



Technical Report

Ontario Silviculture Sector Root Cause Analysis Workshop Results and Next Steps

A focused approach to improving
workplace health and safety

Date: February 1, 2024

Workplace Safety North

Technical Paper: Root Cause Analysis report - Environmental factors including exposure to danger trees, wind and weather events, temperature extremes and wildlife

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Executive Summary

A volunteer group of worker and management subject matter experts, met face-to-face to conduct a risk assessment of the hazards in Ontario's silviculture industry, and later, a root cause analysis of its top health and safety risk.

The group of representatives from management, worker, government, and not-for-profit organizations, was facilitated by Sabrina Missere, Health and Safety Specialist at Workplace Safety North (WSN). In advance of the workshop, each industry expert submitted their top health and safety concerns, and during risk assessment workshop, more than 30 identified risks were reviewed and discussed by the group. Both management and worker agreed the top risk was about environmental hazards, factors including exposure to danger trees, wind and weather events, temperature extremes and wildlife.

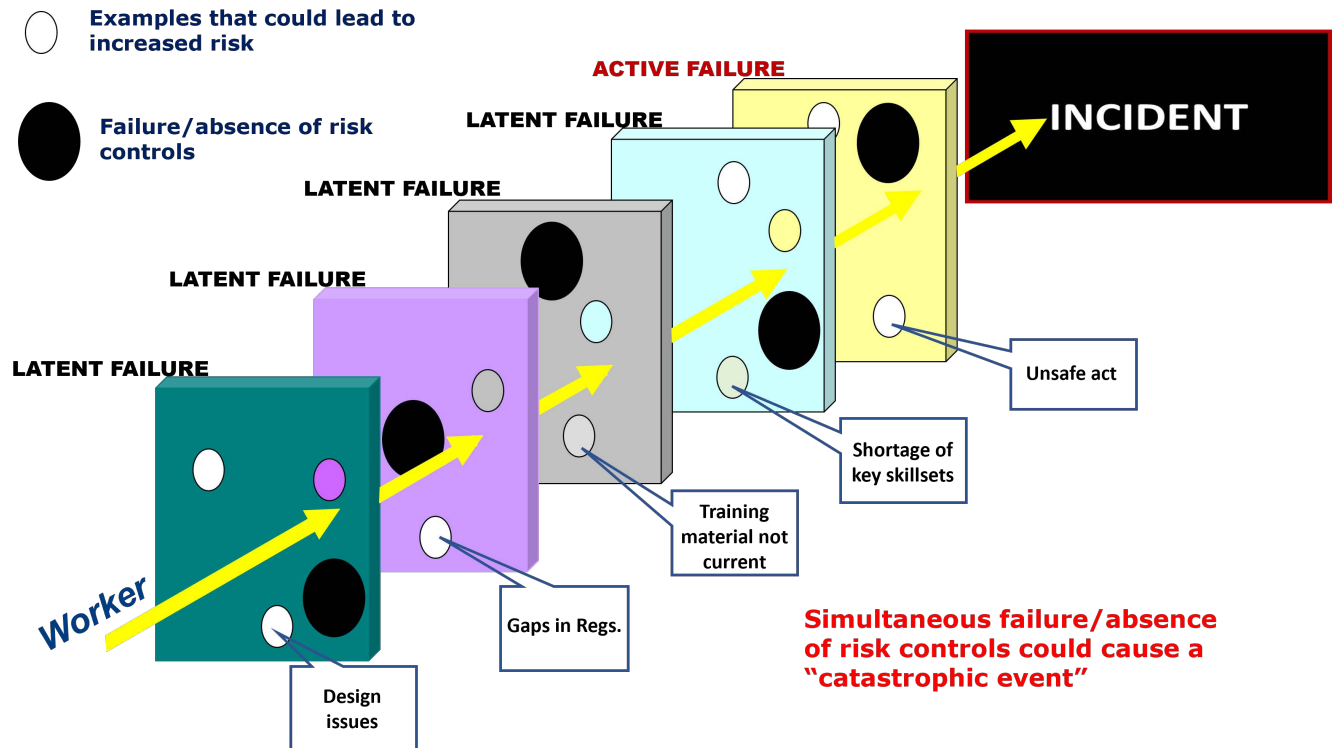
The experts' root cause analysis workshop determined the top 10 causal factors for **"Environmental factors including exposure to danger trees, wind and weather events, temperature extremes and wildlife can have negative impacts on workers."** The top 10 causal factors:

1. Remote work locations limit connectivity
2. Severe weather conditions can affect emergency response
3. Forest management practices increase exposure to danger trees
4. Inconsistent application of work procedures during wind and weather events
5. Inconsistent enforcement of safety practices due to camp culture
6. Lack of consistent sector-specific safety guidelines and resources
7. Worker turnover results in high level of inexperienced personnel
8. Inconsistent risk assessment of environmental hazards
9. Lack of safety program oversight results in higher level of risk acceptance
10. Fatigue, illness and living conditions compromise the ability to recognize hazards

Furthermore, the group of representatives determined specific controls for each. Next steps include an immediate focus on the most common systemic weaknesses. WSN will work with industry to establish a Silviculture Advisory Committee to engage with and provide sector-specific support in advancing:

- Industry leading practices and standards
- Knowledge of leading practices and standards

1. Risk Assessment Project: The Subject of Inquiry



Pictured above: James Reason's Swiss Cheese Model of simultaneous failure, or absence of risk controls, that could cause a "catastrophic event." In this model, when there are latent failures in design, gaps in regulation, outdated training material, shortage of skillsets, and an unsafe act, all the "holes" in the system line-up to potentially cause an incident, including critical injury or fatality.

2. Background: Revisiting the 2023 Risk Assessment Workshop Results

In March 2023, a volunteer group of subject matter experts met face-to-face for a silviculture sector workplace risk assessment at Workplace Safety North (WSN) headquarters in North Bay, Ontario. The workshop with representatives from management, worker, Ministry and Workplace Safety North was facilitated by Sabrina Missere, Health and Safety Specialist at Workplace Safety North (WSN).

In advance of the workshop, each industry expert submitted their top health and safety concerns, and during the one-day workshop, all 34 identified risks were reviewed and discussed by the group.

Various risk categories were discussed, ranging from environmental and driving hazards to emergency preparedness, ergonomics, and psychosocial hazards. The comprehensive list covered potential risks like eye injuries, exposure to hazardous substances, and working around equipment.

The identified risks included not only physical dangers like falling trees and motor vehicle incidents, but also environmental factors such as strong winds. The importance of emergency planning and addressing issues like repetitive strain injuries was highlighted. The workshop results emphasized the need for a comprehensive and proactive approach to ensure a safe working environment.

When it came time for the final vote on the top risks, only actual workers and managers from the silviculture industry were eligible to vote. To ensure an open and fair voting process, handheld electronic devices recorded votes anonymously. Both worker and management agreed: the top risk in Ontario Silviculture sector is dead snag trees or branches, chicots, hang ups, spring poles in cutover falling on workers.

Top 10 health and safety risks in the Ontario Silviculture Sector:

1. Dead snag trees or branches, chicots, hang ups, spring poles in cutover falling on workers
2. Highway traffic incidents (especially those involving transport trucks)
3. Unsafe driving on forestry roads
4. Motor vehicle incidents
5. Strong winds: Standing trees falling on workers in the block
6. Heat stress leading to dehydration
7. ATV, wheel, and track machine incidents (rollover, loss of control, speed, collision, leaving roadway)
8. Wildlife encounters or attacks
9. Lack of emergency planning
10. Musculoskeletal injuries and repetitive strain injuries

This Provincial Silviculture Sector Risk Assessment Workshop successfully brought together industry experts to identify and prioritize health and safety risks. By taking a collaborative approach and considering various perspectives, the workshop created solutions that all stakeholders could support.

Health and safety in the workplace

When the group of industry experts reviewed the risk assessment results, there was discussion around the environmental hazards, 4 of which ranking in the top 10:

1. (1) Dead snag trees or branches, chicots, hang ups, spring poles in cutovers falling on workers.
2. (5) Wind events: standing trees falling on workers in the block with strong winds.
3. (6) Heat stress leading to dehydration while working in hotter environments.
4. (8) Wildlife encounters or attacks resulting in workplace incident.

Note: # in brackets indicates ranking within the top 10 risks

The above identified risks had similar risk categories and contributing factors. Following review and discussion, both industry worker and management members voted and confirmed that that it was worth capturing all 4 identified environmental hazards through the next step: a detailed analysis of the root causes of environmental hazards and the creation of an effective prevention plan put in place to address the primary causal factors of these identified risks.

Using the risk assessment method and analyzing its root causes within the workplace is an extremely effective method to identify leading indicators to allow industry to work more proactively in addressing key concerns.

In November 2023, the group of industry experts met for two days to determine the root cause of environmental factors (exposure to danger trees, wind and weather events, temperature extremes and wildlife) in the workplace, and develop critical controls that can be put in place to address the risks.

3. Root-Cause Analysis: Risk Statement

Based on the results of the silviculture sector risk assessment, the following risk statement was selected by the Workshop Committee Members for Root-Cause Analysis focus using the “Fishbone” approach:

“Environmental factors including exposure to danger trees, wind and weather events, temperature extremes and wildlife can have negative impacts on workers.”

4. Root-Cause Analysis Workshop: A Bipartite and Collective Process

- Workshop participants were peer-recognized industry and system experts.
- Workshop process was open, transparent, and collaborative.
- Participants were able to participate in-person or virtually.
- Ranking and prioritization of causal factors was voted on by industry management and worker only; MLITSD and WSN did not vote.

