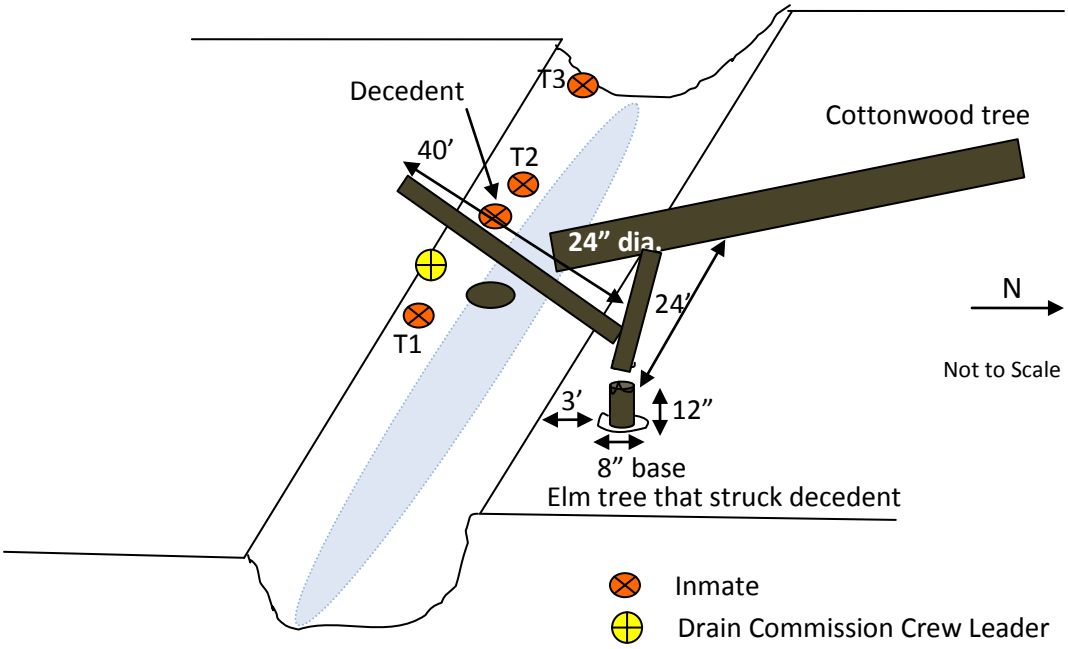
MIFACE Investigation Report #10MI034

SUBJECT: Inmate Struck by a Falling Elm Snag



Drawing 1. Drawing of Incident Scene

Summary

In the spring of 2010, a male inmate in his 40s died when an elm snag (dead standing tree) fell without warning in his direction and struck his head. The decedent was a member of a 4-person inmate work crew contracted by the County Drain Commission through local law enforcement. The work crew was clearing a county drain of trees. The decedent and his coworker (Inmate 1) had just felled a 24-inch diameter cotton wood tree. Inmate 1 operated the chain saw and the decedent inserted the wedge to keep the tree from sitting back on the chain. The cottonwood tree fell in its desired direction (northeast), and also knocked several trees over as it fell to the ground. The inmates and the Drain Commission crew leader indicated the ground shook when the cottonwood landed. Approximately 10-20 seconds later, the elm snag broke approximately 12 inches above the ground fell to the northwest. The snag broke into two pieces, with the 4-inch diameter uppermost piece striking the decedent on the right side of his head. The decedent was not wearing a hard hat. An emergency response call was initiated by one of the inmates, and another inmate began resuscitative efforts. Emergency response arrived and assumed care of the decedent. He was transported to a local hospital where he was declared dead.

Factors contributing to this incident include:

- Inadequate site assessment for hazard trees
- Lack of personal protective equipment use
- Inadequate training regarding tree felling

RECOMMENDATIONS/DISCUSSION

- Crew supervisors and tree fellers should receive training to properly evaluate the trees and surrounding area so potential hazards can be identified and appropriate control measures implemented. Training should be a continuing process for skills development and for the understanding of safe methods and practices in the logging industry.
- A "pre-job safety plan" should be in place for the cutting site and the plan should be reviewed prior to each day's cutting.
- Correctional facilities with an inmate work crew program should develop, implement, and enforce a written health and safety program for the inmates, which includes, but is not limited to, training in hazard identification and mitigation, personal protective equipment and methods for dealing with inmate noncompliance of the health and safety program requirements, such as unannounced inspections.
- Drain Commissions should develop, implement, and enforce a written health and safety program for its employees which includes, but is not limited to, training in hazard identification, avoidance, and abatement for the work performed by them as well as methods for dealing with employee noncompliance of the health and safety program requirements.

