. Establish an information and education program to disseminate knowledge of the industry.

2. Install training programs which include knowledge of mechanized methods which can be employed to harvest timber. Most people don't seem to realize that it is possible to harvest timber today with a minimum of hard physical labor.

3. Emphasize to the public that the successful producer is a skillful businessman, and that success is within his reach.

The vocational-education program in the school is one area that we should give a lot of attention to. Here in Louisiana,
vocational agriculture teachers have an opportunity to spend an "internship" with a forest products industry during the summer, and to receive graduate degree credit for it. We have worked with several of these teachers already, and with excellent results.

Pulpwood production classes in South Carolina high schools will benefit from the load of logging equipment that is being made available by industry. This equipment will be moved from one high school to another.

In Pennsylvania, a forest harvesting training program designed to teach the basic skills of modern logging methods using the latest harvesting equipment will be taught by experienced teachers at an area vocational-technical school.

Certainly, training programs such as these will help to encourage workers to join the industry, and to take pride in their work.

There is also need for intensive re-training programs of workers already on the job, to make their training a means of upgrading the job, and job satisfaction.

Lang recently wrote in PULP AND PAPER Magazine that there is some speculation as to whether or not the men will remain in the forest industry after having undergone extensive training at considerable cost. He feels, as I do, that increased mechanization and improvements in logging will stimulate and motivate the vast majority of graduates to remain in our industry.

Another important point to consider is the contribution we can make as an industry to the economic development of small rural communities across the South by providing good jobs.

As we have already shown, there has been a tremendous exodus of young people from rural to urban areas. Yet most young people would rather live in small towns or open areas, if they can earn a living and have a satisfying life.

Forest-based jobs can provide the economic backbone for many rural communities. As we upgrade the jobs, as we stabilize a high-quality work force, then economic life in the community can also be expected to take on new vigor.

We are working in an exciting period in the development of this industry--at a time when we may have many opportunities to influence meaningful change.

We can make work in this industry meaningful, satisfying and financially rewarding, but to do so we must recruit and train a stable, productive work force.

We can make forest work as safe as that in any other industry. We can give the workers pride in the fact that they produce a vital
product, and do so in a way that properly regards environmental factors. We can develop healthy labor-management relationships and relationships with government.

We can, and we must get interested in sustaining the work force for this industry, if you want this industry to be around to sustain you in the years to come.

May I remind you again of Bruce Zobel's comment:

"If the timber can't be harvested economically, it is really of little importance how much wood we grow."
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When I first arrived in the South and looked at a modern paper mill, it suddenly occurred to me that paper men were either the greatest optimists this world has ever known or the biggest gamblers. Here, men were gambling that the voracious appetites of hundreds of millions of dollars worth of highly automated plants were going to be fed by a "rag-tag" assortment of vehicles that looked like refugees from a junk yard. But somehow that armada groped its way out of the woods, dragged itself down the roads and highways and fed the ravenous chippers. It fed them well and the woodyards grew high and overflowed. But that was three years ago.

Today the logging fleet is limping badly and the chippers are hungry, not starving, but developing a lean look that suggests a rigid diet. There are those who speculate on the possibility of a fast and as a result, the price of wood is beginning to creep upward at a higher rate than the cost of living index.

This is happening to a very competitive industry which is attracting the attention of government agencies, agencies which are baring their teeth and making demands--very costly demands. Some of those demands concern workmen's compensation insurance, federal social security, occupational safety and health, the ecology and environment and a proposed guaranteed annual income. Historically, woodland industries have been proud, independent industries, staffed by men who resisted government subsidies and government control. But the government control is beginning to be felt at a time when inflation is a national problem and price controls are being imposed. Questions arise--can the industry absorb these additional costs without accepting some return of its tax money? If the money is returned, where can it do the most good?
When we walk inside a paper mill, we find a highly controlled process in operation. A competent staff of well trained employees exercise the control and technology necessary to produce the paper products of the twentieth century. The quality of the employee is readily apparent in a brief discussion with any one of them.