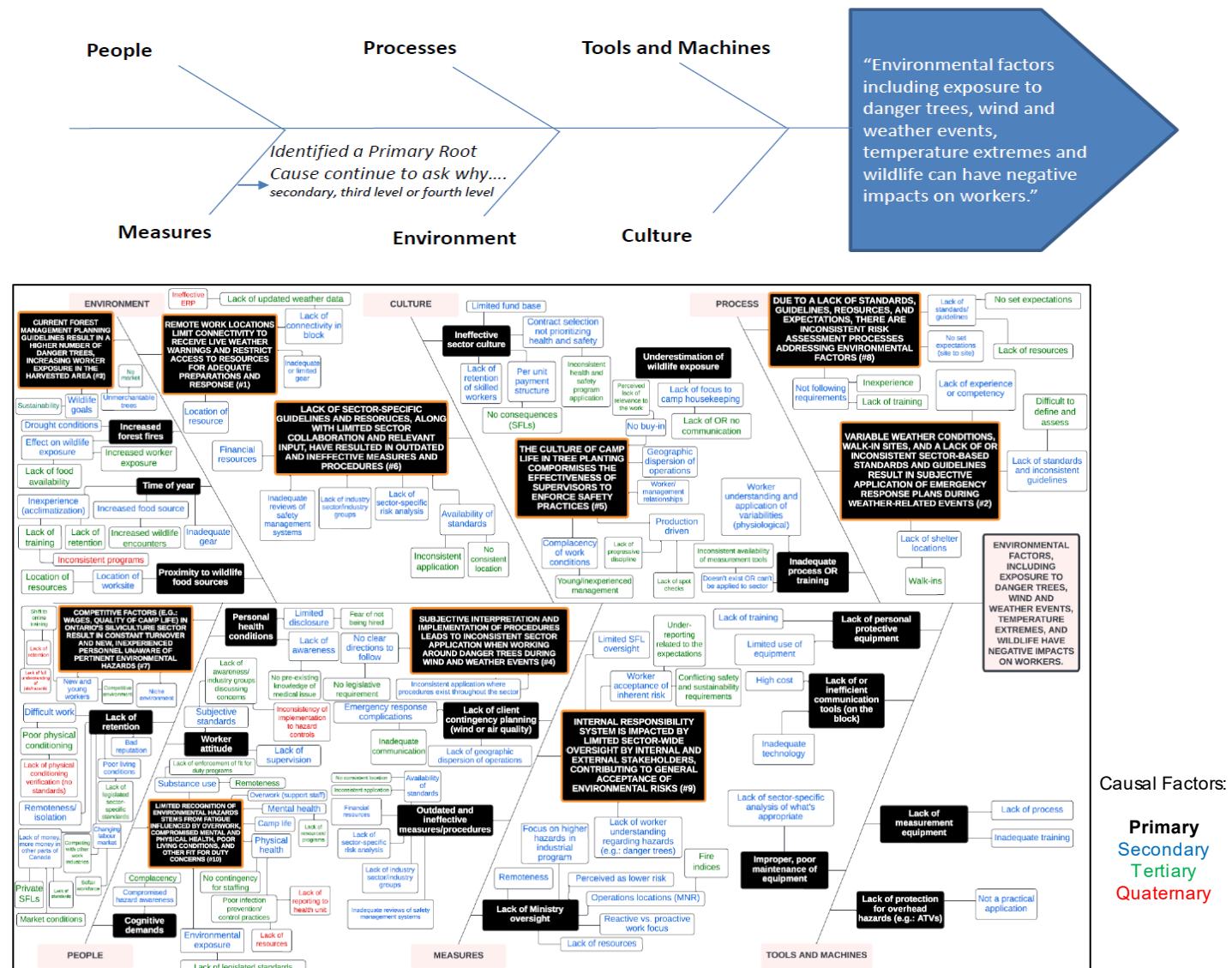
Validation of the results, in addition to workshop subject matter expert participants, included having the results presented and discussed among silviculture industry constituents through a webinar hosted by Workplace Safety North.

5. Workshop Participants:

Due to the nature and timelines of silviculture operations, the risk assessment and root cause analysis sessions were open to participation at the availability of the industry partners. As such, various industry partners and their worker and management representatives were invited to participate in as many sessions as they were able to. The following industry and system partners included:

- Brinkman Reforestation
- Nedaak Inc.
- First Resource Management
- Outland
- Haveman Brothers Forestry Services
- Resolute FP Canada
- Fisher Wavy Inc.
- Greenmantle Forest Inc.
- Workplace Safety North
- Ministry of Labour

6. “Fishbone” Diagram: Primary Causal Factors



CLOSE-UP of fishbone diagram: Primary causal factors of environmental factors (exposure to danger trees, wind and weather events, temperature extremes and wildlife) focused on six key workplace factors including: People, Environment, Measures, Culture, Process and Tools and Equipment.

28 Primary Causal Factors Identified by Category

#	Category	Primary Root-Cause
1	Environment	Remote work
2	Process	Emergency response plan - No/lack of considerations of wind, weather, etc.
3	Environment	Forest management plan requirement (chicots)
4	Measures	No consistent procedures (danger trees, wind/weather)
5	Culture	Poor enforcement of measures and procedures
6	Culture	Outdated and ineffective measures/procedures
7	People	Inexperience
8	Process	Inconsistent risk assessment processes
9	Measures	Lack of IRS (management presence)
10	People	Fatigue
11	Tools and machines	Lack of or inefficient communication tools
12	Process	Inadequate process or training
13	Culture	Ineffective sector culture
14	Environment	Increased forest fires
15	Tools and machines	Inadequate personal protective equipment
16	People	Lack of retention
17	People	Worker attitude
18	People	Personal health conditions
19	Environment	Time of year
20	Tools and machines	Improper, poor maintenance of equipment
21	Measures	Outdated and ineffective measures/procedures
22	Measures	Lack of Ministry oversight
23	Culture	Underestimation of wildlife exposure
24	People	Cognitive demands
25	Tools and machines	Lack of measurement equipment
26	Measures	Lack of client contingency planning (wind or air quality)
27	Environment	Proximity to wildlife food sources
28	Tools and machines	Lack of protection for overhead hazards (e.g.: ATVs)

7. Top 10 Primary Causal Factors:

#	Category	Primary Root-Cause
1	Environment	Remote work
2	Process	Emergency response plan - No/lack of considerations of wind, weather, etc.
3	Environment	Forest management plan requirement (chicots)
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7	People	Inexperience
8	Process	Inconsistent risk assessment processes
9	Measures	Lack of IRS (management presence)
10	People	Fatigue

Following a review of the Top 10 Primary Causal Factors, the industry group of subject matter experts began to develop controls that could be put in place for such factors and address the risk of environmental hazards causing harm to workers in the workplace.

8. Critical controls to address primary causal factors of Environmental Hazards

Note: Control lists are not in any order of priority

1. ENVIRONMENT: Remote work locations limit connectivity to receive live weather warnings and restrict access to resources for adequate preparation and response.

- Use of Garmin units (or equivalent) to monitor weather
- Policy: Manager notifies supervisor of weather pattern fluctuations (further chain of communication to be clarified in policy for worker awareness).
- 24-hour two-way communication policy.
- Ensure functional satellite phones are available on every block.
- Working alone policy and procedure (ensure enforcement).
- Radio usage for solitary workers in remote areas.
- Encourage Ministry of Natural Resources and Forestry to make available a merged online map with active fires with weather station data (make layers accessible to industry)

2. PROCESS: Variable weather conditions, walk-in sites, and a lack of or inconsistent sector-based standards and guidelines result in subjective application of emergency response plans during weather-related events.

- Establishment of a silviculture advisory committee to formulate sector-based standards and guidelines and training.
- Encourage SFLs to examine site-specific emergency response plans (on a weekly/monthly basis).
- Encourage SFLs to require scheduled drills to test ERPs and determine gaps for continuous improvement.
- Development of a standard template for emergency drill documentation to be disseminated to firms (see SWO).
- Make Safe Workplace Ontario (SWO), or equivalent third-party certified health and safety program mandatory
- Encourage SFLs to factor in considerations for renewal when making access plans for blocks (post-work assessment); encourage MNRF enforcement.
- Advise MNRF of this issue (advisory committee to be apprised)
- Development of contingency/shelter-in-place plans.
- Requirements for enhanced first aid response in remote areas; potentially include first response personnel (e.g.: medical first aid responder Level 2).
- Encourage mandatory training regarding wilderness first aid.

3. ENVIRONMENT: Current forest management planning guidelines result in a higher number of danger trees, increasing worker exposure in the harvested area.

- Alert the MNRF and the MLITSD of the existence of this problem; encourage a formal risk assessment.
- Establishment of a silviculture advisory committee to examine forest management planning guidelines.
- Messaging or enforcement of current rules regarding windfirm trees.
- HSAs (WSN) to create/disseminate alerts/bulletins pertaining to hazards associated with danger trees.
- Ensure harvesting contractors are aware of requirements.
- Dialogue among all parties associated with one project: combined pre- and post-work assessment.

4. MEASURES: Subjective interpretation and implementation of procedures leads to inconsistent sector application when working around danger trees during wind and weather events.

- Establishment of a silviculture advisory committee to formulate standard procedures addressing working near danger trees/around weather events.
- Encourage SFLs to ensure contractors have appropriate measures in place.

5. CULTURE: The culture of camp life in tree planting compromises the effectiveness of supervisors to enforce safety practices.

- Supervisory/management training.
- Encourage SFLs to make mandatory supervisory training.
- Encourage mentorship training
- Establishment of a silviculture advisory committee to recommend appropriate supervisor training (both management and worker reps).
- Encourage accommodation for different needs such as daycare in camps or remote work for specific tasks.
- Require risk assessments around environmental factors in the field with the workers

6. CULTURE: Lack of sector-specific guidelines and resources, along with limited sector collaboration and relevant input, have resulted in outdated and ineffective measures and procedures.

- Establishment of a silviculture advisory committee to recommend appropriate supervisor training (both management and worker reps).
- Establish PPE guidelines based on risk assessment
- Worker engagement on what is working and what is not working and why (surveys)
- Establish stop work guidelines based on environmental conditions

7. PEOPLE: Competitive factors (e.g.: wages, quality of camp life) in Ontario's silviculture sector results in constant turnover and new, inexperienced personnel unaware of pertinent environmental hazards.

- Establishment of a silviculture advisory committee to review wage and camp living conditions to make tree planting in Ontario a sustainable industry.
- Consistent training module across the province in environmental hazards
- Encourage SFL's to ensure that companies are training their employees, emphasis for new, on their rights and prove it
- Establish a tree planters bill of rights for consistency
- Testing competencies to help identify gaps in knowledge
- Danger tree assessment (WorkSafe BC)
- Make mandatory alerts to public health units, MNRF, and MLITSD regarding the existence of tree planting camps and their locations, including in contract language

8. PROCESS: Due to a lack of standards, guidelines, resources, and expectations, there are inconsistent risk assessment processes addressing environmental factors.

- Silviculture advisory committee to work toward the development of a standardized risk assessment (and accompanying guidelines and training for its use) on:
 - a) Danger trees (see WorkSafe BC)
 - b) Wind and weather events
 - c) Air quality (wildfire and smoke)
 - d) Extreme temperatures as they apply to silviculture (e.g.: seasonal considerations; narrow timelines to complete contract work)
 - e) Wildlife

9. MEASURES: Internal responsibility system is impacted by limited sector-wide oversight by internal and external stakeholders, contributing to general acceptance of environmental risks.

- Silviculture advisory committee helping to engage MLITSD, SFL's, MNRF and management and worker representation for consistency with:
 - a) company accountabilities
 - b) training of new supervisors
 - c) measures and procedures based on standards and guidelines, risk assessments

10. PEOPLE: Limited recognition of environmental hazards stems from fatigue influenced by overwork, compromised mental and physical health, poor living conditions, and other fit for duty concerns.

