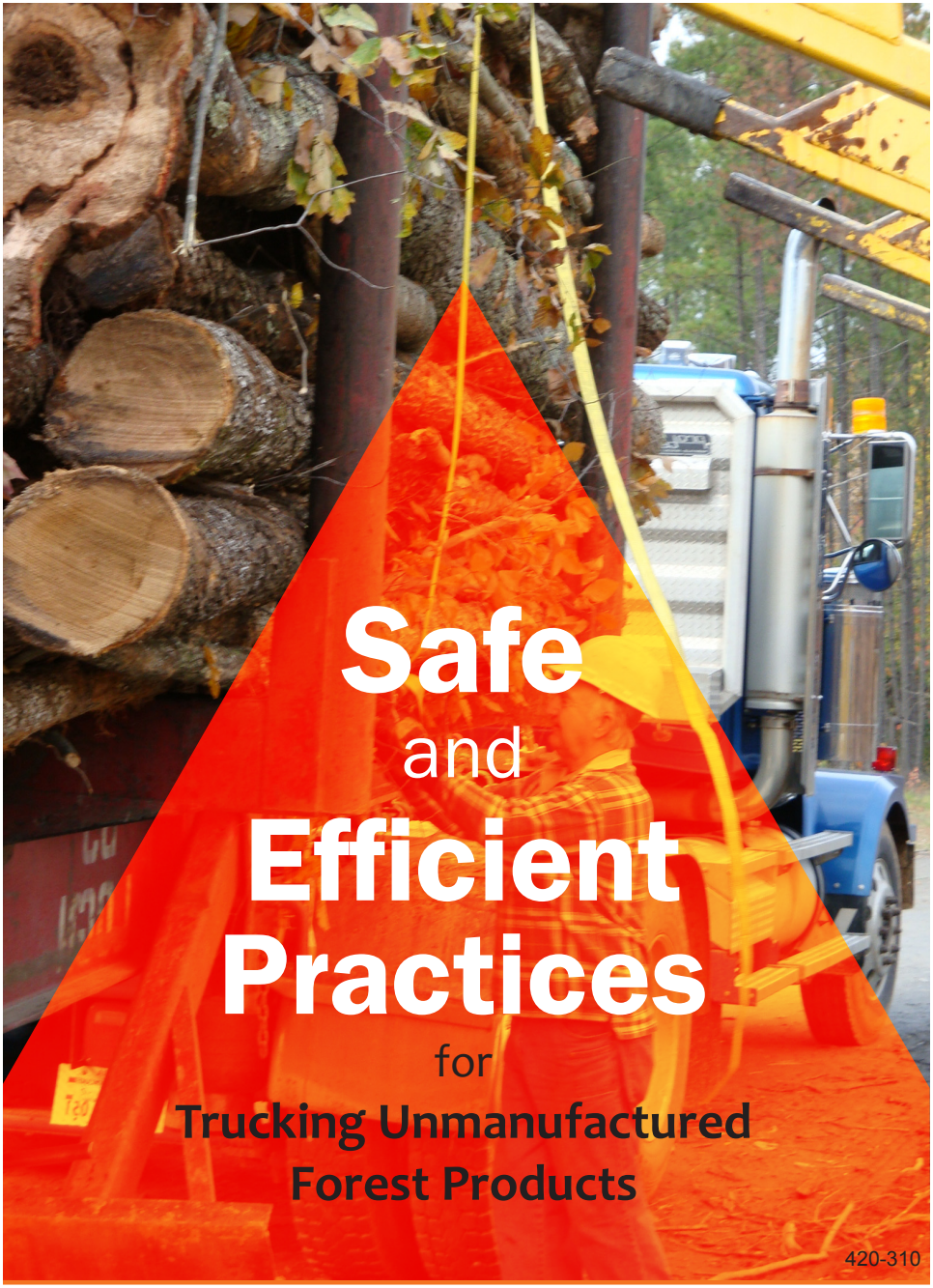

Safe and Efficient Practices for Trucking Unmanufactured Forest Products

420-310

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Introduction

The transportation of unmanufactured forest products is an important component of any timber harvesting system. In the southeastern United States, approximately 90 percent of the wood delivered to mills is transported by truck. Wood fiber is typically delivered to mills in one of five forms: chips, shortwood, cut-to-length, log-length, and tree-length. There are several types of truck and trailer combinations in use today for delivering these products. Combinations include trucks paired with trailers with two or four bolsters (figure 1), self-loading trucks, chip vans (figure 2), tandem with pup, stinger steering trucks, folding pole trailers, and 10-wheeled trucks (figure 3). This wide variety of truck and trailer options is reflective of the differences in product being hauled, as well as terrain and road limitations. For example, tandem/pup combinations are often used due to switchbacks associated with roads in mountainous terrain. Trucks paired with a two-bolster trailer are limited to tree-length products, while four-bolster trailers may haul cut-to-length wood in "double bunks."

Figure 1. Four-bolster trailer

Figure 2. Chip van

Figure 3. Ten-wheeled truck

There are typically two categories of ownership associated with these various trucks: contract haulers and company-owned trucks. A 2001 Georgia study reported that contract-truck hauling was responsible for 45 percent of harvesting operations.[1] Regardless of ownership, all trucks must be operated in a safe and efficient manner. Trucking is often the most expensive phase of a timber-harvesting operation, accounting for as much as 40 percent to 60 percent of the total harvesting cost.[2] As a result, all possibilities for reducing the cost of trucking forest products or improving the efficiency of their transport should be examined. Unsafe trucking practices carry the risk of liability due to injury, property damage, and resulting unproductive time. Inefficient working practices also present the risk of lost revenue as a result of lost loads or machine breakdowns, as well as increased fuel and labor expenses.

Inefficiencies and safety hazards in transporting unmanufactured forest products can affect the ability of harvesting systems and wood-processing