Although not causative factors in this incident, MIFACE makes the following recommendations to minimize the possibility of a future work-related fatality:

- All tree cutting operations should adhere to the principle that a distance of at least two tree lengths should separate adjacent occupied work areas.
- The area surrounding an incident site that has standing trees which pose a hazard to rescue and/or investigative personnel should be felled if possible. If unable to be felled, an individual should be assigned as a spotter to alert rescue/investigative personnel to any change in the tree(s) stability.
- Investigative agencies, such as Police, Sheriff and State Police should have hard hats and other personal protective equipment readily available for protection against hazards present at the incident scene.

BACKGROUND

In the spring of 2010, a male inmate in his 40s died when a dead elm snag fell in his direction and struck his head. MIFACE was notified of this incident by a newspaper article. The MIFACE researcher interviewed the County Drain Commissioner at the Drain Commission Office and then was accompanied by the Drain Commissioner to the incident site. During the writing of this report, MIFACE interviewed the MIOSHA compliance officer, reviewed the Sheriff Department report and pictures, death certificate and medical examiner's report. Drawing 1 is based upon a drawing provided by the Drain Commissioner during the MIFACE interview. MIFACE revised the drawing to reflect information in the Sheriff report. Pictures used in Figures 1-4 are courtesy of the responding Sheriff department. Pictures used in Figures 5, 6 and 7 are courtesy of the MIOSHA compliance officer. Illustration 1 is copied from the MIOSHA General Industry Tree Trimming Standard. Any photograph showing identifying information was modified by MIFACE to preserve anonymity of the County Drain Commission, the decedent, and the responding Sheriff Department.

With the approval of the County Sheriff, the inmates may voluntarily work outside the jail to designated agencies to pay their jail boarding costs. The inmate work crew was utilized by the County Drain Commissioner (Drain Commission) to clear the waterways of the county. The inmate work crew worked under the supervision of a Drain Commission employee (Drain Crew Leader).

The Drain Crew Leader had worked at the County Drain Commission for six years. During the first five years he worked part time and had been a full time employee for approximately one year. He was working with four inmates; Inmate 1 for 60 days, Inmate 2 for 90 days, Inmate 3 for two weeks, and Inmate 4 (decedent) for 30 days. The Drain Commissioner did not know the extent of training received by the inmates regarding chain saw use and tree felling activity.

The County Drain Commission district employed nine individuals at the time of the incident. County Drain Commissioner manages more than 400 different county and inter-county drains, a total of more than 800 miles of waterways. A few of these are enclosed storm sewers, but most are open watercourses.

The Drain Commission Office did not have a written Health and Safety Plan or written work rules for the task. Employees were provided with on-the-job training. Employee training documentation was not maintained. The Drain Commission Office provided some safety equipment, such as hard hats, hearing protection, eye protection to both Drain Commission staff and the inmates, but did not require that it be worn.

Drain Commission remediation activities following the incident included:

- Inviting MIOSHA Consultation, Education and Training (CET) division to perform employee training
- Mandating the use of personal protective equipment
- Developed guidelines with County Sheriff regarding use of inmates and responsibilities of the two parties
- Holding quarterly safety meetings with staff
- Holding a tree cutting class to certify tree fellers, and included chain saw safety. Class was open to any local contractor so they too could safely fell a tree.

MIOSHA General Industry Safety and Health Division cited the County Drain Commission Office for the following Serious violations at the conclusion of its investigation:

Personal Protective Equipment, Part 33

- Rule 3308(1): An employer shall assess the workplace to determine if hazards that necessitate the use of personal protective equipment are present or are likely to be present. If the hazards are present or are likely to be present, then the employer shall do all of the following:
    - Select, and have each affected employee use, the types of personal protective equipment that will protect the affected employee from the hazards identified in the hazard assessment.
    - Communicate selection decisions to each affected employee

    - Select the personal protective equipment that properly fits each affected employee.
- Rule 3308(2): An employer shall provide training to each employee who is required by this part to use personal protective equipment. Each employee who is required by this part to use personal protective equipment shall be trained in all of the following areas:
    - When personal protective equipment is necessary
    - What personal protective equipment is necessary
    - How to properly don, doff, adjust and wear the personal protective equipment
    - The limitations of the equipment.