The picture changes dramatically when we go into the woods from which the raw materials are emerging. Here we find some men signing their pay checks with "X's", working in mud, mosquitoes, snakes, briars--men sweating in the summer and shivering in the winter; men who haven't expected much, nor received much from life. But many of them kept giving of themselves until they could no longer afford to do so. The "government hand out" was in some instances larger than their annual income from working in the woods.

Yet, it isn't uncommon to hear these people bestow praise on one of their peers; "He's a real pulpwooder" is an admission of distinction. It recognizes efficiency, the ability to get the job done and in many cases, it implies self-taught methods and determination. When we look at them closely, we can see the scars of past mistakes. The real tragedy is that some of them did not survive their mistakes.

Today many of the "real pulpwooders" are in trouble. The squeeze on profit is too great and as a result, the industry is in trouble. The "real pulpwooders" usually are without the resources or the credit which is necessary to upgrade their equipment to a system which can operate economically in today's market. Let us assume that they are capable of acquiring the equipment. There have already been too many examples of failure when this has been tried. The failures were predictable in many cases, because the producer did not have the management ability which success required. Muscle and determination can keep a stump-to-stump operation going, provided you have enough muscle. But when you put a pencil in those muscular hands to figure cost of a sophisticated system, the power to squeeze the pencil into pieces may not produce the desired data. It is easy to rationalize that he should be successful; after all, he has spent his whole life in the woods. We assume his past experience is all that is required; we all know that experience is the best teacher.

Recently, four men, all with advanced college degrees, were involved in a discussion. One of them stated that the only difference between education and experience was that experience required a longer period of time. That statement stood unchallenged. Let's examine it in terms of woodland operations. Those of you who have tried to correct a faulty golf swing know the problems of unlearning acquired habits. The same principle applies when trying to correct careless or improper use of a chain saw. Ask yourself--how many pulpwood workers do you know who have ever had proper instruction in the use of a saw? Actually, they can have a lifetime of bad experience. How many of them really understand the mechanics of an internal combustion engine? If we expect these same producers to understand the capabilities, the
maintenance and the operating costs of skidders, pre- haulers, or any other mechanized system, instruction will have to be provided for them. They must be made to understand that the equipment has to operate continuously if a profit is to be realized. They must also be taught the conditions under which repair costs can be greater than the profit that can be gained. It is necessary for them to be taught to plan. No reasonable businessman is going to assume that a large monthly equipment payment can be met while experience—good and bad—leisurely teaches a modern harvesting system operator where he is making his mistakes. Without help, his daily frustrations will preclude any analysis by the producer and he is doomed to failure. He must know his business before he is provided with the equipment and the financial burden.

All of you who are assembled here are college-trained. You represent the elite of the industry. But, how many of you would be willing to invest your savings account on harvesting a tract of timber? You would cruise it, direct the cutting and hauling and supervise the labor which is available. Think about the available woodsmen before you answer that question. Profit or loss would depend on the crew you could assemble, and to hire capable men would require stealing them from other crews.

The real problem is, where do we get a supply of men who are not only willing to work in the woods but who want to work there? There is only one answer. They must be trained, not only in the skills and economics of woodland operations but also in attitude toward their work and their place in society. You are devoting your lives to this profession, surely you believe that it is important to the great scheme of human progress. Woodsmen must be taught to believe the same thing. They must be taught to think this way, not just for the purpose of getting a job done, but because it is the truth.

When we consider re-training the thousands of men now working on marginal operations and the thousands more that are needed, the job seems staggering in scope. Indeed, it is. But it can be done with the dedication of key men within the industry. Industrial training has never been successful without complete commitment by top management to the program. Whether we like it or not, the men in decision-making positions are the ones that determine the destiny of any endeavor.