facilities to function effectively. Given the small margin of error regarding cost effectiveness in today's forest-products industry, it is imperative that each link of the wood-fiber supply chain operates safely and efficiently, at or near full capacity. This situation has forced forest managers to investigate and analyze losses due to accidents and inefficiency in the supply-chain link appropriate to the entity. Often, collected data and training materials that could lessen losses are scattered and segmented between researchers and wood-consuming companies throughout the country. Therefore, the purpose of this manual is to compile these data, along with solutions, into an understandable and useable format.

Common Causes of Accidents

Just as timber harvesting is a dangerous occupation, so is the transportation of forest products. A study conducted in 1997 found that truck drivers were the third-most injured worker in a harvesting system, comprising 24 percent of all injuries.[3] The study examined what each truck driver was doing when injured. Thirty-five percent of the injuries occurred while driving, 14 percent while performing equipment maintenance, 10 percent while trimming the load, and 8 percent while getting into or out of the truck (figure 4).

This study was repeated in 2001 and found that truck drivers continued to account for a significant percentage (22 percent) of harvesting-related injuries and remained the third-most injured individual.[4] In the 2001 study, injuries incurred while driving increased to 48 percent. It is important to note that of the injuries incurred while driving, 79 percent occurred while the truck was loaded. The study also demonstrated that binding the load was responsible for 12 percent of truck-driver injuries and getting into or out of the truck increased to 10 percent of the injuries, while injuries associated with maintenance decreased by half to 7 percent, and injuries resulting from trimming the load fell to only 2 percent (figure 5).

A study conducted in Louisiana mirrored these results when "the proportion of transportation accidents rose more than any other category."[5] While there were notable decreases in the occurrences of injuries in the fields of maintenance and trimming of loads, injuries incurred while getting into or out of trucks increased by 2 percent and injuries associated with driving the truck increased by 13 percent.

