

## Analysis of Lost Time Injuries - 1997

### Logging (Accident Reporting Scheme Statistics)

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*Hauler breakout hit by drag - fractured femur*

Year January to December	1992	1993	1994	1995	1996	1997
Fatal injuries	9	6	10	9	4	7
Lost time injuries (LTI)	197	246	288	202	218	172
Minor injuries	36	37	107	101	106	103
Near miss incidents	32	46	154	122	124	147
Annual harvest (million m <sup>3</sup> )	14.1	14.9	15.1	16.4	16.9	16.5*
Lost time injuries/million m <sup>3</sup>	14	16.5	19.1	12.3	12.9	10.4

*Table 1 - Injuries and incidents recorded by the Scheme from 1992 to 1997*

*\*Source: Provisional data, Ministry of Forestry, Round wood removals*

## Summary

- There were 172 lost time injuries reported which is 21% less than last year
- There was a total of 1775 days off work which is 38% less than last year
- Average severity was down to 11 days from 14 days in 1996
- Most injuries occurred between 8 and 10 am and 2 to 3 pm
- More fractures and bruises occurred earlier in the week
- More lacerations and sprains/strains occurred in the middle of the week
- There was a 40% drop in thinning injuries since 1996
- Hauler injuries have increased in number to equal those of skidder operations

- Most frequent causes of injury were:
  - felling: being hit by sailer
  - trimming: chainsaw laceration
  - breaking out: hit by ropes and/or carriages
  - skidwork: hit by rolling log and/or machine

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# Introduction

This is the thirteenth year of data collection by the Accident Reporting Scheme (ARS).

The following definitions are used by the ARS:

- lost time – the injury causes the injured person to miss the next full day's scheduled work
- minor – first aid or medical treatment required, but lost time as defined above does not apply
- near miss – first aid or medical treatment not required but the incident could have caused injury.

# Acknowledgments

Liro acknowledges the co-operation of the loggers, contractors and companies that supplied the data used for these analyses.

The ARS is funded jointly by the forest industry and the Public Good Science Fund.

# Analysis of lost time injuries

## Lost time per injury

The average number of days lost per injury was 11.1, which is significantly less than the 13 days reported in 1996 (Parker, 1997). The number of days lost ranged from one to 100 days, (median five days). The number of days lost is occasionally estimated, so caution must be used when interpreting "number of days lost" information.

In 1997, as in previous years, the greatest proportion of injuries resulted in one to five days off work (Figure 1).

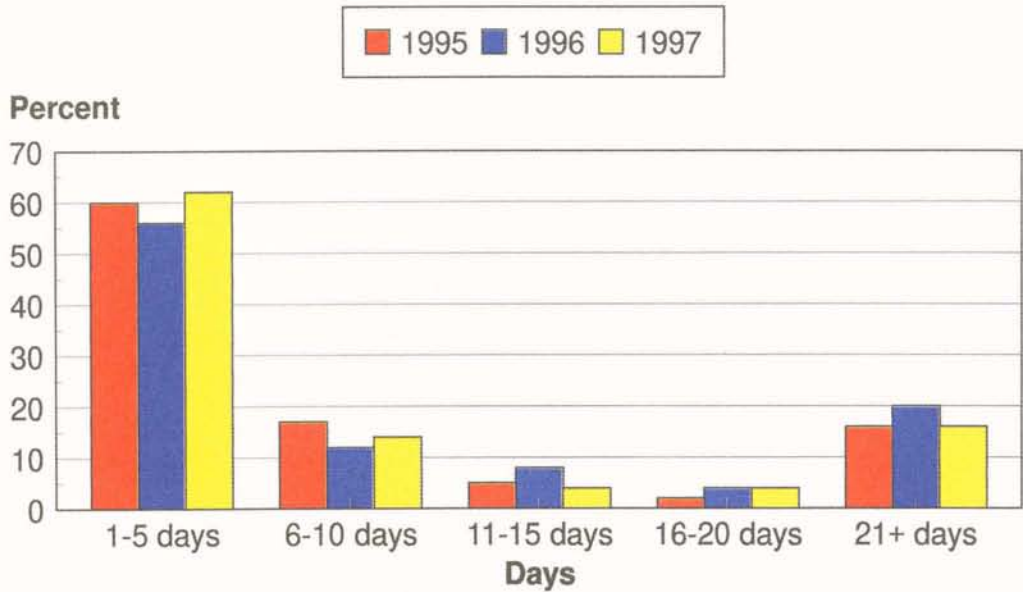


Figure 1 – Distribution of lost time per accident

A total of 1775 work days were lost in 1997. At 235 working days per year, this is equivalent to 7.6 years of lost time. This compares with 12.1 years lost in 1996 and 7.6 years lost in 1995. The smaller number of days lost in 1997 is due to fewer severe fractures and multiple injuries (Table 2).