- Realistic job expectations, appropriate workload for management
- Anyone operating a vehicle should follow hours of service whether they are CVOR or not
- Minimum living conditions
- Establishing psychological risk assessment and mental health resource training
- Back up for individuals who are sick
- Allowing days off to minimize burnout
- Establishing Fit for duty policies and procedures
- Working alone policies and procedures
- Training on employee rights
- Work condition programs and MSDs prevention
- Infection control programs and practices

9. Next Steps: What should be focused on immediately

The group of representatives determined specific controls for each. Next steps include an immediate focus on the most common systemic weaknesses. WSN will work with industry to establish a Silviculture Advisory Committee to engage with and provide sector-specific support in advancing:

- Industry leading practices and standards
- Knowledge of leading practices and standards

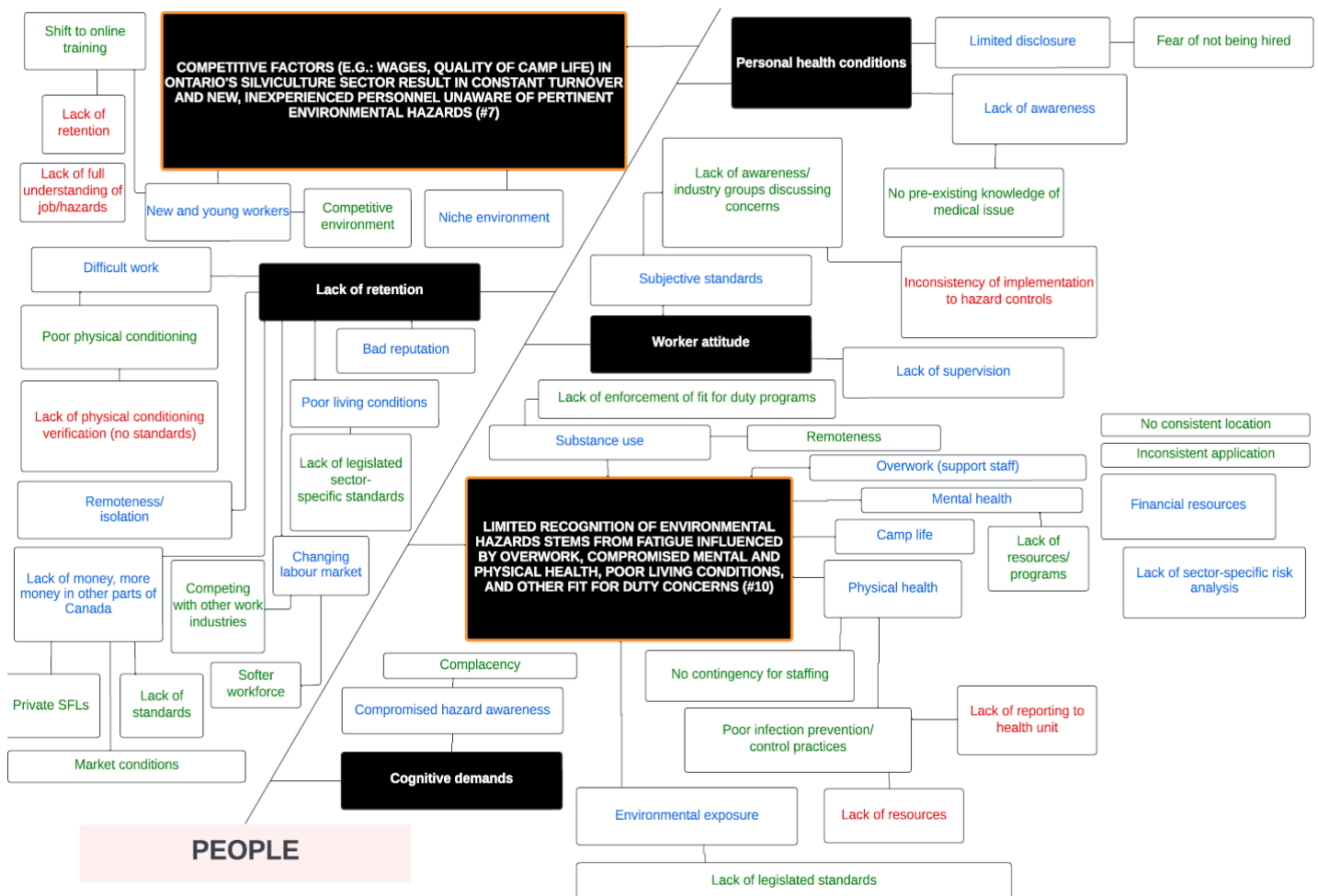
10. References

1. Top 10 Health and Safety Risk in Silviculture Operations 2023:

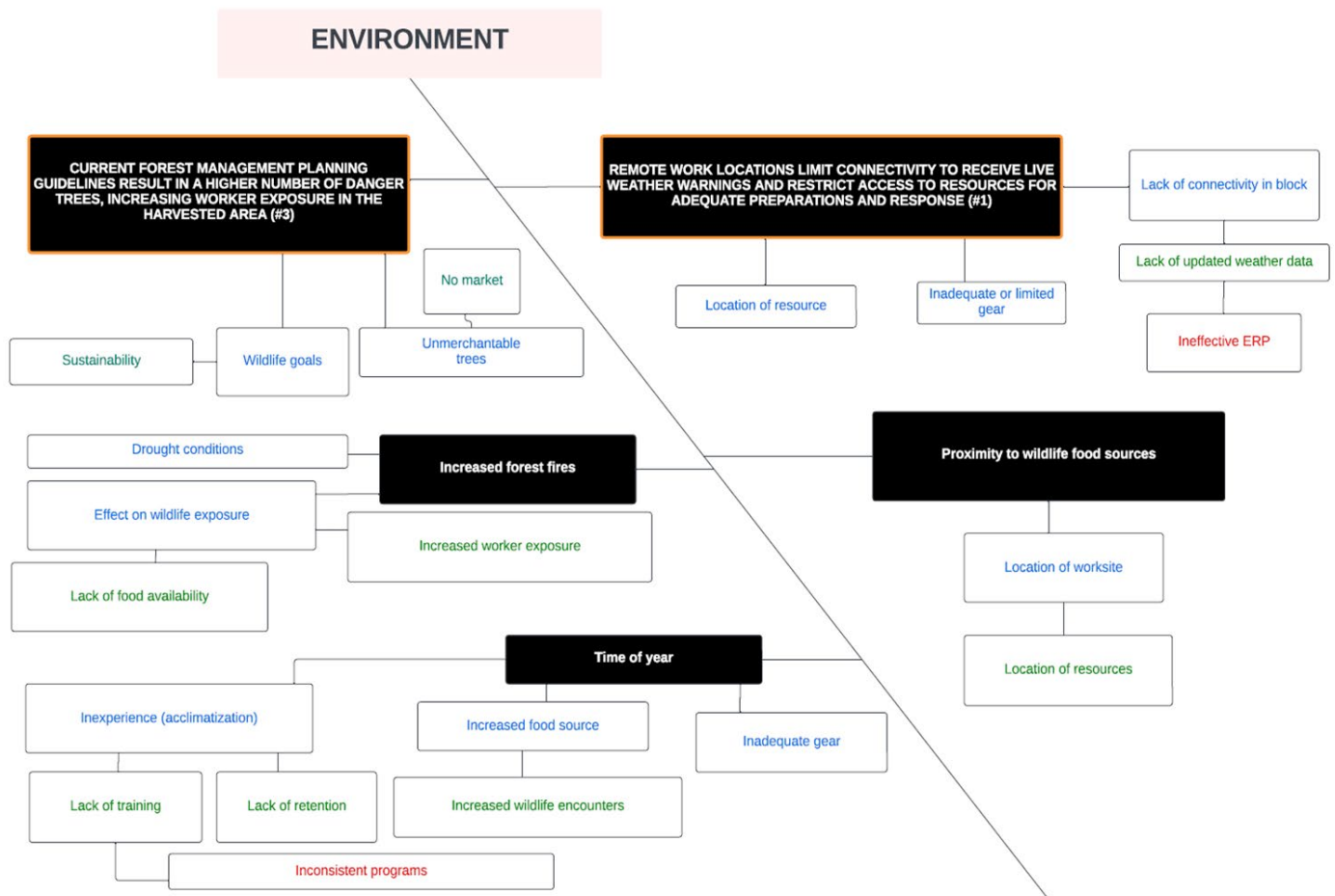
[Top 10 Health and Safety Risks in Silviculture Sector | Workplace Safety North](#)