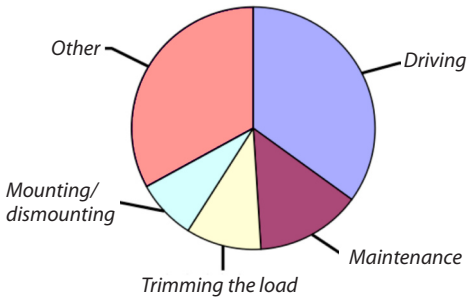

Figure 4. Summary of truck driver injuries in 1997[3]

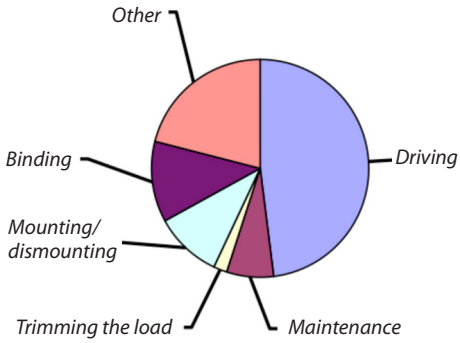

Figure 5. Summary of truck driver injuries in 2001[4]

Best Working Practices

The following "best working practices" are intended to help reduce the likelihood of a truck driver being injured. Recommendations found in this manual should not be construed or used as a substitute for compliance with any applicable federal or state law.

Planning

The planning stage offers the first opportunity to reduce trucking-related injuries during a harvesting operation. Following is a list of best working practices that can help reduce accidents or injuries during the planning stage of any harvesting operation.

Sight distance: Locate haul road entrances to allow safe stopping distances and sight distances to oncoming traffic. A vehicle traveling 60 mph requires a sight distance of 400 feet to 600 feet.

Flaggers: If haul road entrances must be located in blind curves or other areas in which a 400 foot to 600 foot sight distance cannot be established, use flaggers to warn oncoming traffic of trucks entering the road.

Signs: Use "Trucks Entering Road" signs to alert oncoming traffic. All signs and stands should meet standards set in National Cooperative Highway Research Program Report 350.

Mud: Keep mud off of all public road entrances. Gravel, wooden mats, or a combination of geotextile and gravel (or other means) will help keep mud off of highway entrances.

Entry permits: If applicable to your area, be sure to have all necessary entry permits before starting an operation.

Turning radius: Know the necessary turning radii for all trucks that will be used at a harvesting site. If building new roads, design them accordingly. If roads currently exist, use trucks that meet turning radius restrictions or, if necessary, widen turns to accommodate appropriate trucks.

Turnarounds: If turnarounds are used, they must be large enough to accommodate the trucks that will be using them. Turnarounds should also be free of any debris or slash that may cause damage to trucks.

Decks: Decks must be large enough to accommodate the trucks and all other equipment that will be used at the harvesting site. The loader should be placed so trucks can quickly and easily move into position to be loaded. Keep debris cleared from the landing to avoid damage to trucks and injuries to workers.

Loading

The loading deck is a potentially dangerous area on any harvesting operation. Loading at many harvesting operations is performed at a central location with equipment and wood continuously entering and leaving the deck.

- Wait until the loading area is clear of hazards before entering the deck.
- Drivers should exit the truck and move to a safe location during loading.
- Hardhats and other appropriate personal-protection equipment must be worn at all times when the driver is out of the cab.
- All logs must be long enough to be contained by at least two bolsters (figure 6).
- The load must be balanced and stable prior to binding.
- Load heights and overhang must adhere to state or federal law and

Figure 6. Logs contained by two bolsters

Figure 7. Load height lower than bolsters

should not rise above bolsters (figure 7).

- Appropriate warning flags or lights must be used as required by state and federal law (figure 8).
- The truck must not be moved until binders are secured.
- The load must be secured with the number and type of binders required by state or federal law.