	Number of injuries		Days Lost	
	1996	1997	1996	1997
Fracture	36	24	1146	655
Multiple	23	4	459	260

Table 2 – Fracture and multiple lost time injuries by number and days lost for 1996 and 1997



## Time of day of lost time injuries

As in previous years, the greatest proportion of the injuries occurred early in the day (Figure 2). There are two factors which may cause this effect:

- Timing of smoko - from 7 am to 9:59 am almost all loggers will be working, so exposed to hazards. In any hour after 10 am some loggers will be having smoko so the total number of loggers exposed to hazards each hour is less so less injuries will occur.
- Fatigue - most loggers will eat breakfast before work. The energy in the breakfast will only fuel them for up to four hours (Kirk, 1996). So by 9 am or 10 am they are low in energy and more likely to make errors because of fatigue. This effect will occur in the afternoon too, as energy from the morning smoko is exhausted and the logger becomes more dehydrated (Paterson, 1998).

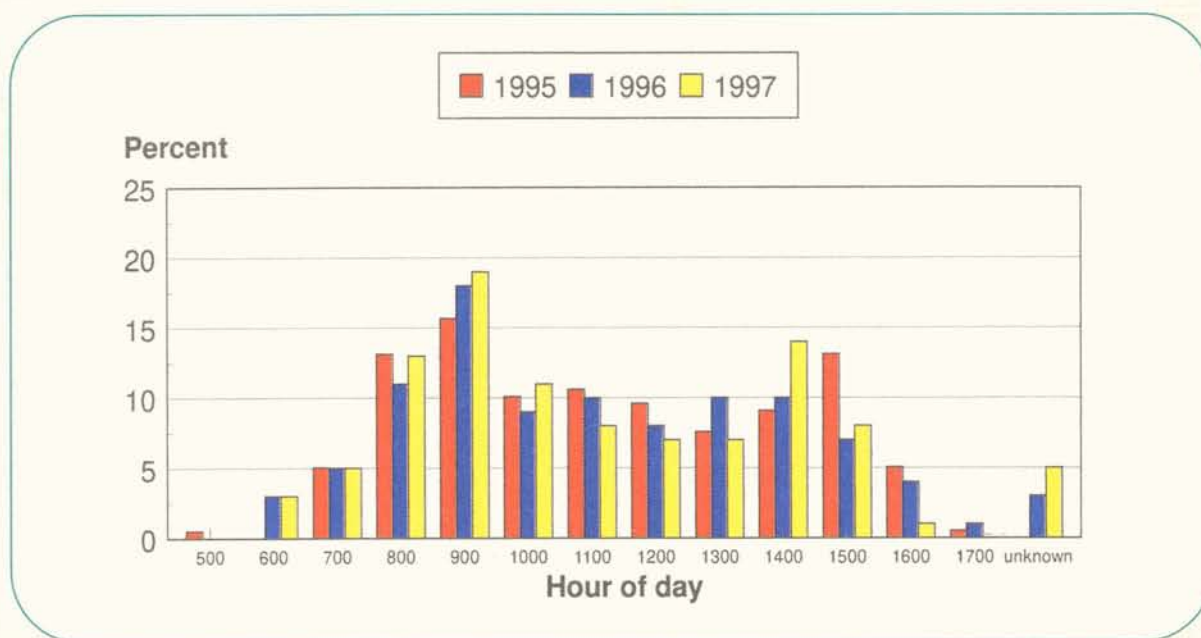


Figure 2 - Lost time injuries by time of day

In previous years, most injuries occurred early in the week. In 1997, injury occurrence was spread more evenly through the first four days of the week with 26%, 17%, 26%, 20% and 11% for Monday to Friday respectively.

However, looking at the data in more detail revealed differences in the type of injury and when it occurred during the week. There was a strong trend for more bruising and fracture injuries to occur early in the week (Figure 3). Many of these injuries resulted from being hit by a log or machine, moved or operated by someone else. They are injuries which result from the interaction of two or more people. Perhaps earlier in the week the crew are not working as efficiently together as they do later in the week.