There are several reasons why woodsmen should be trained on an industry-wide basis, rather than on a company basis. A paper company or dealer that starts an individual training program will soon discover that they have trained men only to see them shipping wood to a competitor who offers a higher price. The most important reason for industry-wide training is the dispersed nature of the business. Wood shipments come to a mill from a radius usually in excess of 100 miles around the mill, and because of overlapping areas, several mills or dealers may be buying wood within the same general area. This results in a concentration of crews which will provide a large training opportunity to develop a first class
program if all of the companies cooperate. If training is conducted on an industry-wide basis, an impartial agency such as the American Pulpwood Association, can administer federal funds for the companies involved.

The American Pulpwood Association has collected more material, conducted more research and is the best informed organization on logger training in this country. It has the resources to produce a course of study which will meet the special training requirements of any area within America. These resources should be used.

Today there are huge quantities of federal money which are designated for training purposes. It is available because unskilled people are a major problem to the economy. The National Alliance of Businessmen was created to help train poor people for gainful employment. This organization is made up of businessmen who understand the problems of business and they have designed a flexible program. They are operating under the authority of the Department of Labor. The training program includes orientation, counseling, classroom study and on-the-job training. Funds are available for physical examinations, some travel expense and for specialized articles of clothing. The employer provides the supervision and one-half the salary of the on-the-job trainees. The on-the-job training is a practical work situation and the employer keeps the wood produced. All of the expenses, other than one-half of the salary that the employer pays, are refunded with federal money. These trainees must be guaranteed employment when their training is completed; however, at any time during or after training when their performance is unsatisfactory, they may be discharged. Trainees who successfully complete a course should be given a certificate of completion by the APA. The Association should maintain files on trainees, thereby providing a record which would be available to employers.

We are all familiar with the procurement procedures of the industry. It is my opinion that if an industry-wide commitment to a large scale woodland training program was made, the National Alliance of Businessmen and the Department of Labor would provide a program which would be satisfactory to everyone concerned.

There is another consideration which needs to be explored by the industry. It is the possibility of newly trained logging crews acquiring equipment through financing by the Small Business Administration. Training will permit close observation under various conditions and those men with leadership qualities can be recognized. The prospective producer can be isolated. Financing loggers has been a risky business but there has been very little experience with financing well-trained crews. There could be a difference.

The funds are available for a complete training program and much of the teaching material to be used is prepared. An examination of the actual training program reveals that every phase of it
can be contracted to training organizations except the on-the-job training. The employer has control over the contents of the total course of study but may delegate the actual teaching to someone else if he so chooses. Let us first consider the areas of training which can be delegated to a contractor.

Orientation defines for the trainee his position within the industry. He learns what is expected of him and what he can expect from the industry. Orientation establishes responsibility.

Counseling is a personal service to the individual. Some men may require no counseling while others may require considerable. It is provided to assist the individual in establishing a healthy attitude toward his work and to help in solving his personal problems. Counselors have to meet professional qualifications. The counseling provision relieves the employer of many of the annoyances of personal problems. It is done during off-duty time.

Much of the classroom instruction can be scheduled during inclement weather. Teaching methods include lecture, discussion, demonstration, and the presentation of audio-visual materials. The American Pulpwood Association has a basic course of study already prepared which covers the topics a woodsman needs to know. This is practical knowledge presented in situations which relate directly to the work a trainee will be doing. It stresses the requirements for success as an independent businessman. In-depth study can be achieved by employing specialists who are knowledgeable in particular subjects. The contractor would probably need assistance from the industry in securing these specialists.

First aid and the requirements of the Occupational Safety and Health Act should, in my opinion, be incorporated in classroom instruction. The American Red Cross first aid course is well prepared and easy to teach. Occupational safety and health requirements are covered in a recent APA publication.

On-the-job training is the responsibility of the employer and unfortunately there are very few examples of former woodland work experience efforts which can be used as models. Cost is the primary reason why the industry was not engaged in more training in the past. It is expensive: an examination of any school or college budget will verify this fact. No criticism is intended toward former efforts in this area because they were pioneer efforts. The facts of the situation are that so few attempts have been made that there is insufficient information available to evaluate the advantages of different methods.