Trimming

The decline in injuries incurred when trimming the load is often attributed to the increased use of effective mechanized delimbing devices, which require less follow-up trimming. However, opportunities to reduce injuries still exist. Anyone who trims a loaded truck should take

Figure 8. Attaching a warning flag

Figure 9. Using a pole saw to trim a load

appropriate safety precautions. Whenever possible, a pole saw should be used instead of a chainsaw (figure 9). Anyone operating a pole saw must have access to – and wear – proper personal-protection equipment, including a hardhat, eye protection, and hearing protection. Anyone operating a chainsaw must following all OSHA standards and also have access to – and wear – proper personal-protection equipment, including a hardhat, chainsaw chaps, cut-resistant boots, eye protection, and hearing protection.

Binding

Injuries associated with binding the load can be reduced in a number of ways. It is important to remember that the log deck is the focal point of a harvesting operation and special care should be paid when moving about on the log deck.

- Be aware of skidders entering and exiting the deck, what the loader is doing, and the presence and actions of other employees around them.
- Due to risk of injury, ratchet binders should be used instead of tension binders.

- Nylon straps should be used instead of chains or wire rope. Nylon straps are lighter and less likely to injure drivers when thrown, should they come into contact with anyone.
- Make sure that the area around the truck is clear before throwing binding straps over the load in order to avoid injuring any individual who may be on the other side of the truck.
- Check for overhead hazards, such as utility lines.
- Care should be taken to make sure that the driver does not lose his/her footing. This can range from not wearing boots with excessively high heels to simply paying attention to where one is walking.
- Binding straps should be checked for cuts or tears before each use. If a cut or tear is found, replace the strap immediately.
- For chip vans, use or install poles for tarping the load to prevent the driver from climbing on top of the trailer (figure 10).

Figure 10. Tarping a chip van

Mounting/Dismounting

Injuries associated with getting into or out of trucks account for 10 percent of injuries to truck drivers, making this act the third-most likely reason for an accident to occur.[6] The number of injuries due to mounting and dismounting can be reduced by the following actions:

- Mandate that employees wear nonskid footwear.
- Ensure that all handholds are properly attached and in sound condition.
- Use the "three points of contact" climbing method (two hands and one foot, or one hand and two feet in contact at all times).
- Stress that truck drivers keep all steps clear of mud and other debris.

Driving

Injuries associated with driving trucks may increase costs due to medical expenses from injured drivers, damage to the truck and trailer, and loss of production associated with accidents. This is compounded by the potential of injuries or property damage to other parties who may be involved in these accidents. There are several ways to reduce the likelihood of these incidents occurring. The first is to only hire qualified drivers with safe driving records. Additionally, drivers should be reliable, as well as willing and able to properly take care of their equipment.

- Comprehensive driver training including defensive-driving techniques and safe loading/unloading methods should be taught periodically as part of a training program.
- Installing governors or global-positioning systems (GPS) or requiring the driver to drive at a lower speed can translate into fewer and less serious accidents.

- The use of new tires instead of recaps – especially on the steering tires – decreases the likelihood of an accident due to a blowout.
- It is important to monitor brake wear and adjustment.
- Be certain air hoses, gladhands, and seals are in good condition.
- Make sure the driver is bleeding the air tank regularly.

Most accidents associated with heavy trucks are caused by brake failure.[7] Drivers should always perform a pre-trip inspection of the truck and trailer. Regular safety inspections of all trucks can help ensure the detection and correction of any problems before they cause an accident.

Haul roads are often rough and littered with debris. Loads can settle, wiring can be pulled loose, and undercarriage parts can be damaged or loosened. The following checklist was adapted from the Forest Resources Association publication "Quick-Check Off the Deck."[8] This checklist can keep trucks operating safely and should be completed before entering any public highway. While this checklist can improve driver safety, it should not be used as a substitute for a complete walk-around inspection, which should be made daily.

Tires: Make sure that all tires are fully inflated, without wood or rocks jammed between them. Remove debris resting on the trailer frame.

Lights: Light wires can be pulled loose and light bulbs may be broken or jarred loose. Ensure that all lights are working properly. Clear mud or heavy dust from lenses (figures 11 and 12).

Load binders: Loads may settle when pulled over haul roads. Binders should be checked for slack and tightened as necessary.