2. Root Cause Analysis Results (Appendices)

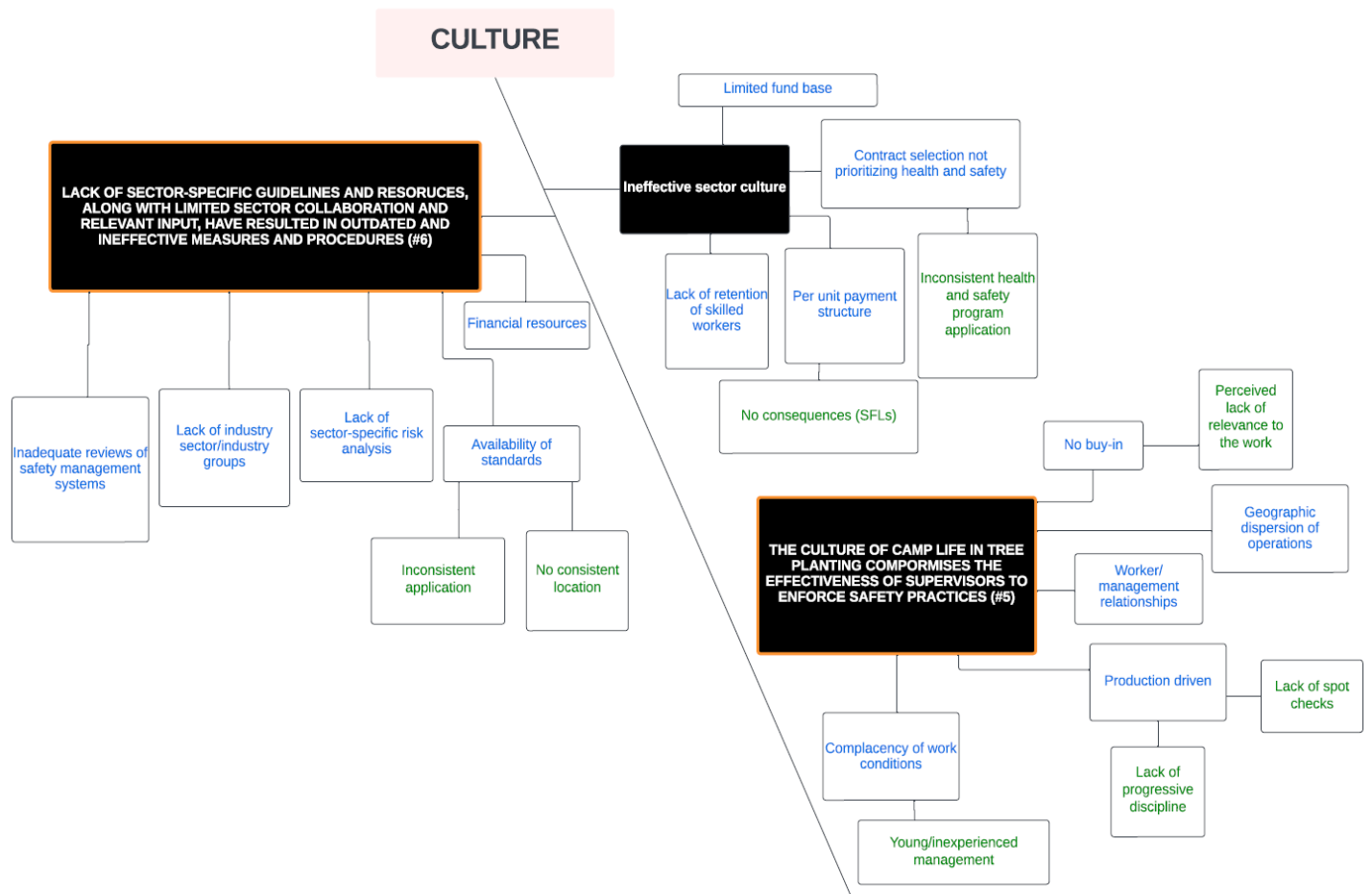
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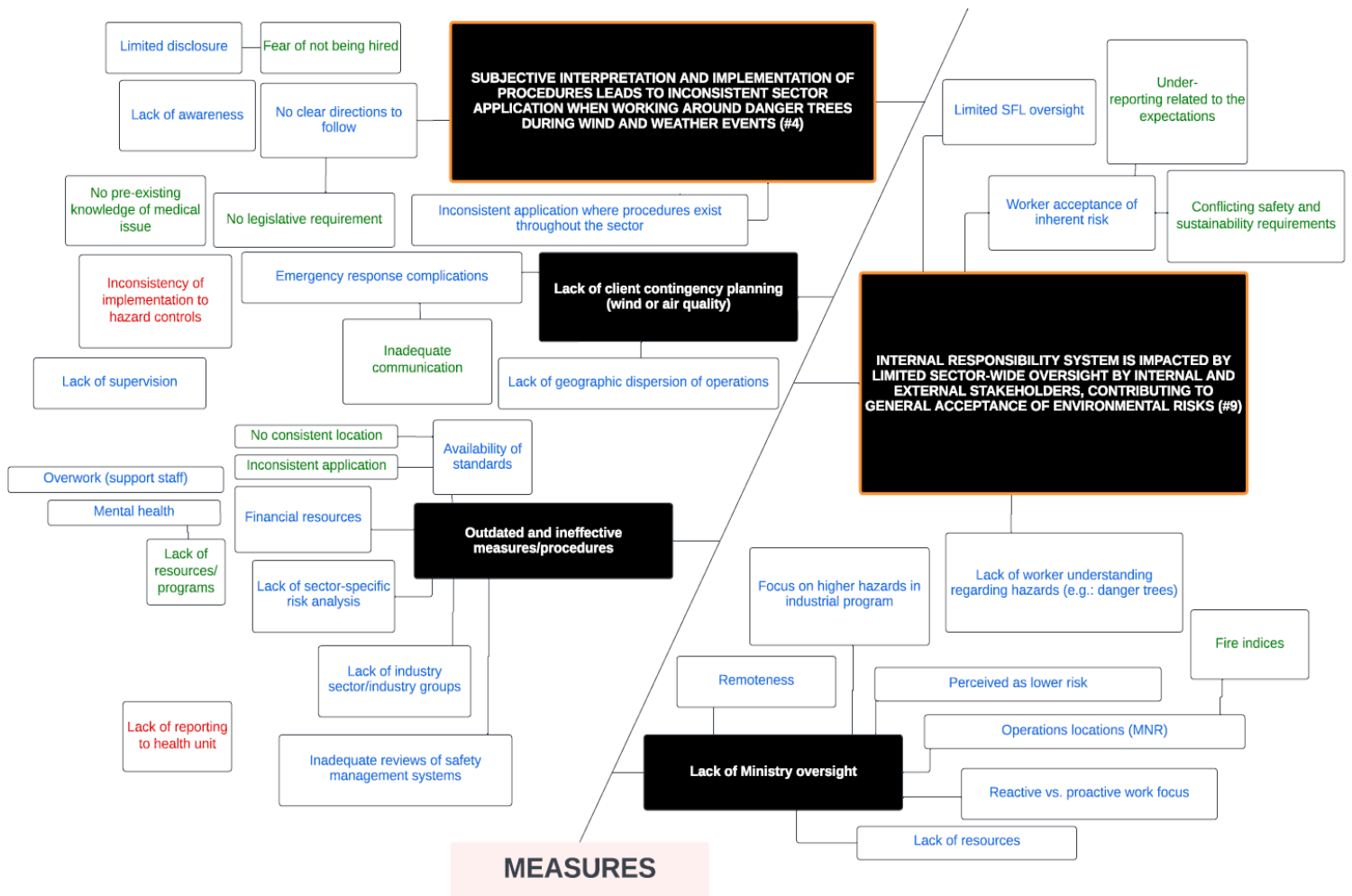
- Black – Primary Causal Factor
- Black + Orange Border – Top 10
- Blue – Secondary Causal Factor
- Green – Tertiary Causal Factor
- Red – Quaternary Causal Factor



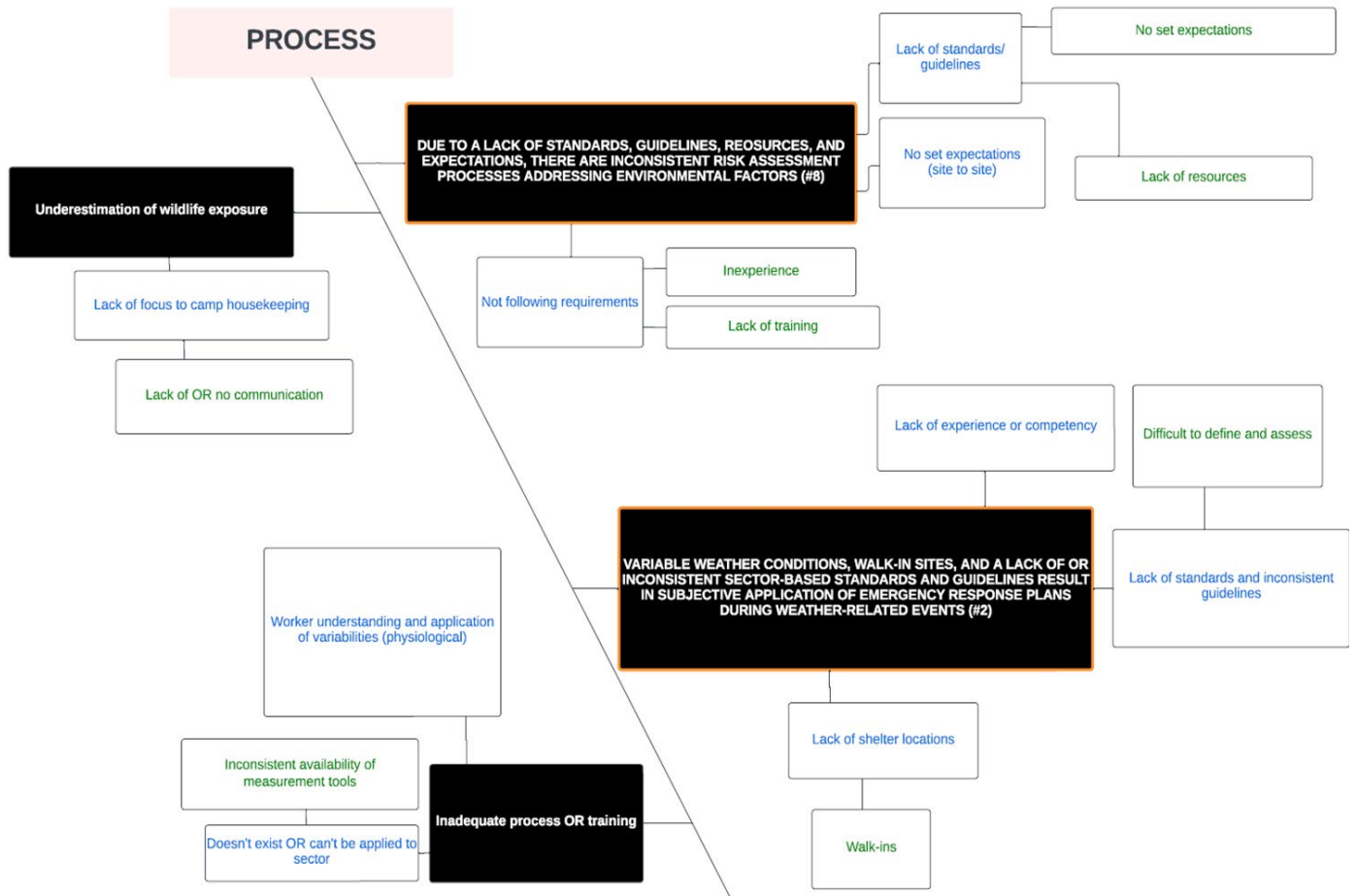
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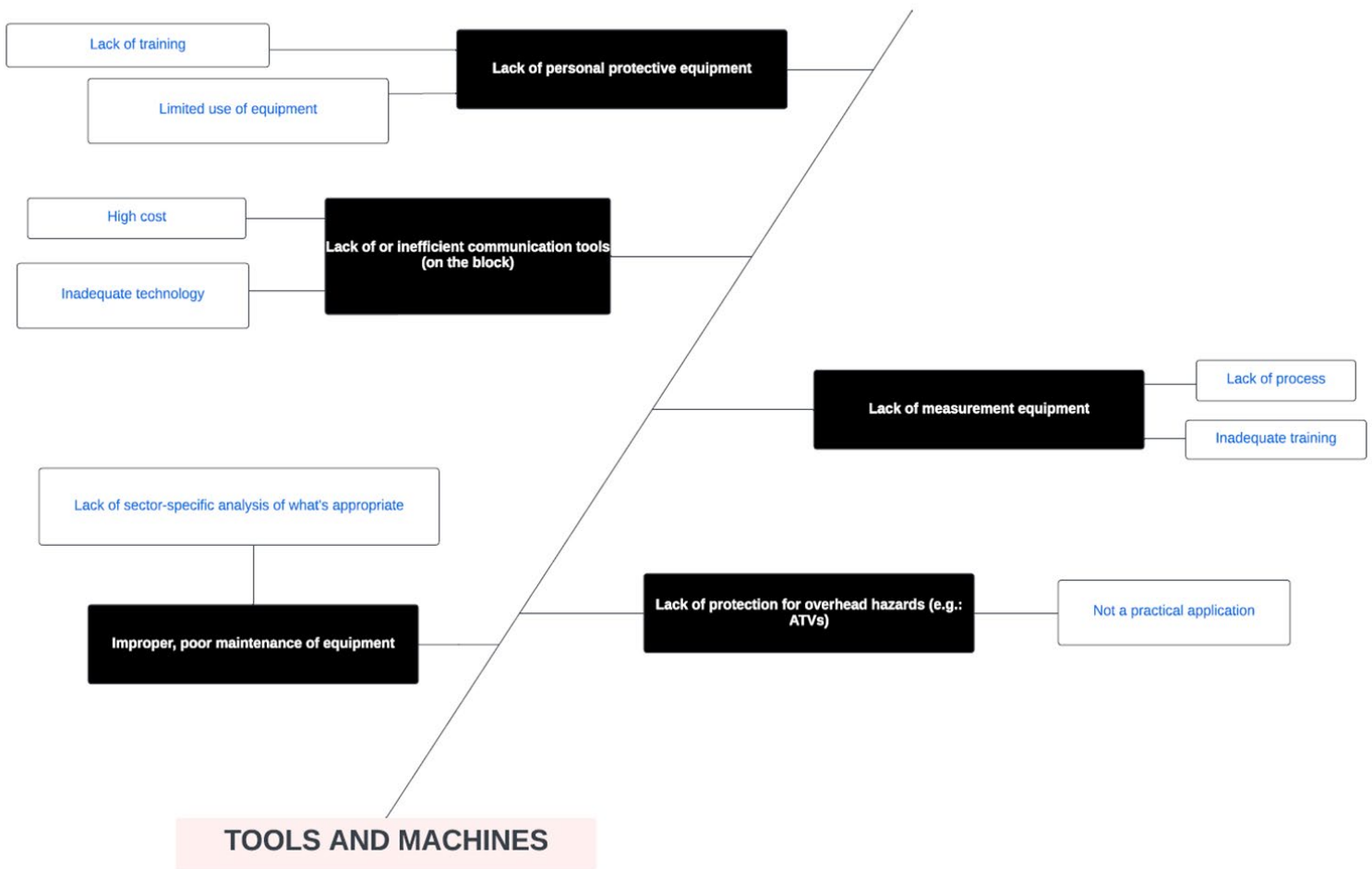
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12. Appendix A: Risk Assessment Methods/Standards

