Cultivating Caution

Grain Bin Rescue

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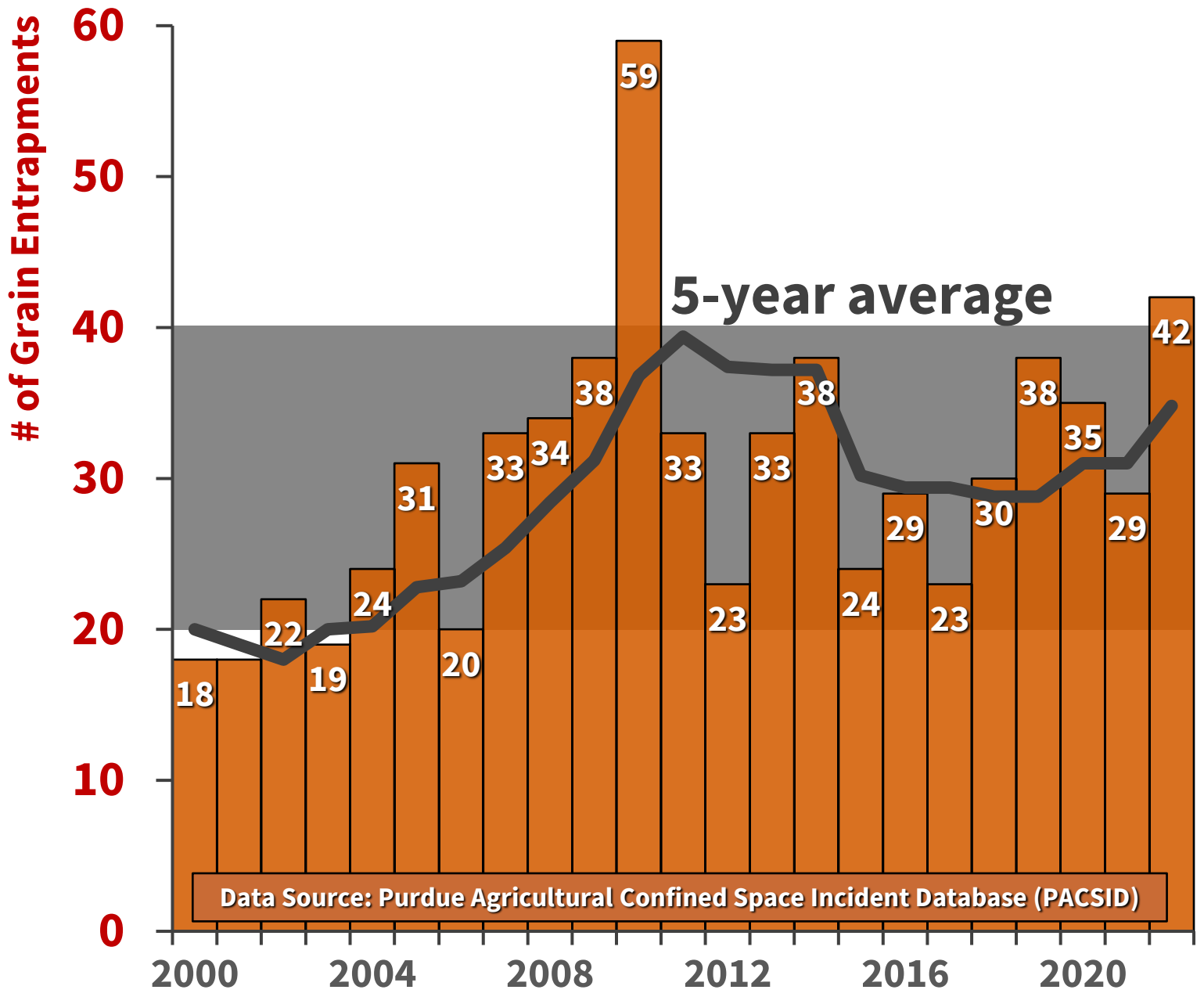
Objectives

- Explain why untrained “rogue rescues” commonly result in secondary fatalities.
- Demonstrate how technical grain rescue tubes function.
- Identify the critical actions farmers can safely take before and during fire department arrival.