The military services have experienced success using a buddy system. This system takes advantage of the experience and knowledge of the best equipment operators. A trainee is assigned to each operator as an understudy and the operator trains him. The disadvantage of this system is that the trainee learns all of the operator's bad habits.
Instructor foremen can be assigned a crew of trainees and supervise and train them to do their jobs. This method depends on the competence of the instructor. There are advantages to it because cross-training into several jobs is possible within the crew.

A third method is that of assigning a trainee to a working crew. The quality of the crew and the acceptance of the trainee by the crew governs the success of this approach.

Demonstrations and supervised experience prior to assignment to a working situation should be beneficial. If possible, trainees should be cross-trained into several jobs. A difficult concept to teach, that of adaptability, should be designed into any training situation. We are all cognizant of the efforts being made by equipment manufacturers to develop efficient harvesting systems. If trainees are taught the uses of mechanical systems such as hydraulics, that knowledge can be used to understand the operation of any machinery using hydraulics. If trainees are taught to look for systems in new equipment, they will be much more adaptable themselves.

We have all grown tired of hearing about the dilemma of the city ghettos—ghettos caused by thousands of rural residents moving to town. We are also tired of paying the bills to support those people. The woodland industries are in the unique position of being able to stop or at least retard the flow of rural Americans into the cities. Woodland operations are country operations and they need country people to do the jobs. If our woodlands are to remain healthy, good harvesting practices will have to be used. Efficient, economical harvesting requires trained men. Isn't it time for us to get busy and train them?
Question: Considering the fact that by far the largest number of loggers and wood producers employ small crews and are independent business men, how can the companies provide leadership or take responsibility for people who are not their own employees? Some companies may shrug their shoulders, but they still need wood from these producers. What is your opinion?

Mr. Berger: I think this is a critical question but it goes right to the heart of the proposal I made today. The leadership within the companies and the producers themselves have to believe in a training program before it can be developed. If the leadership wants it badly enough they can and will encourage each independent producer to obtain some training for himself, and many of them need this, and to have some of his men trained as well. The Job 70 program can be designed to do anything you want it to. It can be made into a very flexible program. The time allocated for training under it is sufficient to meet the needs of industry in training individual producers. The training material has already been prepared and funds are available from the federal government to implement such training sessions. Industrial associations such as the American Pulpwood Association and the Southern Forest Products Association already have the rapport to initiate specific programs of training with the Department of Labor.
THE JOB PERFORMANCE OF PULPWOOD PRODUCERS

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INTRODUCTION

With the staff of the Harvesting Research Project of the American Pulpwood Association a series of studies was directed toward analyzing the job performance of pulpwood producers. The basic intent was to provide the data needed to enable better selection and training of pulpwood producers.

FIRST STUDY

The first study was conducted through the use of a questionnaire constructed by the author in cooperation with the staff of the Harvesting Research Project. The questions used are shown below.

Producer Performance Questionnaire

1. Length of time in logging business?
2. Pulpwood Producer's age?
3. Do you read "Pulpwood Production" magazine?
4. Do you think your present crew is a good one?
5. Do you have trouble getting workers?
6. Do you tell your crew that some set production is needed for the day or week?
7. Have you always used the same method of worker payment?
8. Do you usually have to show the men what to do?
9. Did you start in this business as a worker?
10. Do you have a key man in your crew?
11. In the past five years, have you traveled out-of-state on vacation?
12. Do you ever lend your employees money for personal use?
13. How many people have you fired in the last year?
14. How many people have quit in the last year?
15. How many people have been hurt so that they missed some work in the last year?
16. Do you expect to buy a major piece of equipment within the next year?
17. Do you think most of your crew are "good people"?
18. Do you like the work you are doing now better than other work you have done before?
19. About how many days a week are some of your crew missing from work?
20. Does your crew do what needs to be done even if it is not their regular job?
21. Are your crew members personally responsible for keeping the equipment and tools in good shape?
22. About how long does it take you to train a new man on the job?
23. How many men have you hired in the last six months?
24. Do you think your crew tries to loaf if they can?
25. Grade of school completed?
26. Marital status?
27. How many children do you have?
28. Have you ever had military service?
29. Rating as a labor supervisor?
30. Rating as a business manager?
31. Rating of production quality?
32. Rating of condition - tools and equipment?
33. Method of employee payment?
34. Managerial overall rating?
35. Annual Production/Number of employees?
36. Production hours worked by Producer?
37. Weekly Production/Number of employees?
38. Trafficability (terrain)?
39. Degree of mechanization?