1. Bayesian Analysis
2. Bow-tie analysis
3. Brainstorming (e.g. what-if)
4. Business impact analysis
5. Cause and effect analysis
6. Checklists
7. Computer Hazard and Operability Studies (HAZOP)
8. Consequence Analysis (also called Cause-Consequence Analysis)
9. Likelihood/Consequence matrix
10. Construction Hazard Assessment and Implication Review (CHAIR)
11. Decision tree
12. Delphi technique
13. Energy Barrier Analysis (or Energy Trace Barrier Analysis)
14. Environmental risk assessment
15. Event tree analysis
16. Failure Mode and Effect Analysis (FMEA)
17. Failure mode, effect and criticality analysis
18. Fault Tree Analysis
19. Fishbone (Ishikawa) Analysis
20. Hazard analysis and critical control points
21. Hazard and Operability studies (HAZOP)
22. Human reliability analysis
23. Job Safety Analysis (JSA)
24. Level of Protection Analysis (LOPA)
25. Markov analysis
26. Monte Carlo
27. Preliminary Hazard Analysis (PHA)
28. Reliability centered maintenance
29. Scenario analysis
30. Sneak circuit analysis
31. Structured/semi-structured interviews
32. SWIFT (i.e. structured what-if)
33. Systemic Cause Analysis Technique (SCAT)
34. Human Error Analysis (HEA)
35. Workplace Risk Assessment and Control (WRAC)

Risk Management Standards:

1. Risk Management Principles and Guidelines (ISO 31000:2009)
2. Risk Assessment Techniques (ISO/IEC 31010:2009)
3. OH&S Hazard Identification and Elimination and Risk Assessment and Control (CSA Z1002)
4. Process Safety Management (CSA Z767-17)
5. Enterprise Risk Management (COSO 2004)
6. Global Minerals Industry Risk Management (GMIRM)
7. International Council on Mining & Metals (ICMM)

13. Appendix B: Workshop Contacts

For additional information or questions, please contact:

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14. Appendix C: Poster: Top 10 health and safety risks in Silviculture Sector

Top 10 Health and Safety Risks in Silviculture Sector

Falling dead trees are top health and safety risk

As identified by workers, supervisors, and employers in the Ontario silviculture industry (development and care of forests including tree planting, hand tending, soil scarification) through a risk assessment workshop facilitated by Workplace Safety North.



1. Dead snag trees or branches, chicots, hang ups, spring poles in cutover falling on workers



6. Heat stress leading to dehydration



2. Highway traffic incidents (especially those involving transport trucks)



7. ATV, wheel, track machine incidents (rollover, loss of control, speed, collision, leaving roadway)



3. Unsafe driving on forestry roads



8. Wildlife encounters or attacks



4. Motor vehicle incidents



9. Lack of emergency planning



5. Strong winds: Standing trees falling on workers in the block



10. Musculoskeletal injuries and repetitive strain injuries

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15. Appendix D: Poster: Top 10 Root Causes of Environmental Hazards in Silviculture Sector



Top 10 Root Causes of Environmental Hazards in Silviculture Sector

Falling dead trees is top health and safety risk



Root causes of combined environmental risks — dead trees, strong winds, heat stress, and wildlife — were identified by workers, supervisors, and employers in the Ontario silviculture industry through a root cause analysis workshop facilitated by Workplace Safety North.

	1. Remote work locations limits connectivity		6. Lack of consistent sector-specific safety guidelines and resources
	2. Severe weather conditions (wind, lightning) can affect emergency response		7. Worker turnover results in a high level of new and inexperienced personnel
	3. Forest management practices increase exposure to danger trees		8. Inconsistent risk assessment of environmental hazards
	4. Inconsistent application of work procedures during wind and weather events		9. Lack of safety program oversight results in higher level acceptance of risks
	5. Inconsistent enforcement of safety practices due to tree planting camp culture		10. Fatigue, illness, and living conditions compromise ability to recognize hazards

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16. Appendix E: Root Cause Analysis: Passenger Vehicle Driving Hazards

1. Background: Additional Root Cause Analysis conducted by members

Upon review of the top 10 health and safety risks, it was identified that risk numbers 2, 3, 4 and 7 related to driving hazards. Worker and management representatives decided it would be beneficial to conduct an additional Root-Cause Analysis to better understand the causal factors related to driving, with emphasis on passenger vehicles in the silviculture sector.

Top 10 health and safety risks in the Ontario Silviculture Sector:

1. Dead snag trees or branches, chicots, hang ups, spring poles in cutover falling on workers
2. Highway traffic incidents (especially those involving transport trucks)
3. Unsafe driving on forestry roads
4. Motor vehicle incidents
5. Strong winds: Standing trees falling on workers in the block
6. Heat stress leading to dehydration
7. ATV, wheel, and track machine incidents (rollover, loss of control, speed, collision, leaving roadway)
8. Wildlife encounters or attacks
9. Lack of emergency planning
10. Musculoskeletal injuries and repetitive strain injuries

This two-day root cause analysis took place January 29th and February 8th and followed the same process as the previous session.

2. Root-Cause Analysis: Risk Statement

Based on the results of the silviculture sector risk assessment, and the decision to conduct a second Root-Cause Analysis workshop, the worker and management representatives identified the following risk statement to focus on using the “Fishbone” approach:

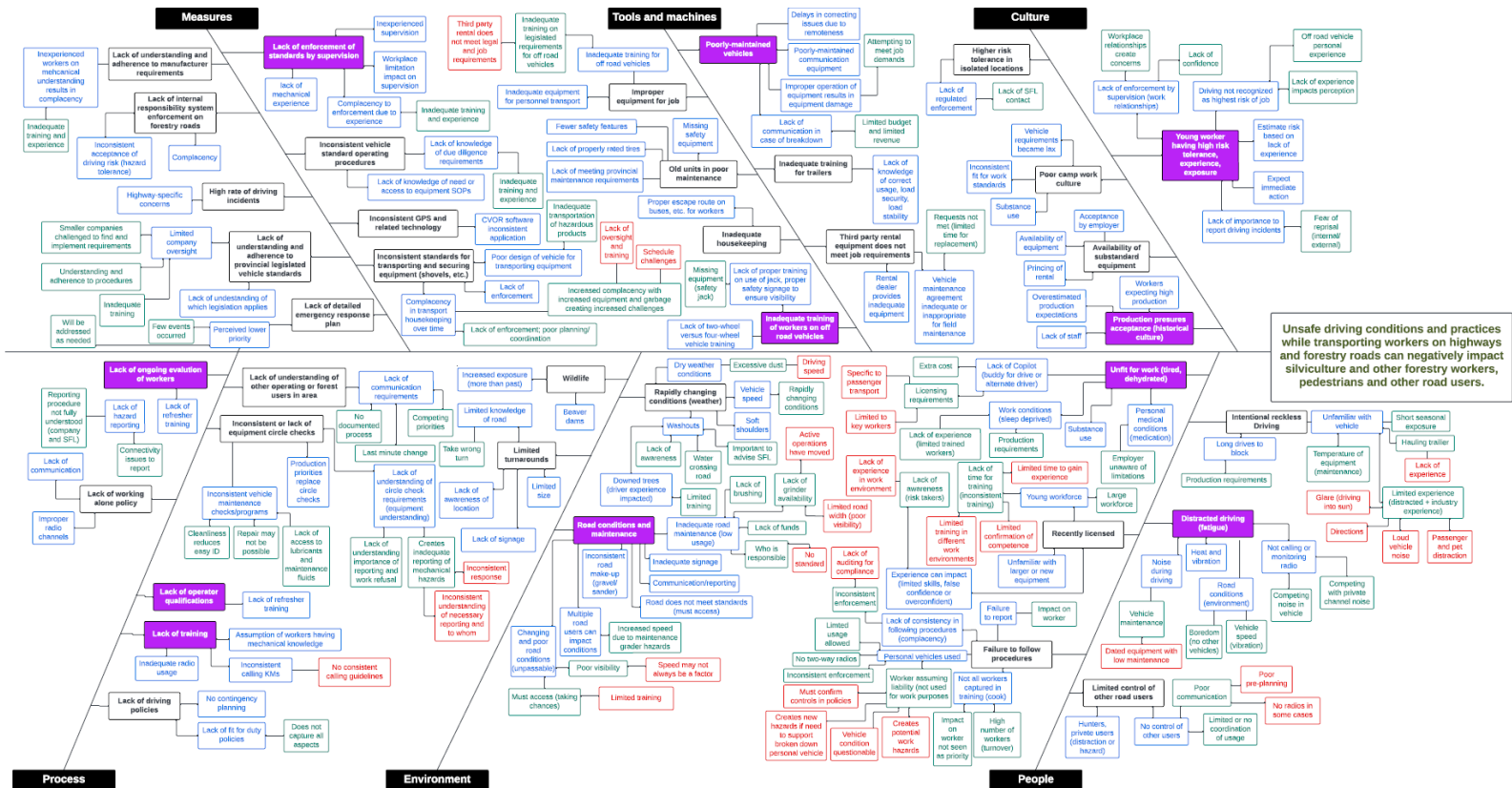
Unsafe driving conditions and practices while transporting workers on highways and forest roads can negatively impact silviculture and other forestry workers, pedestrians, and other road users.