Introduction

- Every year between 20 – 40 grain entrapment cases occur in the US
- Around 50% of them are fatal
- Approximately 2/3 occur in farms and locations exempt from OSHA enforcement.



Rodding grain to unplug a sump with unload equipment running is #1 cause of grain engulfment

Farm Death

Young Farmer Dies In Grain Bin Accident

A young Mt. Carmel farmer died Monday after being trapped inside a grain bin. Steven D. Haase, 21 was pronounced dead at the scene Monday afternoon.

Neighbors report Haase and two other farm workers entered a massive grain storage bin shortly before 9:30 Monday morning to clear a blockage. Haase was drawn into the grain as the unloading equipment was operating. Apparently, no one was outside to shut down the augers as the three men became trapped.

Two of the workers were able to escape without serious injury as Haase was buried in grain. Mount Carmel Fire Department rescue workers, along with the Patoka (Indiana) Township Fire and Rescue responded to the scene. Wabash General Hospital EMS also responded. It wasn't until shortly after 1 pm that Haase's body was recovered. Wabash County Coroner Shawn Keepes pronounced the victim dead at the scene.

The accident happened on the Haase farm, on Friendsville Avenue, near Poor Farm Road. The Haase family is

STEVEN D. HAASE

a widely known farming family, with row crop production in Wabash and Lawrence County in Illinois and Gibson County in Indiana.

Do it Yourself Rescues are usually a bad idea

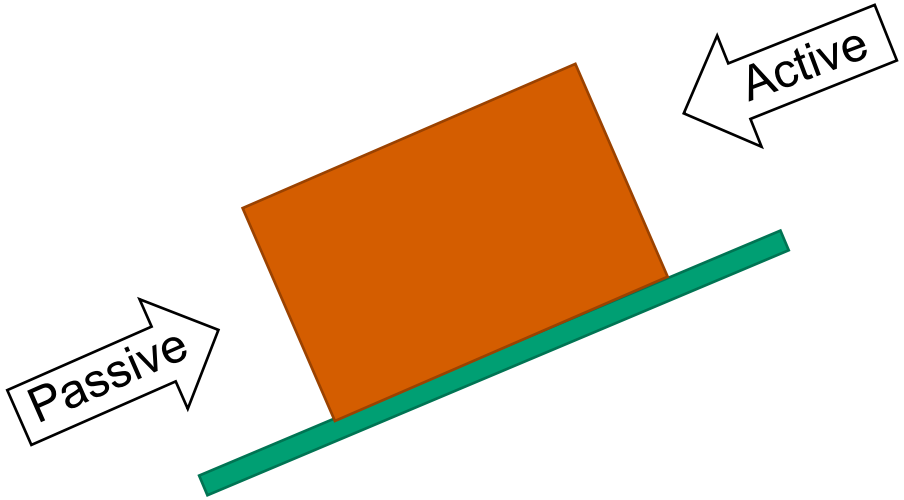
Why can I not pull a person out ?