Figure 11. Lights obscured by dirt and mud

Figure 12. Lights cleaned before entering public roads

Trailer connections: Make sure that gladhands and electrical connections are not loose (figure 13).

Load flag or lights: Make sure that load flags or lights are still attached and working.

Clear vision: Make sure that you can clearly see forward, sideways, and behind while in the cab. Adjust mirrors as needed.

Figure 13. Checking glad hands and electrical connections before entering public roads

Unloading

Unloading at the mill carries many similar risks as loading in the woods. Unloading occurs in a noisy environment often with multiple trucks and cranes moving in a central area.

- Drive at a safe speed inside the mill. Follow any posted speed limits.

- Follow all mill policies during unloading.
- Use the mill's unbinding rack if available (figures 14 and 15).
- When outside the truck, stay in a safe position at all times.

Figure 14. Unbinding rack at mill

Figure 15. Unbinding rack in use

Maintenance and Repair

Whenever possible, vehicle maintenance should be performed inside a controlled shop environment. A tired employee or supervisor, working on a muddy machine in the noise and distraction of the log landing without the proper tools, lights, jacks, lifts, supports, etc., substantially increases the risk of an accident.[9]

- Use proper maintenance and repair safety techniques such as lock-out/tag-out procedures.
- Properly use hand tools for their designed purpose.
- Use proper lifting techniques.

Productivity and Efficiency

Several productivity factors can influence a truck's efficiency, including payload, turn time, and weight variation. While a truck driver may not have control of each factor, by improving factors that fall under their control, they can increase the efficiency and profitability of their trucking system. Below are several variables to consider for improving trucking efficiency.

Tare-Weight Reduction

One approach to reduce costs and increase profits associated with trucking is to reduce tare (empty) weight of log trucks and trailers. It has been estimated that every pound added to a truck's tare weight decreases a logger's profit by $5 per load.[10]

Truck and trailer combinations and components should be selected with durability and weight in mind. For example, pole trailers typically weigh between 3,000 pounds and 6,000 pounds less than double-bunk frame trailers. If a double-bunk frame trailer isn't necessary, don't use it. Many trailer companies now produce "payload" series trailers. These trailers are designed to weigh less; therefore, allowing the truck to haul more payload while staying within legal weight limits. While they typically cost more initially, the trailers often have the potential to pay for themselves in a year or less due to additional payload hauled. Consider the example of a payload series trailer that weighs 2,000 pounds less than an older double-bunk trailer. If this truck/trailer combination hauled three loads per day for 15 loads per week, each truck could haul an extra 750 tons annually, with no additional trips to mills.

Other options include using super-single tires and removing infrequently used landing gear. Every pound saved in tare weight is another pound of wood that may be legally transported. It is also advantageous to minimize tare-weight variability. One way to do this is to maintain a uniform truck fleet. Also, when purchasing new trucks, select trucks with tare weights that are similar to each other and preferably lower than those of old trucks.[11] Table 1 illustrates tare-weight reductions achieved through a range of steps taken by B&B Companies of North Carolina, Inc.[12]

Turn Time

It is also important to minimize travel to and unloading time at the receiving mill (turn time). Shorter turn times allow trucks to be more productive by hauling more loads. As such, any delays should be minimized. While most focus on mill turn time, in-woods turn time can have an equal effect on a truck's efficiency. The typical method to reduce in-woods turn time is staggering truck arrivals to avoid bottlenecks. In some instances, it is also beneficial to reduce the number of trucks hauling from one harvesting site if wood production cannot supply the number of trucks. The use of set-out trailers can also reduce in-woods turn time. By using set-out trailers, trucks no longer have to wait to be loaded. They simply return from the mill, drop the empty trailer, pick up the loaded trailer, and continue to the mill.