3. Root-Cause Analysis Workshop: A Bipartite and Collective Process

- Workshop participants were peer-recognized industry and system experts.
- Workshop process was open, transparent, and collaborative.
- Participants were able to participate in-person or virtually.
- Ranking and prioritization of causal factors was voted on by industry management and worker only; MLITSD and WSN did not vote.

Validation of the results, in addition to workshop subject matter expert participants, included having the results presented and discussed among silviculture industry constituents through a webinar hosted by Workplace Safety North.

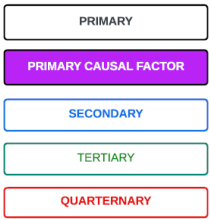
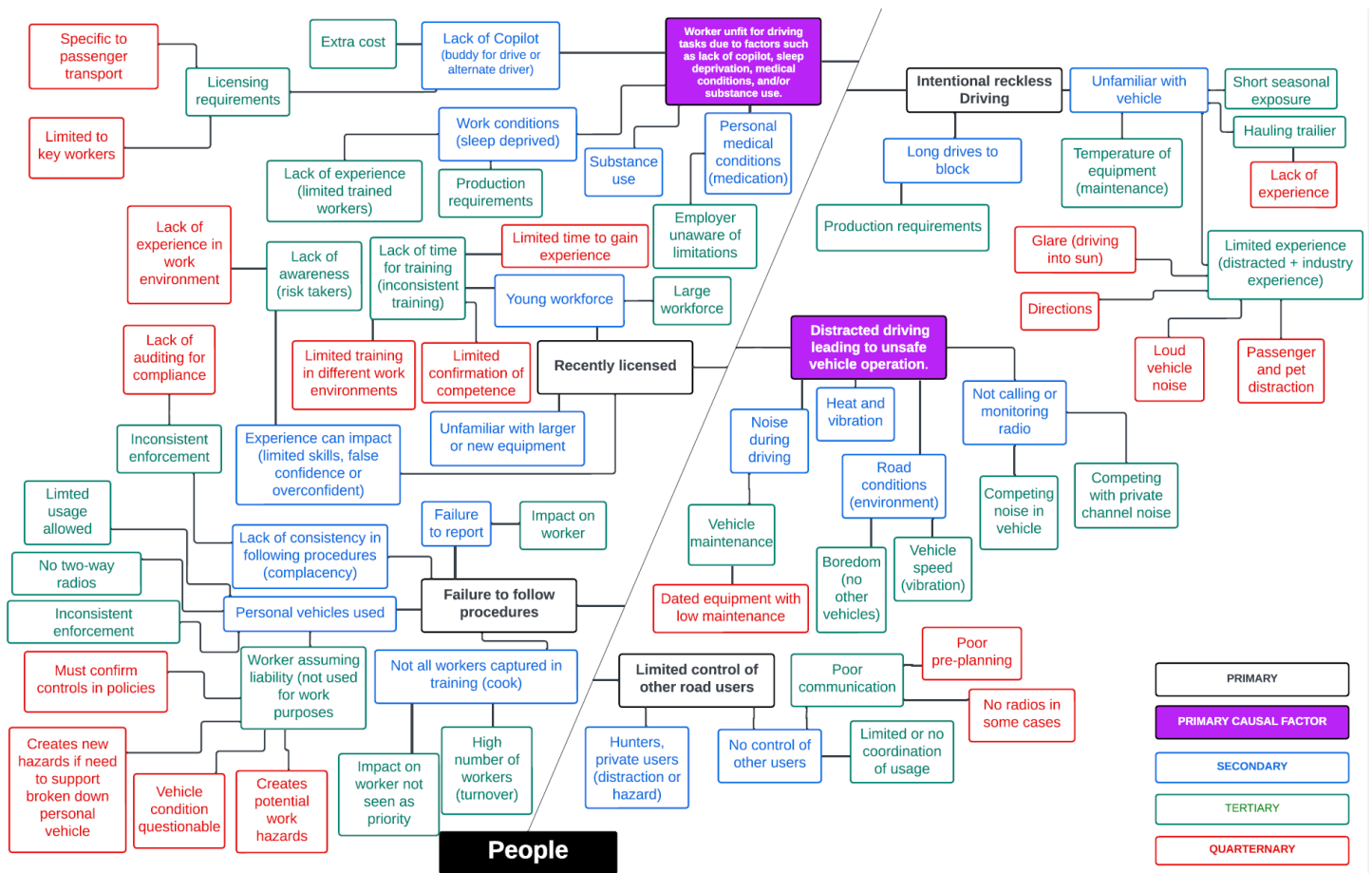
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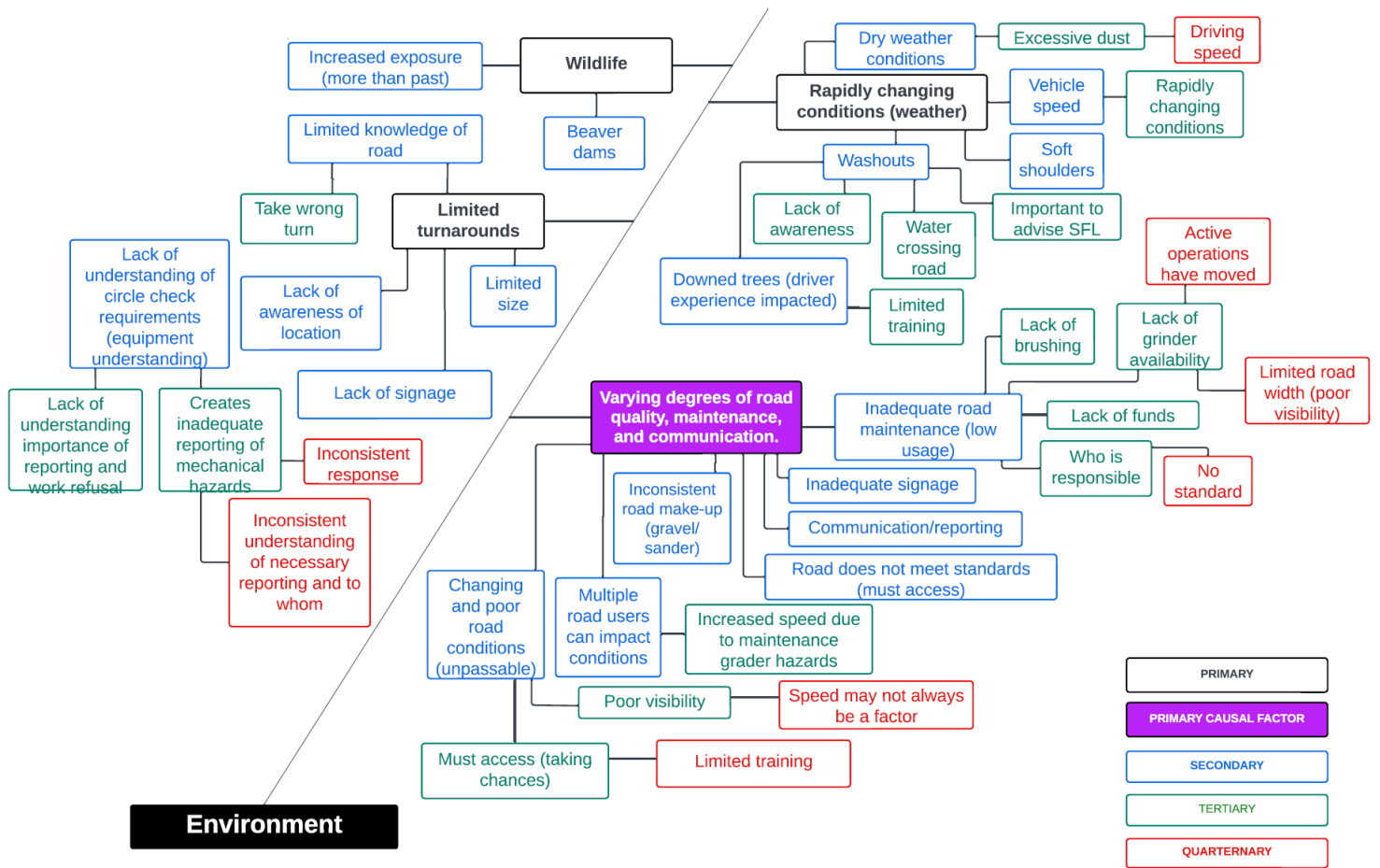