Tree Trimming, Part 53

- Rule 5313(1): Eye Protection shall be provided and used, as prescribed in General Industry Safety Standard, Part 33, Personal Protective Equipment, being R 408.13301 to R 408.13369 et.seq. of the Michigan Administrative Code, by and employee working on any operation covered by this part.
- Rule 5313(2): Head protection shall be provided and used as prescribed in General Industry Safety Standard, Part 33, Personal Protective Equipment, being R 408.13301 et.seq. of the Michigan Administrative Code, by and employee working on any operation covered by this part. Part 52 Tree Trimming 2x distance
- Rule 5336(2): Each assisting employee on the ground shall be instructed exactly what he is to do. Other employees shall be cleared to a distance of twice the height of the tree being cut.
- Rule 5336(4) A back cut shall leave sufficient hinge wood (the distance between notch and back cut) to guide the tree's fall in the desired direction and to hold the tree to the stump during most of its fall. A back cut shall be about 2 inches (50.8mm) above the undercut and as level as possible.
- Rule 5336(5): Before starting a back cut, a feller shall clear the area of other persons or equipment.

INVESTIGATION

Incident Site

The Drain Commissioner was in the process of cleaning the county drains of trees that had grown inside and up the banks of the drains (Figure 1).

The drainage district for the incident drain encompassed five square miles. The Drain Commissioner indicated that drain overflows were rare, but that the water level had elevated in the drain due to tree growth within the drain. The drain district where the incident occurred had a higher water table with Parkhill loam hydric soil. The definition of a hydric soil is a soil that formed under conditions of saturation, flooding or ponding long enough during the growing season to develop anaerobic conditions in the upper part. The Commissioner believed that there was a water source issue from the bottom of the tree allowing water to get to the tree from its base and create fungus issues for the trees in and near the drain's banks.

The dead tree that struck the decedent had succumbed to Dutch Elm disease (Figure 2). The Drain Commissioner indicated that the increase in the water/air interface had caused rotting approximately 12-14 inches up the elm's trunk. The elm was limbless and barkless. The responding Sheriff department measured the tree and found it to be a total length of 40 feet 4 inches with an 8-inch (approximate) diameter at its base. The detective noted that there was no way of knowing how much of the very top of the tree had previously broken away. The area which appears to have struck the decedent was 16 feet 4 inches from the base of the tree. The tree diameter was approximately 4 inches where it struck the decedent.

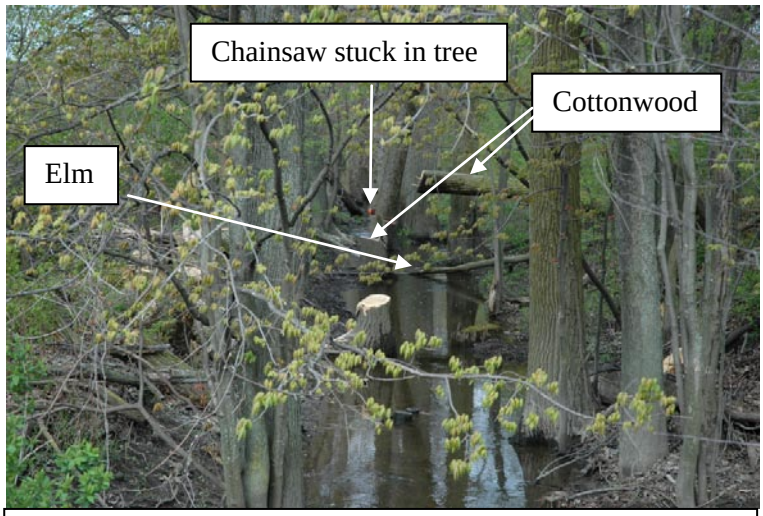


Figure 1. Drain after incident, looking west from road

Weather conditions at the time of the incident were noted in the Sheriff report: temperature was 39 degrees F with a mild light wind out of the west at 6 mph.

Incident Narrative

At approximately 7:15 a.m., the Drain Crew Leader picked up the four inmates at the Sheriff's Office Intervention Center and transported them to the incident site. Inmate 1 and the decedent comprised Crew 1 and Inmates 2 and 3 comprised the second work crew (Crew 2).


Figure 2. Dead elm stump after break

After arriving at the incident site, Crew 2 proceeded directly to the incident drain with their Stihl 025 chainsaw with a 14-inch cutting bar to begin the drain clearing. Crew 1 stayed at the work truck to sharpen their Stihl 310, 25-inch cutting bar's chain.