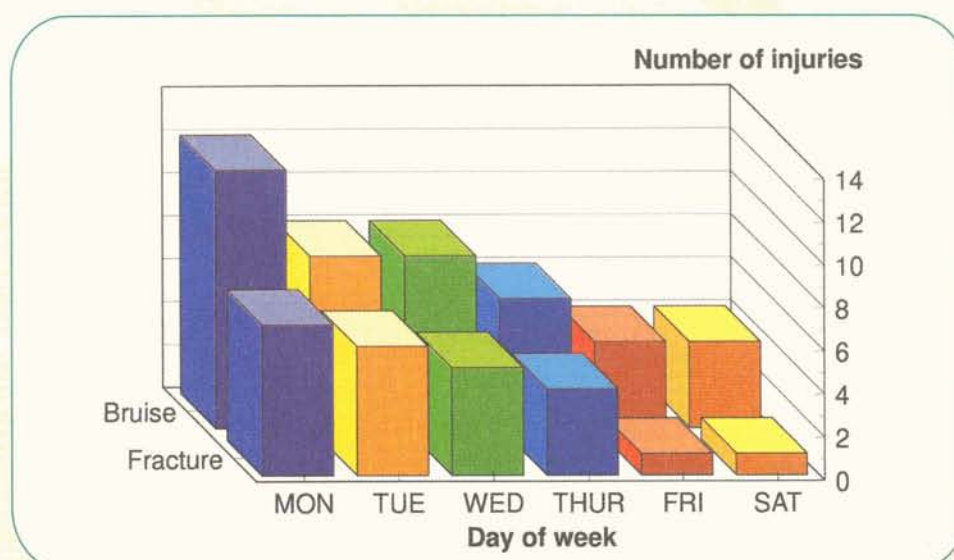


Figure 3 - Bruising and fracture lost time injuries by day of the week

In contrast, laceration and sprain/strain lost time injuries occurred on Mondays but then had another peak later in the week (Figure 4). Many laceration and sprain/strain injuries resulted from events which included no one else. For example, chainsaw laceration to the foot or sprained ankle while walking on cutover. These injuries may be more due to fatigue and not the interaction of people, that was seen in bruising and fracture injuries.

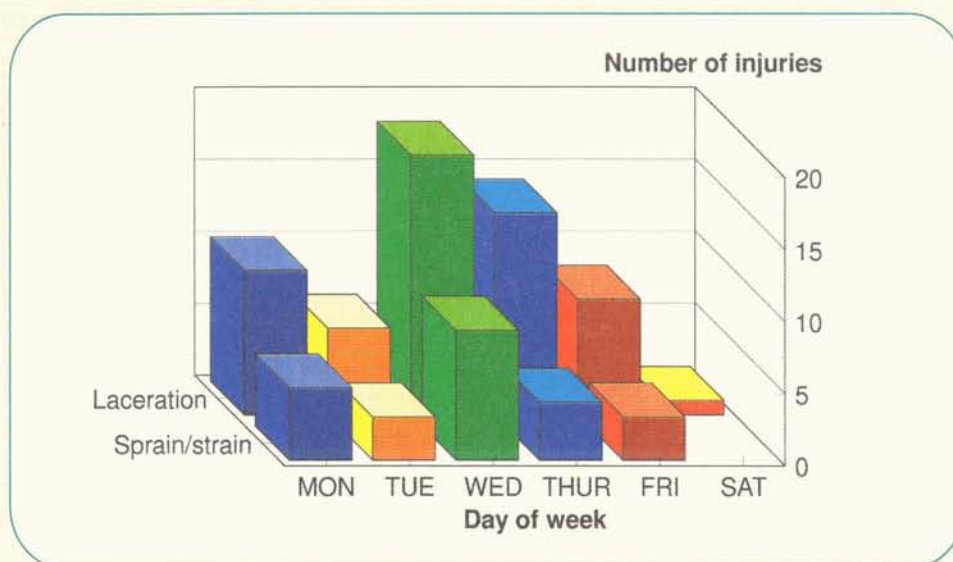


Figure 4 - Laceration and sprain/strain lost time injuries by day of the week

## Type of operation

The proportion of lost time injuries in clearfell has remained similar since 1995 (Figure 5). There were 32 lost time injuries reported in thinning operations in 1996 compared with 19 reported in 1997. Injury severity in thinnings has decreased slightly to an average of seven days off work (Table 4). There were a total of 1420 days lost in clearfell and 141 days lost in thinning in 1997. This compares with 2318 days lost in clearfell and 265 days lost in thinning in 1996 and is similar to 1995 levels of 1456 and 158 days respectively. Mechanisation and safety education programmes may have contributed to the decline in thinnings injuries in 1997. There was no significant decrease in the number of people working in thinnings operations in 1997.

