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## Forestry – Integrating Safety in a Time of Rapid Change

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Forestry work is commonly recognized as dangerous, and stories of this hazardous work are embedded in our western culture. And yet, this is not folklore from our wild west past, but a real issue of our time that has not been addressed. The US Bureau of Labor Statistics demonstrates that logging has the highest occupational fatality rate<sup>1</sup> and one of the highest rates of days away from work.<sup>2</sup> In 2019 Oregon State had seven logging fatalities.<sup>3</sup> The impact of these fatalities on rural communities is profound. A 2019 survey of 500 loggers in the Northwest found that 93% had experienced the loss of someone they knew from a logging incident.<sup>4</sup>

Forestry contractors are often small employers or independent contractors who may be operating with limited financial resources. In the last two decades, more timberland is being managed as investment trusts. Meanwhile, those working in the logging industry struggle to maintain their workforce that heavily relies on immigrant labor.<sup>5,6</sup> This fissured organizational system complicates addressing worker safety needs and may inadvertently exacerbate hazardous conditions. Enumeration of the forestry workforce is challenging due to the high number of independent contractors and farm foresters, undocumented immigrant workers, and crossover with other occupations. Occupational health and forest management professionals need to be prepared to address an upswing in forest products and land management. These trends are driven by the threat of wildfire and expanded demand for US timber.

In the past, public health organizations and the forestry industry have fallen short in addressing the safety of this workforce, but there are new efforts underway. New investments in U.S. forestry safety have been made in recent years, including increased

funding priorities and research grants by the National Institute of Occupational Safety and Health (NIOSH). A session at the Western Agricultural Safety and Health Conference: Cultivating Collaborations entitled “Forestry – Integrating Safety in a Time of Rapid Change” presented an opportunity to review these newly funded studies and look ahead to this industry’s dynamic future and the sustainability of the logging community. A review of presentations from the “Forestry – Integrating Safety in a Time of Rapid Change” session follows.

### Session – new technologies transforming logging

Technological advances in forestry practice present a unique opportunity for improving occupational safety. Steep and remote terrain has long complicated safety solutions related to machine logging, crew communications, and location awareness. Worker safety will be shaped by the rapid advances in technologies such as winch-assisted/tethered logging, drones, Global Positioning System (GPS), and precision mapping.

The positive impact of machine logging has demonstrated improved safety and advanced harvesting in regions with moderate terrain. Yet, slopes in the Western United States are often steep, limiting the adoption of machine harvesting.<sup>7,8</sup> A review of steep slope logging in the states of Washington and Oregon found that skyline yarding and hand cutting are responsible for the majority of fatalities in these states, and that new winch-assisted technologies can improve safety by anchoring logging machines on slopes as steep as 90%. Task analysis comparing conventional and new tethered systems indicated that use of new systems led to an overall reduction in exposure to hazards and reduction

in worker exposure. Tethered machine logging is rapidly expanding in the Pacific Northwest. Other high-risk jobs identified include maintenance and repair while on steep slopes, machine tip over due to tether line(s), or slope failure.<sup>9</sup>

Operators are the key to the success of new technological systems and improved safety outcomes resulting from implementing these technologies. An emphasis should be put on operator guidance and training.

In her presentation, Dr. Vanessa Casanova, Associate Professor and Director at the University of Texas Southwest Center for Agricultural Health, Injury Prevention, and Education (SWAG), addressed the development of mechanized planting and provided a review of a research study in progress. The project characterizes occupational health and safety outcomes of tree planters in the Arkansas, Louisiana, and Texas forestry services sector. Using a participatory approach, this project is assessing risks and exposures, using direct and self-reporting measures by manual and machine tree planters. This worker population is largely Latino. Mechanized planting is a low-tech system with equipment similar to those used in farming and suitable only for flat terrain. Preliminary results show rapid adoption of the technology and some clear needs for guarding and improved design to address safety and ergonomic hazards.

Dr. Robert Keefe, Associate Professor and Director at the University of Idaho Experimental Forest, presented studies on GPS and location sharing for situational awareness in the logging industry. Dr. Keefe's research brought new technological solutions to old and serious issues in logging including: the need for real-time location awareness to avoid hazard areas, ability to notify responders when an incident occurs, and ability to communicate with emergency services. A survey of professional loggers in Idaho about real-time location-sharing technologies was conducted. Loggers identified hand-fallers, rigging crews, and ground crew as those jobs with the greatest need for location technologies.<sup>10</sup> Using global navigation satellite system (GNSS) enabled radios and smartphones, the research team demonstrated that the movements of hand fallers on cable logging operations could be quantified using activity recognition models based on smartphone sensors.<sup>11,12</sup> Currently, field studies

are underway with rigging crews to assess if fitness watches can provide equivalent movement data compared to smartphone sensors. Long-term goals include the production of tools to quantify hazardous work activities, improve incident detection, and decrease response time.

### **Session – workforce development needs in the forestry sector**

The forestry sector relies on both local and immigrant workers who require training for general skills and safety. Regional industry initiatives are underway to create a sustainable workforce by addressing the issues of high worker turnover, a shortage of skilled operators, and an aging workforce. This session identified research that will support the industry's efforts.

Dr. John Garland, Affiliate Professor, and Marcy Harrington, Manager at the University of Washington Pacific Northwest Agricultural Safety and Health (PNASH) Center, shared results of Northwest logger needs assessment project. This project included two activities: 1) surveying contract loggers in Oregon and Washington States and 2) facilitating a Northwest Logging Safety Summit that engaged regional logging safety experts in identifying priority safety and health needs.