The inmate crews were wearing gloves and boots or hip waders. None of the inmates were wearing the available hard hats, hearing protection, or eye protection. Chaps were not available. The Drain Crew Leader indicated to Sheriff that he was the only person who used hearing protection.

Crew 2 began to clear the trees. Inmate 2 was the feller operating the chainsaw and Inmate 3 was responsible for wedging. The first tree Crew 2 attempted to cut down did not fall "cleanly".

Inmate 2 told the detective that he had to "turkey cut" the tree to get it to fall properly. MIFACE could not find a definition of "turkey cut" related to tree cutting activities. Inmate 2 also mentioned to the detective that he got his saw stuck a couple of times. Per the Sheriff's report, Inmate 2 stated "that is not significantly important and that pretty much is very customary in falling trees. What is important is that he knows what to do about it when that does happen." Inmate 2 indicated that the tree he was cutting eventually fell without incident.

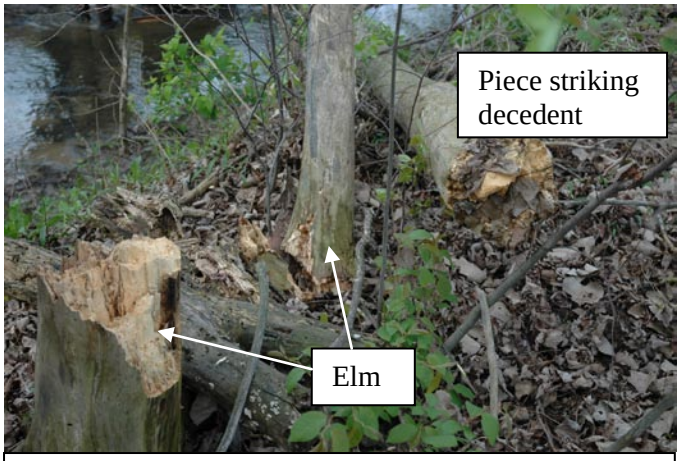


Figure 3. Configuration of elm after breaking into two pieces, one piece across drain striking decedent

Crew 1 arrived at the drain. A 24-inch diameter, 40-foot tall cottonwood tree was growing in the drain and was located approximately 30-35 feet east of Crew 2. This tree was selected for Crew 1's first felling activity. Inmate 1 was the chainsaw operator/feller and the decedent was responsible for wedging.

Crew 2 began to cut down another tree that was approximately two trees away from where the Crew 1 was cutting the cottonwood. While Crew 2 cutting, Inmate 2 once again had the chain saw become stuck in the tree (Figure 1). Crew 2 tried both wedging and a pry bar to try to free the saw, but was unsuccessful. Crew 2 stopped cutting the tree and was watching Crew 1 fall their tree. Inmate 1 told Inmate 2 to stop cutting down such large trees because the bar was not large enough and that he would cut the larger trees because he had a larger bar. Inmate 2 could not remove the saw, so Crew 2 waited by the tree until Inmate 1 finished felling the cottonwood and could come to their tree to help free the saw.

All inmates and the Drain Crew Leader were positioned on the south side of the drain. The Drain Crew Leader was on the bank while the two work crews felled the trees in the drain. At some point during the cottonwood felling activity, Inmate 2 walked near the Crew 1 location.

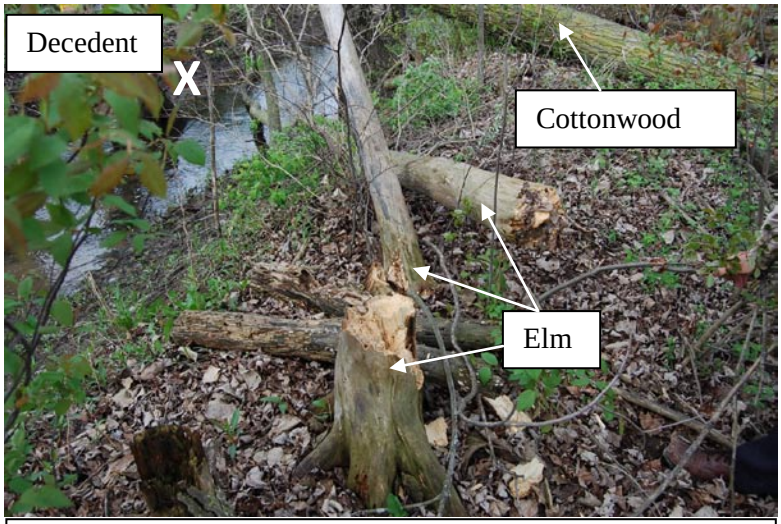


Figure 4. North bank. Orientation of elm, cottonwood, and decedent

Inmate 1 notched the cottonwood tree. The Drain Crew Leader yelled "timber" and after ensuring all workers were clear, Inmate 1 performed the back cut and felled the cottonwood. Crew 1 stepped back up along the south bank as