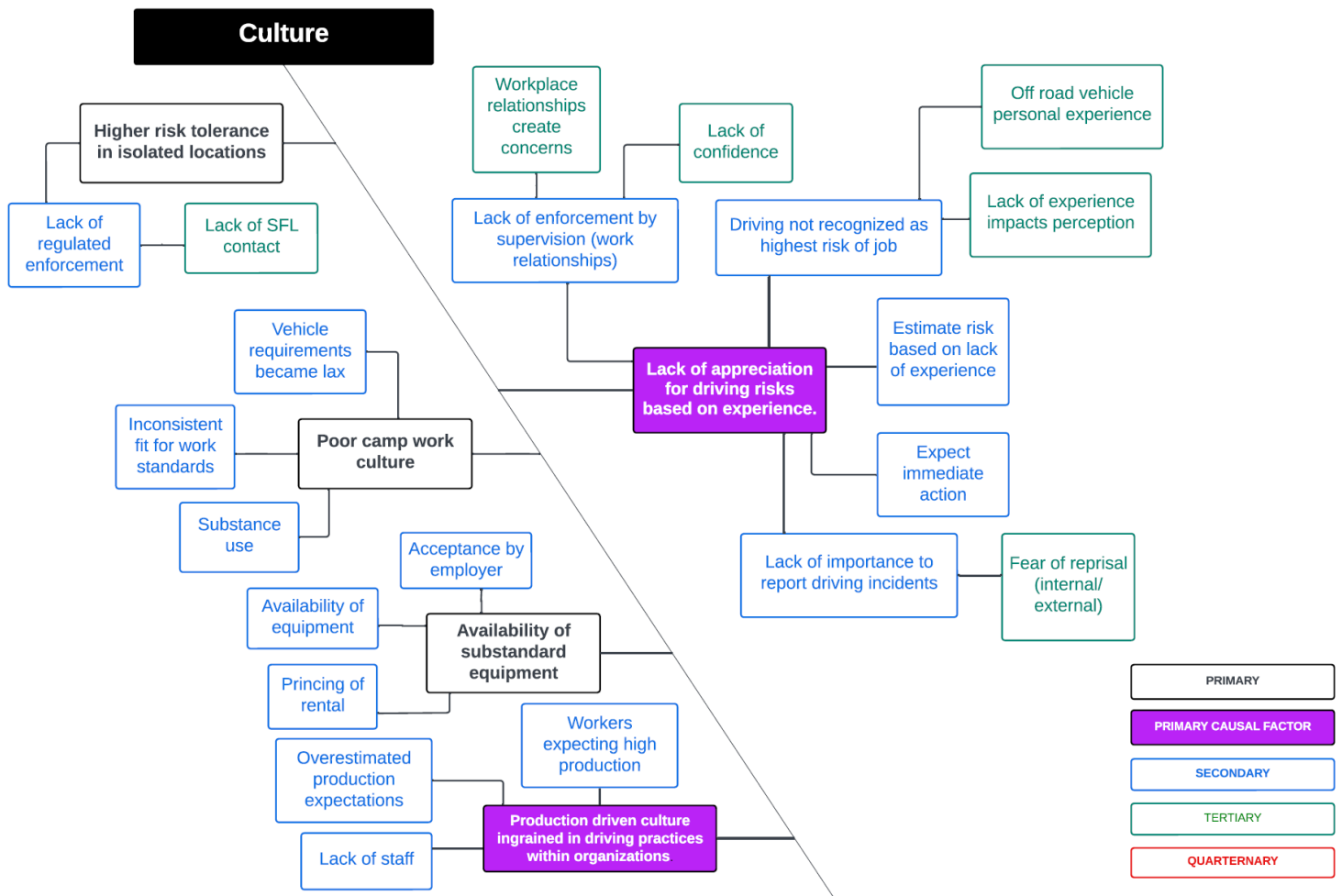
CLOSE-UP of fishbone diagram: Primary causal factors focused on six key workplace factors including: People, Environment, Measures, Culture, Process and Tools and Equipment.

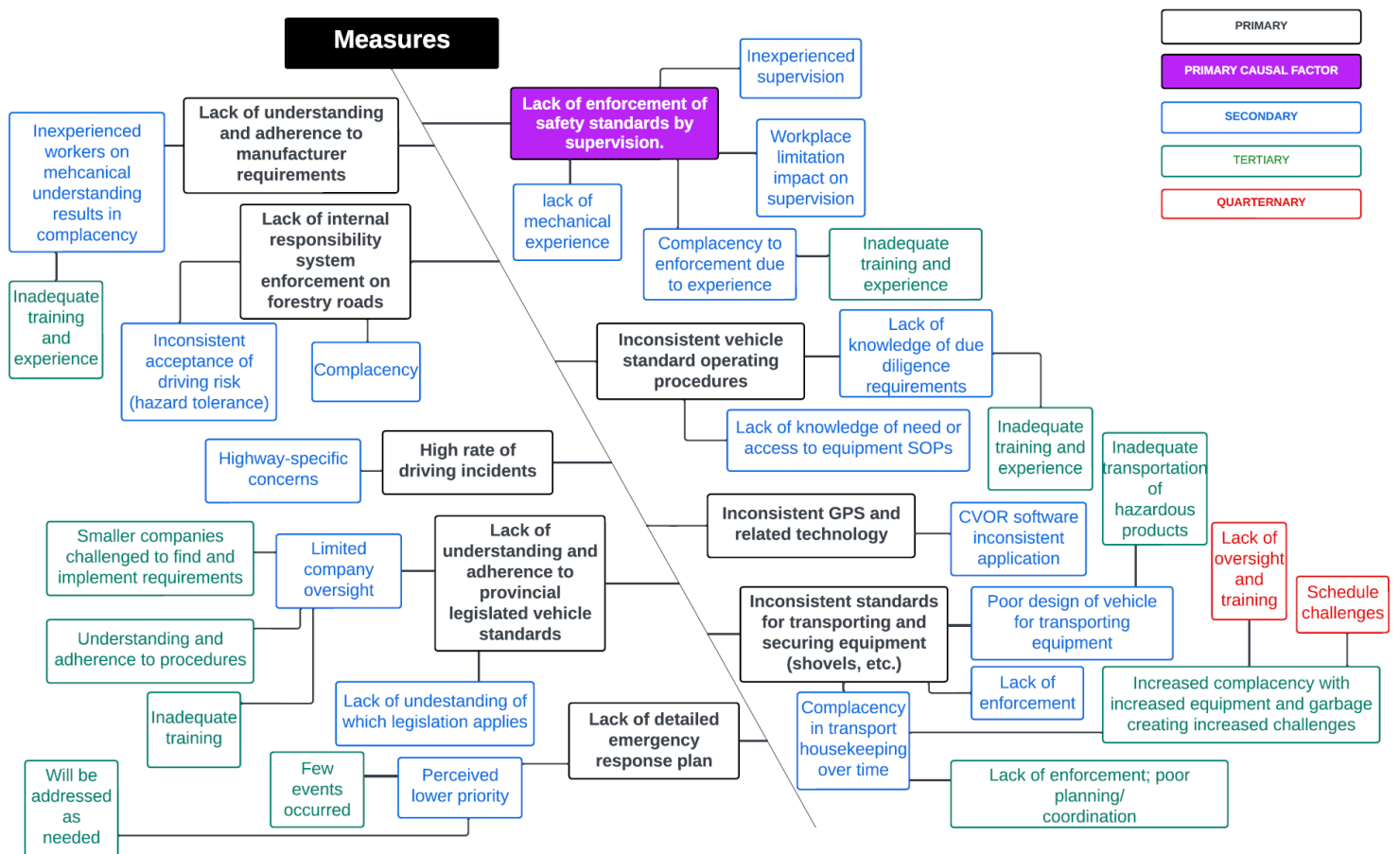
Causal Factors:

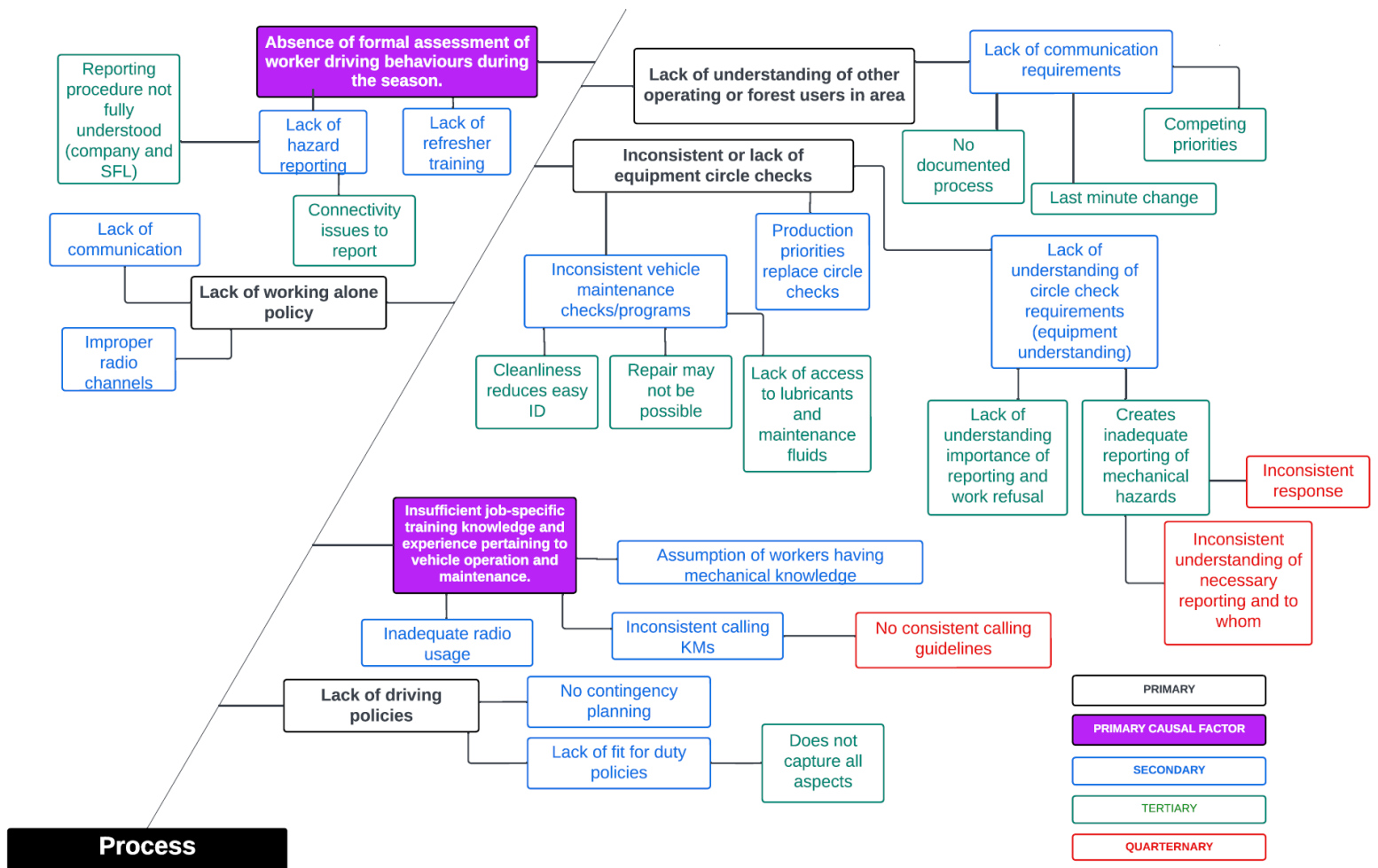
Primary
Secondary
Tertiary
Quaternary

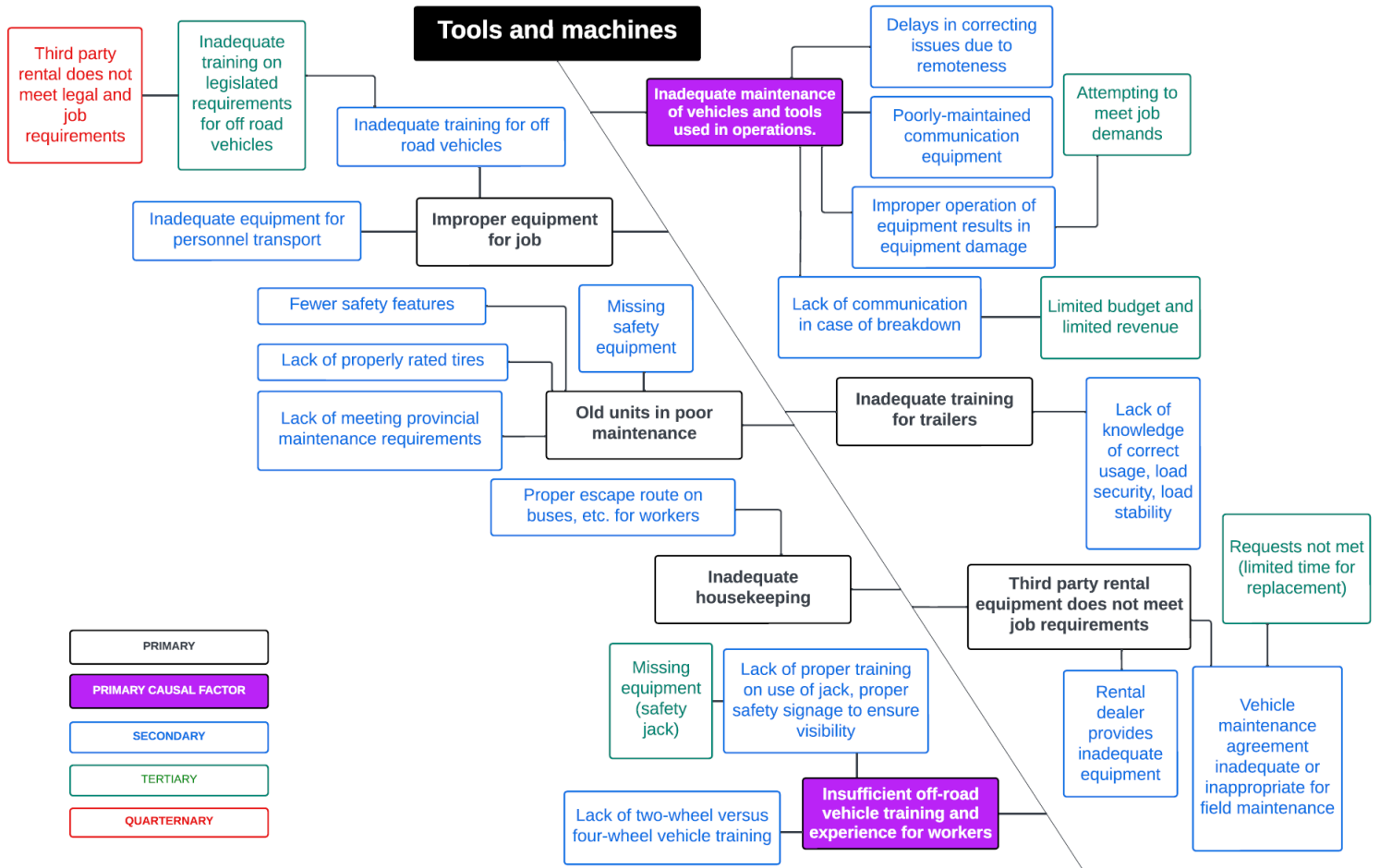












5. Poster: Top 10 Root Causes of Passenger Vehicle Driving Hazards in Silviculture Sector

Top 10 Root Causes of Passenger Vehicle Driving Hazards in Silviculture Sector

Transporting workers is a top health and safety risk

Root causes of unsafe conditions and practices while transporting workers were identified by workers, supervisors, and employers in the Ontario silviculture industry through a root cause analysis workshop facilitated by Workplace Safety North.



1. Lack of training on vehicle operation and maintenance



6. Lack of recognition of driving risks due to inexperience



2. Distracted driving, leading to unsafe vehicle operation



7. Lack of training and experience for driving on forest roads



3. Unfit for driving due to fatigue, sickness, or substance use



8. Inadequate maintenance of vehicles and tools



4. Lack of enforcement of safety standards by supervisors



9. Lack of driver assessments during work season



5. Production-driven culture encourages unsafe driving practices



10. Different levels of road conditions, maintenance, and radio communication

For more information, please contact your WSN Health and Safety Specialist or visit workplacesafetynorth.ca



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6. Critical controls to address primary causal factors of Passenger Vehicle Driving Hazards

1. Process: Insufficient job-specific training knowledge and experience pertaining to vehicle operation and maintenance.

- Practical demonstration of a circle check, basic maintenance, and familiarity with driver controls.
- Review of policies and procedures related to driving and maintenance.
- Review and emphasis on electronic logging device use.
- Practical ride-a-longs with supervisors on the bush road.
- Using a consistent checklist for ride-a-long documentation.
- Safe driving on forest roads modules or equivalent.
- Radio checks before going out in the field.
- Proper vehicle license as per legislative requirements. Develop and implement a standard for silviculture companies with these controls.
- Incorporation of experience and knowledge from mentors and tabletop exercises.
- Clear guidelines on what is acceptable for field maintenance.

2. People: Distracted driving leading to unsafe vehicle operation.

- Distracted driving policy (no cellphones, eating, seating, cargo securement, etc.).
- Develop a distracted driving program.
- Legislative requirements regarding distracted driving.
- Clean cab vehicle policy
- Worker training orientation program to include passenger etiquette in the vehicle.

3. People: Worker unfit for driving tasks due to factors such as lack of copilot, sleep deprivation, medical conditions, and/or substance use.

- Fit for duty policies (incl. exposure to environmental factors, e.g.: excessive heat, rough weather – impact on workers)
- Legislative requirements around impaired driving.
- Company culture to support and enforce company policies.
- Remove workers with production-based payment from driving.
- Education on psychosocial and psychological risk factors, e.g., fatigue, hours worked and sufficient off-duty time, medical conditions, and/or substance use; sufficient off-duty time; hours of service legislation.
- Peer support programs
- Policies (enforced) on taking scheduled breaks and working within set hours (ensuring culture supports this)

4. Measures: Lack of enforcement of safety standards by supervision.

- Competent Supervisor training (or equivalent) to ensure understanding of legislative requirements – ensure training includes safety standards and supervisory skills (e.g.: time management, people management, conflict resolution)
- Pre-season engagement training with supervisors
- Legislated supervisor awareness training (five-step or equivalent)

- Consistent implementation (and enforcement) of company-wide procedures and scheduling to perform inspections.
- Mentorship program for new supervisors
- Diversifying roles to free management responsibilities to focus on other necessary activities
- Establishing check-ins during the season regarding supervisor training/responsibilities.
- Identifying additional supervision/support with larger camps span of control.
- Have enough staff to perform staff functions.
- SFL due diligence in contractor management throughout the full contract.

5. Culture: Production driven culture ingrained in driving practices within organizations.

- Management must ensure that the primary message needs to be that safety is more important than anything, safety always first.
- Management must ensure that there is adequate equipment in good standing.
- Develop a silviculture advisory committee to assist WSN in establishing health and safety resources, policies, procedures, safety talks, job task analysis etc.
- Accountability of workplace parties in maintaining standards throughout the season.
- Sharing best practices from incidents and learnings throughout the season with other committees and firms.

6. Culture: Lack of appreciation for driving risks based on experience.

- Sharing of company hazard alerts (WSN can be the conduit) and through safety conversations on an ongoing weekly basis throughout the season.
- Working with external organizations (such as WSN) or industry experts (professional experienced drivers) on training information and instruction for workers.
- Updated visuals/videos regarding serious driving incidents and road hazards.
- More emphasis on driver training with practical components including realistic scenarios.

7. Tools and machines: Insufficient off-road vehicle training and experience for workers.

- Practical demonstration of a circle check, basic maintenance, and familiarity with driver controls.
- Review of policies and procedures related to driving and maintenance.
- Practical ride-a-longs with supervisors on the bush road.
- Using a consistent checklist for ride-a-long documentation.
- Safe driving on forest roads modules or equivalent.
- Radio checks before going out in the field.
- Proper vehicle license as per legislative requirements.
- Develop and implement a standard for silviculture companies with these controls.
- Incorporation of experience and knowledge from mentors and tabletop exercises.
- Clear guidelines on what is acceptable for field maintenance.
- Training/Refresher training for loading and off-loading and load securement.
- Include off-road vehicle usage with working alone policy and training.
- Worker training around additional hazards with off-road vehicles in relation to blind spots, debris, etc.

8. Tools and machines: Inadequate maintenance of vehicles and tools used in operations.

- Ensure pre-season preventative maintenance.
- Documentation of circle checks, manager/supervisor review and corrective action follow up.
- Preventative maintenance and protocols for all passenger vehicles.
- Policies around proper cleaning of vehicles to facilitate proper inspection prework.
- Training on specific maintenance such as torquing/changing wheels and torque/psi values, safe jacking and towing practices, equipment usage, proper tools, etc.

9. Process: Absence of formal assessment of worker driving behaviors during the season.

- Practical demonstration of a circle check, basic maintenance, and familiarity with driver controls.
- Review of policies and procedures related to driving and maintenance.
- Review and emphasis on electronic logging device use.
- Refresh on practical ride-a-longs with supervisors on the bush road.
- Refresh on using a consistent checklist for ride-a-long documentation.
- Radio checks before going out in the field.
- Continue to incorporate, as needed, experience and knowledge from mentors and tabletop exercises.
- Refresh guidelines on what is acceptable for field maintenance.
- Safety standdown to review and refresh on safety topics.

10. Environment: Varying degrees of road quality, maintenance, and communication.

- Preseason planning to allocate adequate time for travel based on road conditions.
- Safe driving on forestry roads or equivalent training.
- Establishing language on adapting driving behaviors to road conditions in policies, procedures, and training materials.
- Establish site safety plans based on environmental conditions.
- Establish communication between SFL and contractors on hazard reporting, actions taken, and for who is responsible for road maintenance.
- Consistent signage on language used on the roads, at the beginning of roads and kilometer markers throughout.
- Flagging of identified road hazards. Stopping and flagging.
- Consistent practices on road markers and for calling kilometers.
- Legislative requirements for signage as per *Section 117 Industrial Regs.*