The contractor logger survey was conducted at a logging association's annual safety meeting, reaching approximately 400 contract loggers. The survey found that 43% of respondents had worked in logging more than 30 years, and 88% had worked more than 5 years. Primary jobs of attendees were management/safety, skyline yarding, and shovel and skid logging. Priority hazards included difficult terrain, cutting, fatigue, and logging roads. The most important safety needs, in order of ranking, were: training new workers, use of personal protective equipment, monthly safety meetings, and technical communications/situational awareness. Responses showed a strong interest in regular and specialty training on the topics of safety leadership, fatigue and stress, fitness and health, guarding, and danger trees.

The PNASH Center sponsored the Northwest Logging Safety Summit, convening logging safety educators, consultants, and researchers in a 1-day collaborative forum to cross-train and discuss key

regional issues in logging safety. A “World Café” session engaged participants in identifying new and emerging needs and opportunities for logger safety. The recent needs assessment results were reported. Response to the question “What trends will have the largest impact for safety improvement?” included: job pressure from short rotation forestry and high productivity demands (challenge), long-term contracts with landowners (solution), safety leadership from the top down (need), and retirement and insurance benefit packages (need). Ideas in response to the question “What solutions and trainings can we develop?” included: supervisor training in a train-the-trainer format, video-based training, and training certification. The summit concluded with a strong interest in forming a network, reconvening annually, and jointly addressing emerging issues and communicating safety alerts.

Dr. Elise Lagerstrom, PhD Graduate from Colorado State University High Plains Intermountain Center for Agricultural Health and Safety (HICAHS), presented projects conducted in partnership with Montana Logging Association on analysis of logging injuries in Montana and Idaho. The multi-phase project included a mixed-methods needs assessment, training in emergency first aid, and a survey on musculoskeletal symptoms (MSS) and safety climate. The project began with a mixed-methods approach combining analyses of workers’ compensation claims and focus groups to identify factors associated with injuries and fatalities. The study found that inexperienced workers accounted for over 25% of claims. Sprain/strain injuries were the most common nonfatal injuries, and fatalities had the highest median claim cost. Focus groups identified job tasks involving felling trees, skidding, and truck driving as having the highest risk for injury. In the third phase, 743 loggers completed the Standardized Nordic Questionnaire about their previous 12-month work period. Increased MSSs were more than twice as likely for chainsaw felling compared to mechanized logging, and were associated with increased years of experience and higher body mass index.<sup>13</sup> Loggers recommended safety interventions that involved greater mechanization, early career safety training on heavy equipment, and a need for better safety culture.<sup>14</sup> Determinants for a high safety climate included mechanical logging systems; management/supervisor; older workers, higher education

level, and no MSS.<sup>15</sup> Project recommendations included that injury prevention efforts focus on safe work practices and the development of a safety culture and safety leadership, in addition to implementation of engineering controls.

Dr. Anabel Rodriguez, PhD Graduate from the University of Texas Southwest Center for Agricultural Health, Injury Prevention, and Education (SWAG), reported the results of a study on logging machine operators and health and safety training.<sup>16</sup> This project developed and evaluated a mobile learning platform for logging contractors. Thirty-one logging supervisors received safety leadership and management training using scenario-based problem-solving exercises. Results indicated that mobile learning techniques can be effective in delivering safety management and leadership training to logging contractors and supervisors. However, the study recognized that the use of mobile devices is one component of a more comprehensive health and safety management program for workers in the logging industry.

### **Immigrant Latino workforces in forestry services**

A panel addressed the needs Latino immigrant workers in the logging industry. The panel was moderated by Marcy Harrington, PNASH, and included Dr. Vanessa Casanova, SWAG, Dr. Butch de Castro, Professor and Associate Dean for Diversity, Equity and Inclusion at University of Washington School of Nursing, and Dr. Carl Wilmsen, Executive Director of the Northwest Forest Worker Center (NWFC).

In forestry services, immigrant Latino workers typically conduct high hazard, intense manual labor tasks. This industry of subcontractors are at high risk for injury and work abuses. Panelists described their research and engagement methods.

Drs. Wilmsen and de Castro introduced their study that engaged Latino forestry employers and workers. The study analyzed case study worker interviews and engaged workers through the NFWC’s promotora (community health workers) program. This surveyed workforce was found to be largely male, healthy, Spanish-speaking, with little previous experience or training. Findings from the study demonstrated: the hazardous nature of the work, a culture of abusive supervision, barriers for workers

to influence improvements, and the negative affect of supervisors serving as interpreters during work injury medical exams.<sup>6</sup>

Dr Casanova further discussed her work with tree harvesters in her study of mechanical planters. This workforce is also largely male, Latino, and Spanish-speaking. Much of this workforce in the Texas region are resident vs. immigrant. She advised moving away from labor intensive planting, and toward mechanized planting when possible and discussed the need for training and solutions in musculoskeletal disorders, pesticide exposure, and facilities/sanitation.

Panelists emphasized the value of promotores in research and the uniqueness of community programs such as the NWFC. A sustained promotora program provides a culturally aware community gatekeeper and builds a trusted relationship between the promotora and the research community. Dr. De Castro spoke to responsible community-engagement principles. There was a call for awareness and continued research to benefit this vulnerable worker population and recognition that the underlying factor of documentation and immigration status contributes significantly to Latino worker's precarious employment status and injury experience and that immigrant reform is needed.

For additional studies on US forestry occupational safety and health, please visit the Journal of Agromedicine Special Issue: Forestry and logging: people, practices and safety.<sup>17</sup>

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