the tree began to fall. Inmate 2 indicated to the Sheriff that he was standing near the decedent. Inmate 1 stated the cottonwood fell in the desired northeast direction from the point of the base of the tree, taking down a couple of additional dead trees as it fell to the ground. The additional trees also fell in a northeast direction.

The decedent's coworkers described that the earth shook when the cottonwood tree landed. The work crew thought the area had stabilized after the cottonwood fell. Inmate 1 indicated to Sheriff that he placed the saw down by a nearby tree and turned his back just momentarily to the decedent, who was standing to his side. All of a sudden, Inmate 1 saw a tree coming down. This southwest-falling tree was the dead elm snag, which was approximately three feet from the edge of the northern bank of the drain and 24 feet east from the landing zone of the cottonwood (Figures 3-5). The dead elm snag fell toward Crew 1's position and they ran to get out of the way of the falling tree. The decedent was unable to clear the area and the tree struck the decedent on the right side of his head. Inmate 2 stated to the Sheriff that he felt a brush on his shoulder and then the decedent was struck by the snag. The decedent fell to the ground, unconscious.

The Drain Crew Leader asked Inmate 2 to go to the work truck and call for emergency response. Inmate 1 administered first aid and CPR waiting for emergency response to arrive. The Drain Crew Leader also called for emergency response. Emergency response arrived and assumed care of the decedent. He was transported to a local hospital where he was declared dead.

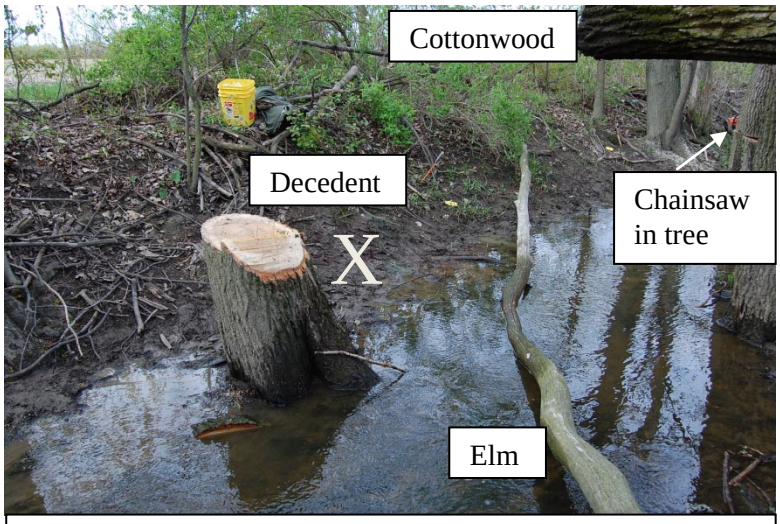


Figure 5. Looking south from North bank. Orientation of elm, cottonwood, and decedent

The Drain Commissioner was informed of the incident by another Drain Commission employee. He then traveled to the incident scene. The detective asked Inmate 2 if there was any advance warning, any sounds or any noise at all when the snag was falling, such as hitting other branches or trees as it fell. Inmate 2 responded that "absolutely not - that there was no sound at all from this falling tree."

The responding Sheriff noted in the report that while the Sheriff's office was conducting their investigation, Drain Commission employees were warning and lecturing the Sheriff staff about being in an area where there was a dead tree that appeared to be ready to fall. Two sheriff officers and two County Drain Commission employees were standing on a nearby roadway at the conclusion of the investigation. They heard the sound of a tree crashing to the ground. The falling tree was the tree that Drain Commission employees had been warning the detectives about. The Sheriff noted there were no other trees that caused this tree to fall. There were no significant winds and no severe weather. It appeared to the detectives that the tree fell without apparent cause or advance warning.

CAUSE OF DEATH

The cause of death as listed on the death certificate was craniocerebral injuries due to blunt impact of the head. Toxicology was negative for alcohol and illegal drugs.