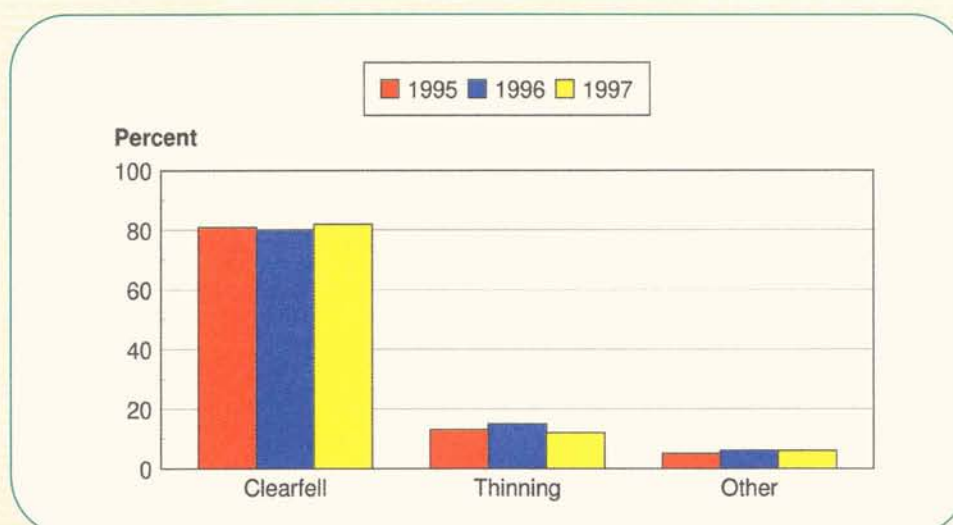


Figure 5 - Lost time injuries by type of operation

For the first time skidder and hauler operations accounted for an equal proportion of known lost time injuries with 41% and 42% respectively. This result is not unexpected because the number of hauler operations has been increasing relative to skidder operations. Results of a telephone survey of plantation forest logging operations in 1997 (T. Evanson of Liro, pers comm.) indicated that of the 308 logging crews identified, 66% were ground-based and 34% were hauler operations. This compares with 59% ground-base injuries and 42% hauler injuries.



When comparing the higher injury rate of hauler operations with ground-based operations, account must be taken of the following:

- in hauler operations almost all felling is motor-manual with no mechanisation to reduce injury
- hauler crews are generally larger (7.5 people per ground-based crew vs 10.7 people per cable crew in 49 crews - CHH Forests, Tokoroa region) than ground-based crews so there are more people available to be injured per crew
- hauler crews work in steeper terrain which may result in more injuries.

Historically, as a proportion of all injuries, hauler operations have accounted for 37% in 1996, 37% in 1995, 32% in 1994 and 18% in 1993.

Expressed as a proportion of all lost time injuries, tractor operations accounted for fewer injuries, (15%) than in 1996, (21%).

	1994	1995	1996	1997
Skidder	104	78	77	59
Hauler	70	68	67	61
Tractor	42	35	35	24
Unknown	67	32	19	26

Table 3 - Number of lost time injuries by extraction method and year

Type of operation	Number of injuries	Severity (average days lost per injury)	
		1996	1997
Clearfell	140	14	10
Thinning	19	9	7
All lost time injuries	172	12	11

Table 4 - Injury severity - clearfell versus thinning (days lost)

\*The number of observations does not correspond with the data in Table 1 due to missing information about the amount of time lost. This follows in all analyses involving lost time.

## Logging task

Over the last three years, there has been little change in the proportion of lost time injuries occurring during felling and breaking out (Figure 6). However, the proportion of injuries inflicted during trimming on the cutover has steadily decreased over the last three years. This trend has been seen in both hauler and ground-based operations. This may be due to better technique, improved protective equipment and the greater use of mechanised delimbing. There is a trend to a greater proportion of injuries occurring during skid work. This trend applied equally to hauler and ground-based operations. This may be due to the intensification of work on the landing - more people (engaged in quality control?) and machines working together and greater volumes of wood passing through the landing.

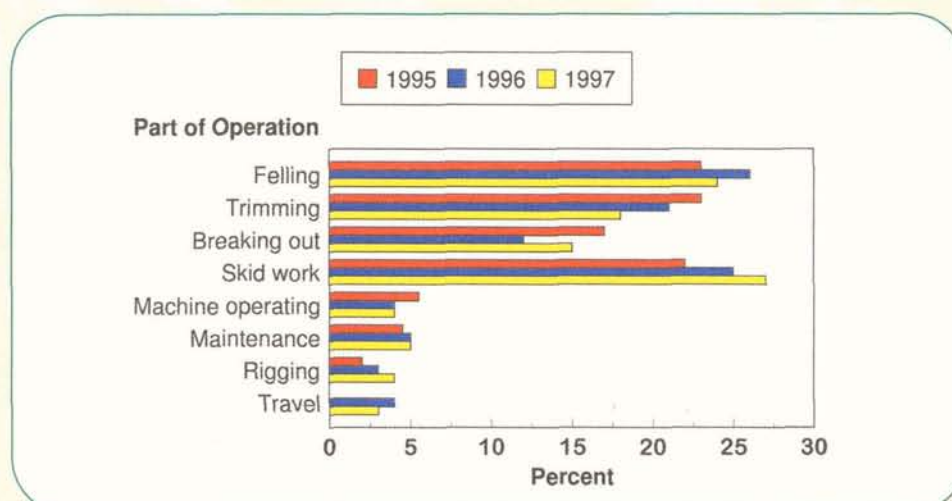


Figure 6 - Lost time injuries by part of operation

There was a large and steady increase in the average severity of felling injuries in 1997 compared with earlier years (Figure 7). Two very severe injuries involving being hit by trees contributed to this high average severity. The average severity of falling injuries in hauler operations has gone up from four days in 1995 to 23 days in 1997. The average severity of injuries in trimming has not changed in three years. Breaking out injuries have decreased in severity since 1996 but show no long term trends. Although the number of skid work injuries has increased, the average severity has decreased from previous years with less fractures to the legs. The average severity of skid work injuries in hauler operations has decreased from 13 days in 1995 to six days in 1997. Skid work injury severity has remained unchanged in skidder operations.