A 2001 Wood Supply Research Institute report investigating causes of delays at the mill found that many turn time variances are related to mill-specific factors.[13] This report also found the two leading causes of delays at mills to be when the crane/loader cannot keep up with the number of trucks waiting to be unloaded, and when there is a lack of space for waiting trucks inside the mill. Both of these delays are exacerbated by the number of trucks present at the mill at a given time. If mills can be avoided during their peak hours, turn time can be reduced. This can be achieved by hauling to other mills that accept the same products, if feasible, or by using set-out trailers to concentrate wood at one location and then hauling to the mill before or after peak hours.

Table 1. A tare-weight reduction example adapted from Forest Resource Association technical release 07-R-29

Weight-reduction strategy	Pounds (lbs) eliminated per load
Use super-single tires with air-pressure management and aluminum wheels	700 lbs – tractor, 700 lbs – trailer
Remove passenger seat	40 lbs
Use lighter engine	500 lbs
Limit fuel to a per day basis	7 lbs per gal saved
Replace chrome with fiberglass bumpers	70 lbs
Eliminate dual exhaust stack	200 lbs
Eliminate lights not required by DOT	5 – 10 lbs
Use single leaf springs on trailers	4 x 40 lbs = 160 lbs total
Wash mud off truck and trailer	100 lbs minimum
Use lighter-weight landing gear	200 lbs
Total weight savings available for wood payload	**Approximately 2,680 lbs**

Weight Variability

It is also important to control the variability of loaded truck weights. Overweight loads are subject to penalty by the state, and occasionally by the receiving mill. However, underweight loads are a source of lost revenue on every occurrence. Ideally, trucks should be loaded to the maximum legal weight every time. A low cost and simple technique to control load variability is to frequently communicate with the loader operator and set target load weights. This information can heighten the awareness of loader operators regarding their ability to estimate load weights, which should result in improved performance.[14] Another option is the use of an in-woods weighing device. Three basic types include onboard truck scales, portable platform scales, and grapple scales. Both onboard and platform scales provide axle and tandem weights as well as net payload weight, while grapple scales record the weight of the wood in the grapple. These scales can help to increase average payload while reducing overweight fines or mill penalties.

Truck Scheduling

Another way to increase a truck's efficiency is to increase the percentage of loaded miles it travels. A method to accomplish this is to look for possible backhauls along with proper truck scheduling. A study in Georgia tracked 18 log trucks from three independent companies operating at six logging sites to 15 mill destinations over five days.[15] A centralized dispatch system was then simulated using actual inventory and loading/unloading data and constraints to manage hours worked and truck flows per tract. Results indicated that the same volume of wood could be delivered using 55 fewer minutes per truck per day and 36 fewer miles driven per truck per day, with an estimated daily cost savings for the 18-truck system of $759 per day or $42 per truck per day.

Currently, there are few truck scheduling packages on the market that allow for real-time truck tracking and scheduling. Products such as Blue Ox allow for real time truck dispatching and routing/navigation. Blue Ox and other products such as Trim Web also provide truck-speed summaries, real-time truck location and status, and other functions.

Preventative Maintenance

It is also important to establish a sound preventative-maintenance program for log trucks. Equipment abuse is the only factor that increases maintenance costs more than dirt.[16] Blocked air cleaners can reduce power and decrease fuel economy. As such, it is important to regularly clean and check air filters. The conditions encountered in logging require more frequent oil changes than those specified for over-the-road trucks by their manufacturers. It is also important to remember transmission and rear-end oils when changing engine oil. Tire inflation should be monitored daily and be kept at the manufacturer's recommendation. Properly inflated tires can lead to better fuel economy and prolonged tire life. Electrical systems such as turn signals, brake lights, and headlights should be tested daily to be certain they are functioning properly. Also turn signals and brake lights should be kept clean to ensure their visibility.

Summary

As previously stated, trucking is often the most expensive aspect of any timber-harvesting operation. As a result, possibilities to reduce costs or to improve efficiencies must be explored. This document may be used to decrease the likelihood of accidents, as well as to increase

the efficiency of unmanufactured forest-product transportation. By increasing safety and efficiency, total costs to the harvesting operation should be reduced.

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