The questionnaire data were intercorrelated and subjected to a factor analysis. Essentially this statistical technique is used to reduce a large number of variables to a small, more understandable number. The results are shown in Table V.

The variable numbers in the left-hand column correspond to the questions on the questionnaire.

Factor I identified producers who were so impressive that interviewers rated them high in terms of supervision, management, and business skill. Such producers are individuals who:

1. are well educated
2. have a small family
3. read the trade magazine
4. did not start in the woods as workers
5. are businessmen
6. do not work in the woods
7. believe they have a key man
8. are lenient with the crew
9. have a highly mechanized operation
10. keep equipment and tools in good condition

That such individuals should be rated as highly effective producers was not in accord with research results. The only objective criterion with which the above characteristics appeared related was that of a high injury rate on the part of the crew. This disparity may be explained by a phenomenon known as the halo effect whereby raters who are impressed by an individual regarding one characteristic tend to be biased toward rating that individual favorably on all characteristics. In this particular case, the halo effect was probably a result of the producer's personal characteristics (e.g. education) and his mechanized operation. That there is a high injury rate is probably a result of the producer's lack of knowledge of actual job conditions.

Factor II identified producers whose attitudes toward their crew are positive and who appear to be more concerned with employees as individuals than they are with production. Such individuals are those who:

1. are in the business to "make a living" as opposed to getting rich
2. believe the crew takes responsibility and initiative on the job
3. supervise largely by allowing the men to do the job as they see fit
4. take considerable trouble in training new people
5. have established a reputation locally as a good employer
6. believe they have a key man

These characteristics were associated positively with low turnover and low absenteeism on the part of the crew, but they did not correlate highly with production.

Factor III is a seniority factor in that it identified older individuals who have considerable experience as producers. These producers are individuals who:

1. are family men
2. have a poor education
3. believe they have a key man

In this particular case, no relationship was found between age and time in the business and any performance criterion, such as productivity. This is not to say that no relationship exists. It is possible that a minimum age or experience does characterize the effective from the ineffective producer, but that this requirement did not reveal itself in this study because of the relatively high age ($\bar{X} = 40$ yrs) and experience ($\bar{X} = 14$ yrs) of the sample group.
Factor IV is the only factor which identified producers whose production per man day is relatively high. These producers are individuals who:

1. work in the woods
2. set a production goal
3. give instructions and explanations
4. provide training
5. use varied methods of paying the crew
6. have had military experience
7. keep equipment and tools in good condition
8. have some mechanization
9. believe they do not have a key man (they possibly see themselves in this role)

This factor typifies the producer who is constantly in the woods in a helpful as opposed to a watchdog role. In supervising the crew, he shows his men what and how he wants things done, and if necessary, he is able to accomplish such tasks himself. These characteristics correlate with high production and low injury rate. The two most important characteristics are (1) setting a production goal, and (2) remaining in the woods with the crew.

Factor V identified producers who are similar to those individuals described in Factor IV in that both set production goals. However, there the similarity ends. These producers are primarily production oriented and show little evidence of concern for the crew. As such they represent the antithesis of those producers identified in Factor II. These producers tend to blame employees for job difficulties even when tasks have not been adequately explained and procedures have not been properly demonstrated. Although these producers may remain in the woods, they do not actually perform any manual labor. Supervision is probably restricted to castigating the crew for any observed shortcomings. This behavior is correlated positively with high labor turnover due to job dismissals and voluntary departures.