RECOMMENDATIONS/DISCUSSION

- Crew supervisors and tree fellers should receive training to properly evaluate the trees and surrounding area so potential hazards can be identified and appropriate control measures implemented. Training should be a continuing process for skills development and for the understanding of safe methods and practices in the logging industry.

The Drain Crew Leader did not conduct a walkthrough of the surrounding area where the inmates were felling trees to evaluate the potential hazards associated with dead trees in the area. The Drain Crew Leader appeared to have underestimated the hazards posed by the soil conditions in the area and the dead elm snag, per the police report: "As a matter of fact, it was a tree that their crew would not even have attempted to remove. It was a dead tree but it was well outside maybe 12-14 feet of the banks edge. Well outside of the scope of the area they would have worked on." The Drain Crew Leader had overestimated the distance of the snag from the ditch bank edge.

Figure 1
APPROVED UNDERCUTS

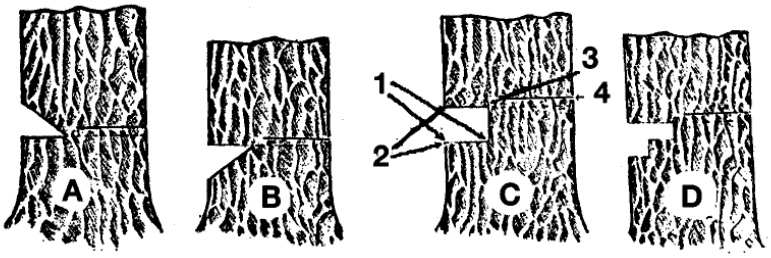


Illustration 1. MIOSHA Tree Trimming Standard, Figure 1. Approved Undercuts

Although many dead trees were in the area, a walkthrough evaluation may have identified the hazard of this particular snag, as well as other potential hazards such as soil type which may affect tree integrity, logs, rocks, snags, spring poles, lodged trees, etc. The County Sheriff Office and the Drain Commission should ensure workers are aware of potential hazards associated with manual felling and emphasize assessing the tree to be felled *and other nearby trees* for potential hazards.

The County Sheriff and the Drain Commission should provide workers with training in safe work practices that includes how to evaluate their work area prior to beginning work.

Figure 6. Undercuts and backcuts at incident scene

Such training should include factors such as the lean of the tree to be cut, wind conditions, and the locations of other trees in the immediate work area, as well as the need to identify potential hazards such as dead, broken or rotted limbs or trees (snags). Once identified, any dead, broken or rotted limbs should be felled or otherwise removed before commencing the cutting activity. Training should also include tree cutting techniques when using a chain saw.

Experience can be a great teacher and a necessary element in skills development, but unguided experience can foster poor technique and enhance bad habits. Training and education are necessary compliments to what we learn via the experience route. In this incident, both tree fellers had experience but did not appropriately fell the tree. The trees did not have the appropriate undercuts and backcuts as per MIOSHA General Industry Safety and Health Standard, Part 53, Tree Trimming and Removal Standard (See Illustration 1).
MIOSHA rules state:

- An undercut shall be large enough, about 1/3 the diameter, to safely guide the tree and reduce the possibility of the tree splitting. See Illustration 1.
- A back cut shall leave sufficient hinge wood (the distance between notch and back cut) to guide the tree's fall in the desired direction and to hold the tree to the stump during most of its fall. A back cut shall be about 2 inches (50.8mm) above the undercut and as level as possible.

Figure 6 show the stumps left by Inmates 1 and 2 demonstrating inappropriate undercuts and back cuts and inappropriate cutting techniques. A continuous training and education process, coupled with on the job experience, are foundation blocks that enable workers to make good judgments. Education and training also reinforce best practices and provide for review of current safety and regulatory requirements.

- A "pre-job safety plan" should be in place for the cutting site and the plan should be reviewed prior to each day's cutting.

Prior to a tree cutting operation at a new site, a pre-job safety plan developed by the correctional agency and the Drain Commission should be developed that defines how the site should be safely cut. In addition, prior to each day's work, the workers and supervisor should conduct a brief review of the plan and reconfirm each work crew's work area and the direction of the tree cutting activity. A site action plan and a daily briefing should occur in order to safely and effectively coordinate the activities. It is important that the pre-job safety plan be clearly understood, that the work areas are well defined and hazards and other potential emergency situations are addressed. This should include having other work crews positioned with at least two tree lengths away from each other.