Figure 7 - Average

## Felling

The 41 felling injuries resulted in a total of 607 days lost. These were:

- hauler, 13 injuries, total of 279 days lost
- skidder, 12 injuries, total of 85 days lost
- tractor, 5 injuries, total of 43 days lost
- unknown, 11 injuries, total of 200 days lost.

The most common reasons given for injury during felling were:

- hit by material falling from trees, 16 injuries, total of 259 days lost
- slipping and tripping over, nine injuries, total of 26 days lost
- too close and hit by butt of tree, 11 injuries, total of 273 days lost.

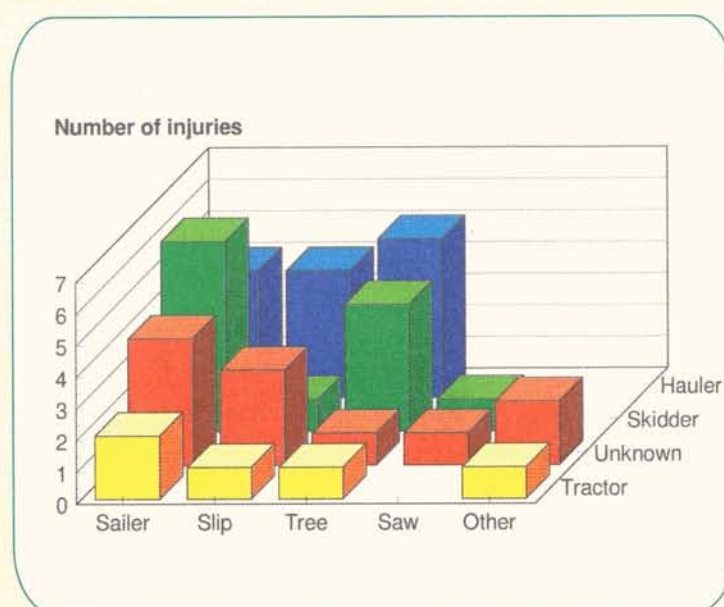


Figure 8 - Cause of felling injuries by extraction method - 1997

## Focus

The most frequent causes of injury during falling were being hit by material falling from trees, slipping over walking between trees and being hit by the tree as it falls.

- Hit by sailers - prevention of this injury relies on constant awareness of what is happening up in the canopy of the tree. There is no protective equipment which will prevent injury from a falling sailer.
- Slipping over - a greater proportion of these injuries occur in hauler operations where the terrain is steeper. Careful walking technique coupled with spiked boots will reduce slipping injuries. Spiked boots have been proven to improve traction even on slash and bare dirt.



- Hit by tree - more of these injuries occur in hauler operations because the tree can roll on the steeper country. Good felling technique and moving down the escape route well out of the way are the best ways to avoid injury. There is no protective equipment which will prevent injury from a falling tree.

## Trimming

Thirty lost time injuries occurred while trimming on the cutover and accounted for a total of 266 days lost. These were:

- hauler, one injury, total of 20 days lost
- skidder, 21 injuries, total of 156 days lost
- tractor, five injuries, total of 47 days lost
- unknown, one injury, total of 4 days lost.

The main causes of injury were:

- slipping over, seven injuries, total of 44 days lost -five were chainsaw lacerations
- hit by tension wood or saw hit by tension wood, five injuries, total of 20 days lost - four were chainsaw lacerations
- hit by sailers, one injury, four days lost
- cut by chainsaw (no other information given), seven injuries, 23 days lost
- chainsaw kickback (no other information given) seven injuries, 129 days lost.