Producers identified in this factor are individuals who:

1. work in the woods in a watchdog capacity only
2. set a production goal
3. have some degree of mechanization
4. have plans to purchase new equipment
5. are continually hiring new men
6. have a poor reputation locally as an employer
7. believe they have a key man
8. believe their crew does not loaf

Factor VI identified producers who:

1. work with the crew
2. use varied methods of crew payment
3. have some degree of mechanization
4. believe they have a key man
5. do not set a production goal

The major difference between this individual and the man described in Factor IV is that the former does not set a production goal and does believe that he has a key man. It is possible that this producer lacks the supervisory skill that may be gained through military experience and that he relies on money as a primary motivator.

Moreover, it appears that he depends on someone else to see that the job is accomplished and thus he is probably incapable of energizing his men. These behaviors did not correlate with any performance criterion.

Factor VII identified producers who in many respects are similar to those described in Factor II. These producers are individuals who:

1. read the industry magazines
2. do not work in the woods
3. have a highly mechanized operation
4. believe they have a key man
5. provide a high degree of training

These producers were rated as effective supervisors, managers, and businessmen when in fact their production is low. Again, a halo effect was probably operating.

Factor VIII identified producers who have a high accident rate even when working on optimal terrain. These producers are individuals who:

1. have a mechanized operation
2. have a low rating as a supervisor
3. use straight piece work pay
4. do not believe they have a key man
5. do not give instructions and explanations
6. read the trade magazine

These producers appear to be individuals who believe that technology is the answer to all harvesting problems. They seem to have no appreciation of the difficulties faced by workers in learning or doing a job. It is likely that workers are assigned to jobs with virtually no training or instruction. Their philosophy is that equipment, not people, are the key to production.

To repeat, Factor IV is the one that describes the highest productivity producer and some of the behaviors required to attain such productivity. It is to be noted that this production is achieved in spite of a relatively low level of mechanization (item 39) and terrain has absolutely no effect on productivity. The general meaning is that there are crucial producer job behaviors, and optimum amount of mechanization and, with these, a producer can become more effective.
STUDY 2

In an attempt to determine exactly what job behaviors are shown by producers, "critical incidents" were collected from a representative, random sample of dealers and foresters. Essentially these incidents describe effective and ineffective job performance on the part of pulpwood producers.

CRITICAL INCIDENT BEHAVIORAL CATEGORIES AND SUBCATEGORIES
(after Latham, Gary P. 1970)

Effective Behavior

I. Planning, Scheduling and Work Performance
   A. Plans work with regard to weather conditions
   B. Sets production goals
   C. Uses weekends to prepare for the following week of work
   D. Carries extra tools, equipment, or supplies
   E. Does not waste timber
   F. Works a full day or week regardless of circumstances

II. Safety
    A. Dresses crew in clothing designed for safety
    B. Recognizes and avoids potentially dangerous situations
       (e.g. lodged trees, improper use of equipment)
    C. Keeps special safety equipment or supplies

III. Financial Responsibility
    A. Keeps books or records on all facets of his business
    B. Establishes a good credit rating
    C. Handles all his financing
    D. Purchases or replaces essential equipment
    E. Purchases highly mechanized equipment
    F. Makes wise financial investments
    G. Saves money
    H. Files Social Security and insurance

IV. Operating Equipment
    A. Repairs his own equipment
    B. Refuses to operate equipment in need of repair

V. Public Relations
    A. Goes out of his way to help a dealer or a producer
    B. Seeks advice of dealer on special problems
    C. Keeps dealer informed of his operation
    D. Purchases all or most of his own timber
    E. Is scrupulously honest
    F. Executes deeds which are recognized and commended

VI. Supervision
    A. Remains with the crew constantly
    B. Gives instructions and explanations
    C. Provides training
D. Sets minimum standards of behavior
E. Organizes crew so that work is continuous
F. Allows group decisions
G. Commands loyalty and respect
H. Operates in the role of a supervisor rather than as a worker

VII. Use of Rewards
A. Pays good wages
B. Provides incentives or bonus systems
C. Does special favors for crew at his own inconvenience
D. Provides rest breaks
E. Initiates a spirit of competition

VIII. Shows Ingenuity: Improves Equipment or Procedure
A. Devises, initiates, improves or changes a method or procedure
B. Devises, designs, or improves a tool or equipment