A "pre-job safety plan" is an important tool, but the work layout is a process that is in constant motion during the day's activity. In order to support the safety plan, the tree fallers must be in continual communication with each other during the cutting process.

- Correctional facilities with an inmate work crew program should develop, implement, and enforce a written health and safety program for the inmates, which includes, but is not limited to, training in hazard identification and mitigation, personal protective

equipment and methods for dealing with inmate noncompliance of the health and safety program requirements, such as unannounced inspections.

This program should include but not be limited to training in hazard identification and mitigation and the proper use of required personal protective equipment. Procedures should be established for unannounced worksite inspections and for dealing with inmate noncompliance of the health and safety program requirements.

Based on the Sheriff report, MIFACE identified several training issues. One training issue was the lack of knowledge of chain saw use by Inmate 2. A second issue was the misconception of the inmate crew as to the benefits provided by personal protective equipment. Inmate 1 stated to the police: "he and other crew members were not wearing "safety helmets, goggles or ear protection….crew members make a conscious decision not to wear them. Feel that the helmets are not safe because it restricts their vision while working, therefore they select not to wear the safety helmets."

The inmate work program should include a documented procedure to warn and retrain, and if a repeat infraction occurs, a revocation of the inmate's work status. Sheriff Departments should designate an officer to perform unannounced safety and health inspections at an inmate worksite, especially if the work crew is supervised by an individual not associated with the correctional institution. Conducting unannounced safety and health inspections of worksites will help ensure that established safety and health procedures are being followed and demonstrate the Sheriff's Office commitment to the safety of their inmates.

Considering the hazards to personal safety that tree felling operations may create, tree fellers should wear head, hand, leg, eye, face, and foot protection. In this incident, the decedent did not wear a hard hat, and given the force of the blow he received, its use may not have affected the fatal outcome. However, lives have been saved and injuries avoided by proper use of head protection by workers performing tree felling operations where overhead hazards exist.

Figure 7. Hard Hats in transport vehicle

The use of PPE should be included in every health and safety program. Anytime workers are required to use personal protective equipment, they must be trained about how to use the equipment. The Drain Commission provided some, but not all personal protective equipment required by the MIOSHA Logging Standard (Figure 7). Neither the Sheriff's Office nor the Drain Commission required and enforced the use of personal protective equipment.

- Drain Commissions should develop, implement, and enforce a written health and safety program for the inmates which includes, but is not limited to, training in hazard identification, avoidance, and abatement for the work performed by them as well as

methods for dealing with employee noncompliance of the health and safety program requirements.

In this incident, the Drain Commission did not have a written safety program and therefore had no established means for communicating and enforcing safety expectations. Evaluating tasks performed by their employees, identifying all potential hazards and then developing, implementing and enforcing written safe work procedures would address these issues. Additionally, the health and safety program should include a documented procedure to warn and retrain the employee, and if a repeat infraction occurs, further disciplinary action which could include time off without pay or termination.

Although not causative factors in this incident, MIFACE makes the following recommendations to minimize the possibility of a future work-related fatality:

- All tree felling operations should adhere to the principle that a distance of at least two tree lengths should separate adjacent occupied work areas.

The distance between Crew 1 and Crew 2 was well *within* the height of the tree. Although not a factor in this fatality, Inmate 3 was within two tree lengths of the cottonwood as it fell. Although the cottonwood fell in the direction intended, the intended direction was in the vicinity of Crew 2. Even with the best of intention by the tree feller, trees do fall in an unintended direction.

An estimation of height can be utilized by the feller using the geometric principle of right triangles. Per the International Society of Arboriculture, *Tree Climbers' Guide*: "Hold the stick so that the distance from your eye to your hand equals the distance from your hand to the top of the stick. Hold your arm horizontally and the stick vertically. Walk forward or backward until the distance from your hand to the top of the stick is proportional (visually equal) to the distance from the felling cut to the top of the tree." The distance you are away from the tree is the approximate height of the tree (Figures 7.7A and 7.7B from the *Tree Climbers' Guide*).

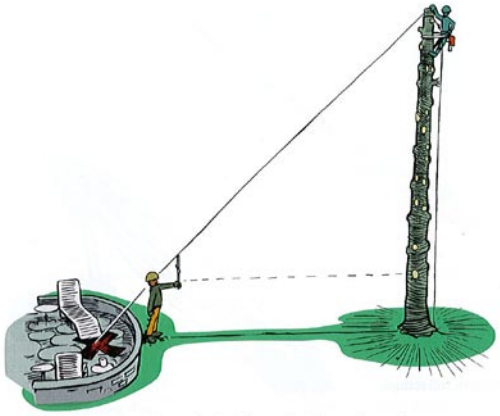


FIGURE 7.7A Most techniques for height estimation are based upon a geometric principle of similar right triangles.