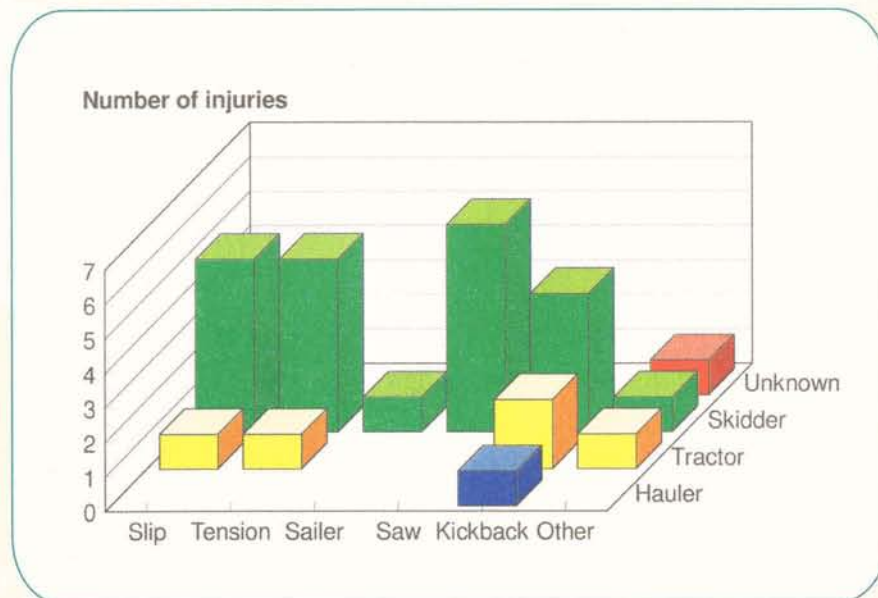


Figure 9 - Cause of trimming injuries by extraction method - 1997

## Focus

The great majority of lost time injuries, which occurred during trimming, were chainsaw lacerations. Most injuries were to the arms and feet:

- Slipping over - careful walking technique is needed at all times when using a chainsaw. In addition, spiked soled boots substantially reduce the chance of slipping, whether walking on wood, slash or dirt.
- Tension wood - it takes training and experience to recognise the tension in a limb or stem. Keep your body well out of the expected path of the chainsaw.
- Saw - these injuries had no other cause of injury given, but may have resulted from any of the causes mentioned above. When filling out accident reports, please include the cause of injury.

## Breaking out

There were 24 breaking out injuries resulting in a total of 378 days lost. These were:

- hauler 18 injuries, total of 176 days lost
- skidder five injuries, total of 192 days lost
- tractor one injury, 10 days lost.

The main causes of injury were:

- slipping over, three injuries, total of 16 days lost
- hit by the drag, five injuries, total of 71 days lost
- hit by dislodged material, five injuries, total of 27 days lost
- hit by ropes or carriage, seven injuries, total of 70 days lost.

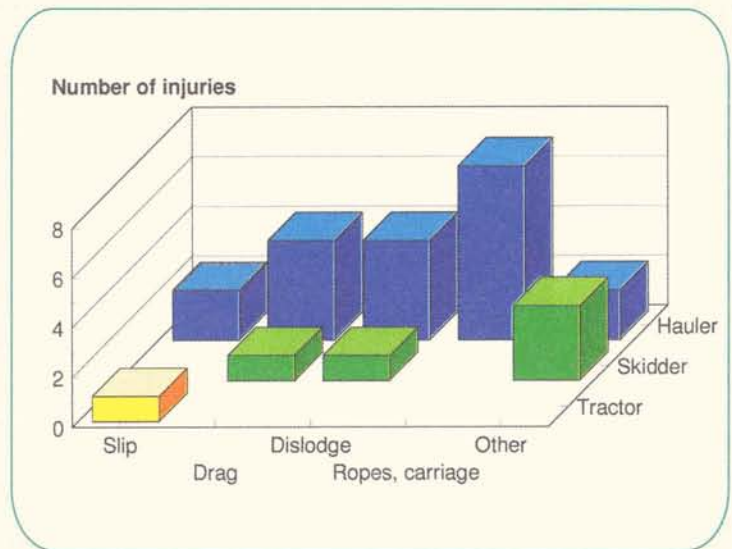


Figure 10 - Cause of breaking out injuries by extraction method - 1997

## Focus

In 1997, as in the previous year, the greatest cause of injury for breakerouts was being hit by the ropes or carriage. Moving ropes over long spans are an unpredictable hazard, keep well out of their way. Wait until the rope or carriage has stopped moving before hooking the drag on. Get well clear BEFORE signalling to the operator to haul-in.

## Skid work

There were 45 lost time injuries in skid work resulting in a total of 361 days lost. These were:

- hauler 16 injuries, total of 94 days lost
- skidder 15 injuries, total of 159 days lost
- tractor 7 injuries, total of 50 days lost.

The main causes of injury were:

- rolling log 10 injuries, 115 days lost
- hit by machine or by material moved by machine, 11 injuries, 72 days lost
- cut by chainsaw (no other information given), seven injuries, 96 days lost
- slipping and tripping over, 9 injuries, 69 days lost.