IX. Miscellaneous

Ineffective Behavior

I. Planning, Scheduling and Work Performance
A. Cannot or does not work in wet weather
B. Does not use weekends to prepare for the following week of work
C. Loafs on the job
D. Does not carry extra tools, equipment or supplies
E. Does not work a full day or week
F. Does not fell trees using proper procedures
G. Does not cut stumps to the proper level or height
H. Does not cut wood according to specified standards
I. Leaves merchantable timber

II. Safety
A. Operates or allows operation of equipment which lacks protective features
B. Operates or allows operation of equipment in an unsafe manner
C. Allows the use of alcoholic beverages on the job
D. Permits fires in the woods
E. Involves others in dangerous or fatal incidents

III. Financial Responsibility
A. Lacks proper accounting procedures
B. Lacks credit
C. Purchases highly mechanized equipment unwisely
D. Makes poor financial decisions
E. Fails to file Social Security and insurance
F. Intentionally remains in debt
IV. Operating Equipment
   A. Operates equipment in need of maintenance
   B. Repairs equipment improperly
   C. Abuses equipment
   D. Fails to get maximum use for his equipment
   E. Lacks mechanical aptitude

V. Public Relations
   A. Unethical conduct
   B. Does not or will not cut the wood according to the landowner's instructions
   C. Cuts unmarked timber
   D. Destroys property unnecessarily

VI. Supervision
   A. Does not stay in the woods with the crew
   B. Does not give instructions or explanations regarding proper procedures
   C. Does not provide training
   D. Loses control of emotions in his interactions with the crew
   E. Breaks promises to the crew
   F. Operates as a member of the crew rather than as a supervisor
   G. Does not enforce his commands
   H. Distracts crew from their tasks

VII. Miscellaneous

These results mean that essentially eight dimensions were defined for the job performance of the producer, since six of the eight categories defining effective performance were similar to the six categories which define ineffective performance.

In many cases the ineffective behaviors were simply the converse of the effective behaviors. However, this was not always true. "Setting goals" (effective category 1b) defined effective performance but the converse of this behavior, "not setting goals" was not reported.

Generally, the first category describes planning work. This includes setting up a logical systematic work plan and maintaining work despite job difficulties. The next emphasizes the observance of established safety regulations. Also included are behaviors involved in making judgments concerning the relative safety of certain actions which are not covered by any specific regulation. Subsumed under the third are behaviors which are critical to financial independence. A fourth primarily concerns behavior involved in the correct operation of equipment. A fifth, seeking out the best sources of information pertinent to given problem areas, fulfilling commitments, and honesty and fairness in dealing with associates. Activities which are not directly related to the job, but indicate the producer's interest in his work, are also included. A sixth area emphasizes recognition of the crew's
need for closely supervised attention, giving clear and detailed instructions, planning and coordinating the work of the crew, making decisions, taking action on those decisions, providing training, fulfilling promises, and fostering cooperation within the group. The seventh stresses recognition or acknowledgement (rewarding) of the crew's effective behaviors and implementing the means by which to maintain this performance. Also included is behavior which indicates an interest in the crew's welfare. The final category concerns creative or imaginative behavior through which techniques, procedures, or materials are devised or modified to meet specific needs or to adjust to changes in conditions.

STUDY 3

In the previous description of the job performance of pulpwood producers, the importance of goal-setting to production was emphasized. Its real importance is shown in Table VI.

Factor 1 identified producers who set production goals and supervised their crew. The objective measure of supervision, number of hours the producer worked with the crew, was supported by such subjective measures as a positive response to questions related to giving the crew instructions and explanations, providing training, using varied methods of crew payment, having military experience, and a negative response to the question, "Do you have a key man in the crew?" (the producers saw themselves in this role). These behaviors correlated positively with productivity and negatively with injury rate.

Factor 2 identified moderately mechanized operations with producers who set production goals only. Working with the crew did not correlate with items comprising this factor. A subjective measure of poor supervision was provided by a positive response regarding the relief of a key man in the crew thus indicating that these producers are not the primary source of crew leadership. These behaviors correlated positively with compulsory and voluntary employee termination.