FIGURE 7.7B Find the position at which the distance from your hand to the top of the stick visually equals the height of the tree from the cut.

It is extremely important that good communication takes place between tree faller crews working in a tree stand. The falling teams need to know exactly where their fellow cutters are located at all times. Workers have to recognize when they are working too close. The two tree length or more separation between fallers has to be constant however, and maintained at all times.

The distance of two tree lengths between work crew recommendation may be difficult for an inmate work crew to implement due to the work release rules, which may require inmates to "stay within view of the supervisor/correctional officer at all times." This should be identified in the pre-job hazard assessment and the work activity coordinated with the Drain Commission.

- The area surrounding an incident site that has standing trees which pose a hazard to rescue and/or investigative personnel should be felled if possible. If unable to be felled, an individual should be assigned as a spotter to alert rescue/investigative personnel to any change in the tree(s) stability.

An issue arose during the rescue and the sheriff investigation of this fatality. The Drain Commission personnel identified a tree that was in a position of falling. The sheriff noted in his report that Drain Commission personnel "lectured" and warned the responding officers of the hazards posed by the tree. In addition to the Sheriff Department, other individuals with a need to travel or work in the area subsequent to the incident were also exposed to the hazard of the tree falling unexpectedly. While the Sheriff was performing the scene investigation, Drain Commission staff were onsite monitoring the tree and in a position to advise responders/investigators of any change in the tree stability. Although the hazard was identified and warnings given, the tree was not felled to eliminate the hazard. When possible, or as soon as it is safe to do so, the tree should be felled. While standing on the roadway, the Sheriff noted the tree fell without advanced warning.

- Investigative agencies, such as Police, Sheriff and State Police should have hard hats and other personal protective equipment readily available for protection against hazards present at the incident scene.

During the investigation of this incident, the Sheriff Department did not wear a hard hat to provide head protection even though an overhead hazard existed. MIFACE recommends Police, Sheriff, and the State Police issue and require the wearing of hard hats or other protective equipment as dictated by any hazards at the incident scene.

REFERENCES

MIOSHA standards cited in this report may be found at and downloaded from the MIOSHA, Michigan Department of Licensing and Regulatory Affairs (LARA) website at: www.michigan.gov/mioshastandards. MIOSHA standards are available for a fee by writing to: Michigan Department of Licensing and Regulatory Affairs, MIOSHA Standards Section, P.O. Box 30643, Lansing, Michigan 48909-8143 or calling (517) 322-1845.

- MIOSHA General Industry Safety Standard, Part 53: Tree Trimming
- MIOSHA General Industry Safety Standard, Part 33: Personal Protective Equipment
- MIOSHA General Industry Safety Standard, Part 51, Logging
- International Society of Arboriculture, *Tree Climbers' Guide 3rd Addition*. P.O. Box 3129, Champaign, IL 61826-3129
- Tree Feller Killed by Falling Tree Limb – West Virginia. West Virginia FACE program. http://www.cdc.gov/niosh/face/In-house/full9305.html

- Tree Feller Dies After Being Struck by Tree Being Felled in West Virginia. West Virginia FACE program. http://www.cdc.gov/niosh/face/stateface/wv/99wv026.html
- Logger Killed when Struck by a Dislodged Limb. Alaska FACE Program. http://www.cdc.gov/niosh/face/stateface/ak/99ak015.html
- Log Cutter Dies in West Virginia After Being Struck By a Limb From a Dead Tree. West Virginia FACE Program. http://www.cdc.gov/niosh/face/stateface/wv/97wv056.html
- Logger Killed by Falling Snag. Kentucky FACE Program. http://www.cdc.gov/niosh/face/stateface/ky/95ky078.html
- Logger Killed by Falling Snag. Kentucky FACE Program. http://www.cdc.gov/niosh/face/stateface/ky/96ky019.html
- Logger Killed when Struck by Top of Falling Tree, which was Felled by an Adjacent Cutter, in Washington State. Washington FACE Program. http://www.cdc.gov/niosh/face/stateface/wa/98wa076.html

Key Words: Tree trimming, inmate, struck by, elm snag, Drain Commission, Public Administration

November 14, 2012