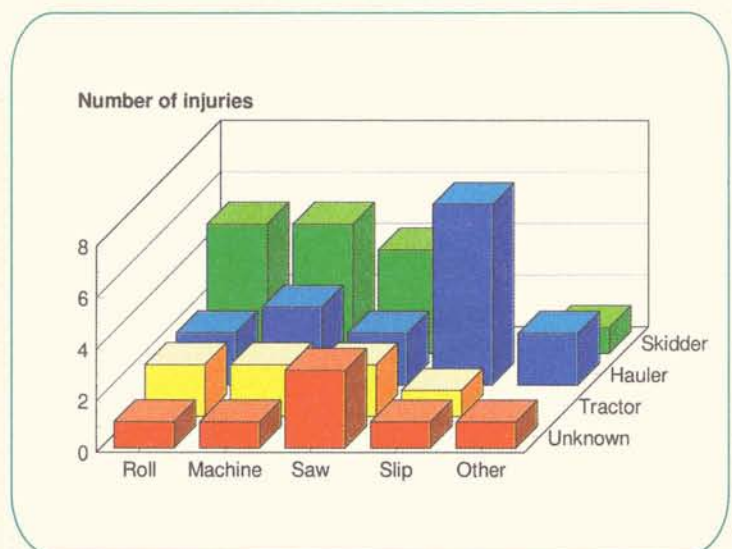


Figure 11 - Cause of skid work injuries by extraction method - 1997

## Focus

Trimmed logs roll well and their weight can easily break bones. Most injuries to skid workers from rolling logs were to the lower legs.

- Rolling logs - skid workers must be aware at all times of the hazard of rolling logs. Do not work directly in front of a log stack in the path of falling logs. Be aware of all other skid workers who are cutting logs. A log cut at one end can drop and roll, crushing the lower legs of someone standing a log length (up to 12 m) away. When cutting a log be sure that none of your fellow skid workers are in the path of a possible roll.
- Machines - machines operating on the landing hit people and hit logs which hit people. If possible, dephasing the operation (machines and workers on separate landings) or two-staging are ways to eliminate many of the hazards of machines and people working in close proximity. Otherwise, skid workers must have a safe area where machines or logs cannot hit them.



- Slipping over – the majority of slipping over injuries occurred on hauler landings. Loggers suggested the following reasons:
  - hauler crews usually use only one landing for the setting, rather than multiple landings used by ground-based crews. The landing gets smaller and more congested with slash and waste material building up
  - more knuckleboom loaders are replacing rubber tyred loaders on hauler landings and so the landing surface is not being swept as frequently. So more material is left on the landing for skid workers to stumble over.

## Other operations

Machine operating – six injuries and 80 days lost:

- climbing out of machine – four injuries, total of 15 days lost
- material entered cab – one injury, 15 days lost
- Bell operator left machine to trim 2 semi-suspended logs in grapple, logs fell on him and crushed right leg – 50 days lost

During maintenance – eight injuries and 23 days lost:

- amputated finger when removing delimbing arm from processor – unknown days lost
- Using hammer to knock off ripper boot, piece of metal came off and hit hand – 3 days lost
- Cut hand or finger sharpening saw – three injuries, seven days lost
- Connected 12V battery to 24V excavator battery in poor light, explosion, burned face and eyes – 5 days lost
- Grinder pad disintegrated and hit him in chest – 5 days lost

Rigging operations – six injuries and 21 days lost:

- Undoing twistlers off previous skyline tailhold – lost grip and stick spun around and bruised head – one day lost
- Stepped off log on to pine cone, sprained ankle – two days lost
- Slipped over and sprained ankle while returning to skid after pulling strawline downhill – three days lost
- Ripped fingernail down thumb loading rope on to trailer, got infected – three days lost
- Tractor pulled over tower when hauler lost air pressure and brake locked on main rope, bruised upper body – three days lost
- Tightening slack in rope after block shift, struck by felled head caught in rope – nine days lost

Travel – five injuries and 68 days lost:

- Van hit log truck on narrow road – three in van, cuts and lacerations – total three days lost
- Log truck and ute collided on corner – bruises 5 days lost
- Vehicles collided in dusty conditions, head lacerations and fractured left femur – 60 days lost

## Part of Body Injured

The lower legs and feet continue to be the most frequently injured parts of loggers bodies. Overall there has been an increase in the proportion of injuries to the head and lower leg. Injuries to the upper torso have decreased. Injuries to the eyes, hands, arms, lower torso, upper leg and feet and multiple injuries have shown no recognisable trend over the last three years (Figure 12).

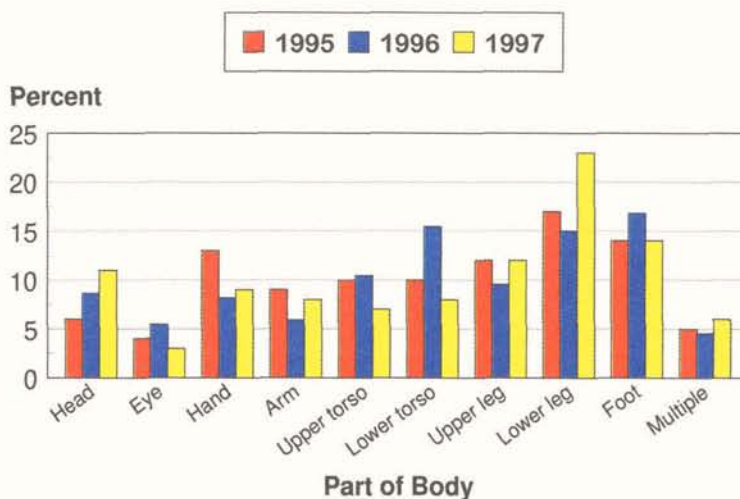


Figure 12 – Lost time injuries by part of body

There has been a steady increase in the proportion of injuries to the head. The most frequent injury was being hit by a sailer during felling or trimming resulting in a total of seven injuries and 59 days lost.