Factor 3 identified producers who work with the crew but do not set production goals. These individuals believe they have a key man in their crew, and use varied methods of crew payment. None of these behaviors correlated with any performance despite the fact that the jobs of these individuals were more heavily mechanized than those of producers identified in the two previous factors.

These results have been confirmed by an independent study conducted by one of the member companies of the Harvesting Research Project.

In general, this study means that there are quite definite behaviors that can be shown by producers and, further, that they do make a real difference in the performance of the pulpwood
crews. Further, adequate crew leadership requires a complex of behaviors—no single behavior is appropriate but the complete "set" is required.

SUMMARY

The above are by no means all of the studies completed but these may be of direct interest to foresters. The completed research has shown that it is possible, to at least some degree to describe the job performance of effective and ineffective pulpwood producers. The work is far from complete but has shown considerable promise. By way of suggestion, a future dollar invested in personnel research could pay off quite handsomely in the future with regard to the selection and training of pulpwood producers.
Table V. Rotated factor loadings\(^1\) (Ronan, W. W. and Gary P. Latham 1969)

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\(^1\)Only loadings of .150 or greater are shown.

\(^2\)h\(^2\): a measure of the proportion of variation associated with the specific variable.
Table VI. Rotated factor loadings (Latham, Gary P. and W. W. Ronan 1970)

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<td>Weekly production¹/</td>
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</table>

¹/Variables of primary interest to this study.

* Absenteeism is not shown as it did not correlate with any of the above variables.
LITERATURE CITED


MOTOR VEHICLE LIABILITY INSURANCE ON PULPWOOD TRUCKS IN NORTHERN LOUISIANA

John H. Corley, Graduate Student
Department of Economics and Finance
Louisiana Tech University
Ruston, Louisiana

(Editor's note: The timeliness of this report, even though it was not a part of the formal program of the symposium prompted the inclusion of this abstract. The report is preliminary in nature. The complete study is available from the author.)

ABSTRACT

Louisiana, like many other states, has a law requiring that liability insurance (MVLI) be carried on all motor vehicles.

During early 1972, nineteen pulpwood dealers in northern Louisiana were interviewed concerning MVLI coverage on trucks operated by their wood producers. The dealers interviewed buy pulpwood from a total of 600 producers of whom only 60 per cent, or 360, maintain MVLI coverage on their trucks.

Although there are numerous reasons, including cost of the premiums, for this lack of insurance, the principal one is failure on the dealer's part to require MVLI on all trucks as a condition of wood purchase. Such a requirement is a policy of only one of the four pulp and paper companies which ultimately receive the pulpwood transported by these trucks.

The minimum amount of insurance carried by the producers included in this study was $5,000 - $10,000 - $5,000. Other

\[1\]

A study supported by the McIntire - Stennis Cooperative Forestry Research Act and administered by the School of Forestry, Louisiana Tech University, Ruston, Louisiana.

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producers carried extended protection to $100,000 - $300,000 - $100,000. Premiums paid in Louisiana vary according to geographic territories established by the Insurance Rating Board of New York City. These territories represent the geographic congestion of motor vehicle accidents and losses in the state.

Dealers interviewed favored a federal no-fault insurance law over a state no-fault law by a ratio of nine to six.

RECOMMENDATIONS

1. Enforcement of the existing Louisiana law requiring MVLI on all vehicles. This could be accomplished by requiring a certificate of insurance to be presented at time of issuance of truck license plates.

2. Enactment of a federal no-fault law. This would probably lower rates as well as eliminate the problems encountered by truck owners who are faced with differing laws in adjoining states.

3. Another proposal is for pulp and paper companies to insist that the state law regarding MVLI be observed; in effect this would require all trucks which haul pulpwood to be covered, at least at the minimum level.

4. Establishment of realistic rates based on actuarial tables of accidents and losses involving only this class of vehicle (i.e., logging trucks) rather than an average of all vehicles.