There was a large increase in the proportion of injuries to the lower legs, resulting in a total of 36 injuries and 416 lost work days. One-third (13) of these were injuries to the ankle - eight sprains, total of 21 days lost and five fractures or dislocations caused by being hit by tension wood or rolling logs - total of 100 days lost. Injuries to the lower leg above the ankle were caused: by rolling logs - five injuries, 39 days lost; falling trees - four injuries, 159 days lost and being hit by logs moved by machines - four injuries, 30 days lost.

Injuries to loggers feet have declined to 1995 levels (Figure 12).

Most (17 of 22 foot injuries) were chainsaw lacerations to the feet resulting in a total of 194 days lost (Table 5). Only one chainsaw laceration was to the right foot "Slipped on bark and foot hit saw" - seven days lost. All other chainsaw inflicted injuries were to the left foot. Although chainsaw cut-resistant boots are available they are not an absolute barrier to the chainsaw. Correct chainsaw technique must be used to ensure the feet are kept well clear of the cutter bar. Other injuries to the feet included crushing caused by rolling logs on the landing (four injuries) and a sprained foot when jumping off a stem after trimming on the cutover.

There has been a large decrease in the severity of chainsaw lacerations to the upper legs (Table 5). There were only four chainsaw lacerations reported to the legs in 1997. Although there has been little decline in leg chainsaw lacerations since 1996, there has been a large decline in chainsaw lacerations to

the legs over the last decade (Sullman, 1998). This decline could be due to improved chainsaw cut resistant legwear being worn by loggers, the greater level of training in the workforce and more mechanisation, of felling and delimbing.

## Discussion and Conclusion

The total number of work days lost in 1997 was significantly less than in 1996 and similar to 1995. This was due to a decrease in the total number of injuries and in the average severity of injury. Fractures and multiple injuries, which result in a long time off work, occurred less frequently in 1997.

The major findings to come from the 1997 Logging ARS were:

- There were 172 lost time injuries reported which is less than in previous years
- There was a total of 1775 days off work, 38% less than in 1996
- Average severity down to 11 days from 14 days in 1996
- Most injuries occurred between 8 and 10 am and 2 to 3 pm
- More fractures and bruises occurred earlier in the week
- More lacerations and sprains/strains occurred in the middle of the week
- Forty percent drop in thinning injuries since 1996
- Equal number of injuries in skidder and hauler operations
- Felling injuries more serious than in 1996
- Less trimming injuries occurring than in 1996
- More skidwork injuries occurring than in 1996
- Most frequent causes of injury were:
  - felling: being hit by sailer
  - trimming: chainsaw laceration
  - breaking out: hit by ropes and/or carriages
  - skidwork: hit by rolling log and/or machine

Part of body	Total number of injuries		Chainsaw inflicted injuries			
			Number		Days lost	
	1996	1997	1996	1997	1996	1997
Hand	18	14	4	4	21	44
Arm	13	13	6	7	73	37*
Upper Leg	21	19	5	2	9	10*
Lower Leg	33	36	0	2	0	2
Feet	37	22	23	17	282*	194*

Table 5 - Chainsaw inflicted injuries to the hands, arms legs and feet - 1997

\* One injury did not state the number of days lost

\*Two injuries did not state the number of days lost



## Quality of the Data

Overall, the quality of the data supplied to the ARS has been improving with each year. However, there are still many accident reports which do not state the extraction machine(s) used – hauler, skidder, tractor, combo, forwarder, etc. Please complete all sections of the accident reports.

### **It is vitally important that the forest industry continues to maintain its support of the Accident Reporting Scheme**

Reports of lost time and minor injuries and near miss incidents are used to focus research, development and training efforts to improve logging safety. A Liro report detailing near miss incidents and minor injuries is currently being prepared.

Injury information has guided research and development into:

Effective use of personal protective equipment

- helmet life
- high visibility clothing
- spiked boots
- cut resistant footwear
- cut resistant leg wear
- penetration and UV resistant eyewear
- retractor seatbelts for machine operators

Effective use of logging systems:

- two staging
- safe zones for skid workers
- adequate fluid intake and nutrition
- fatigue awareness
- rest breaks

## References

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