- Grain Pressure
- Force of grain
- Amount of force your spine will support

Grain Pressure

Chest Pressure

- Passive vs Active
- Load cells measure active
- Ribcage experiences passive



- It pushes out about 1-2 in out

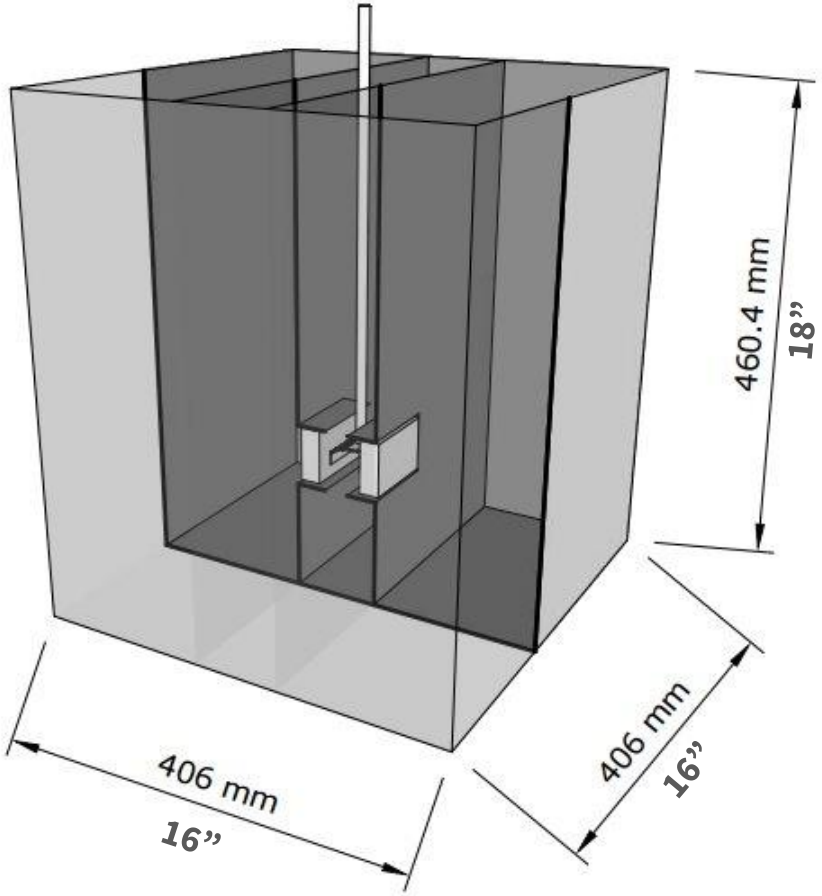
Grain Pressure Methods

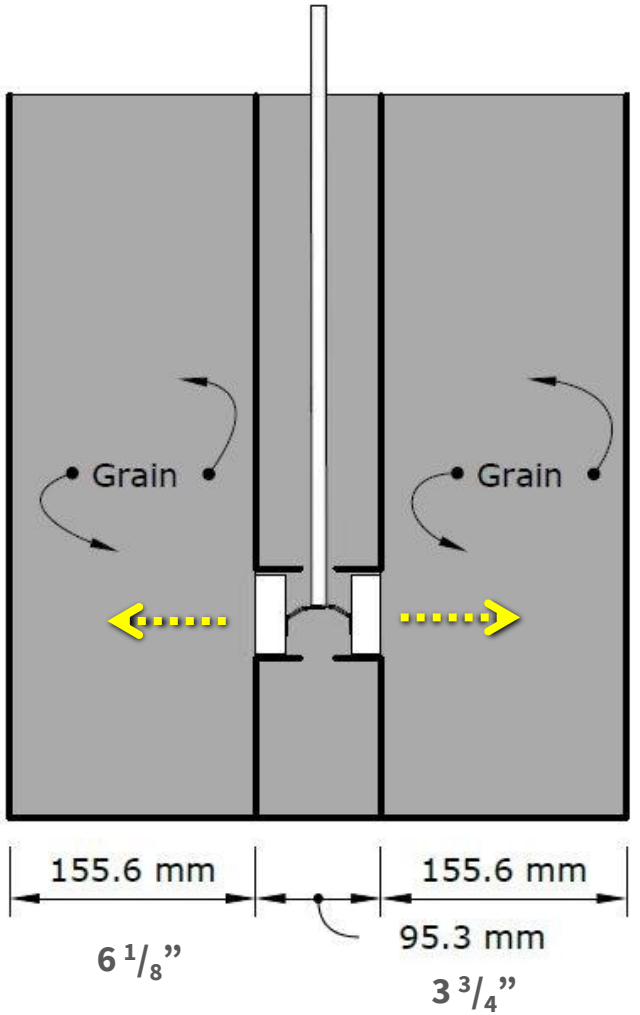
Measured passive pressure by measuring force needed to push grain

Corn

At 10 to 30 cm (4 to 12 inches) depth

Pushed grain about 2 cm (0.8 inches)



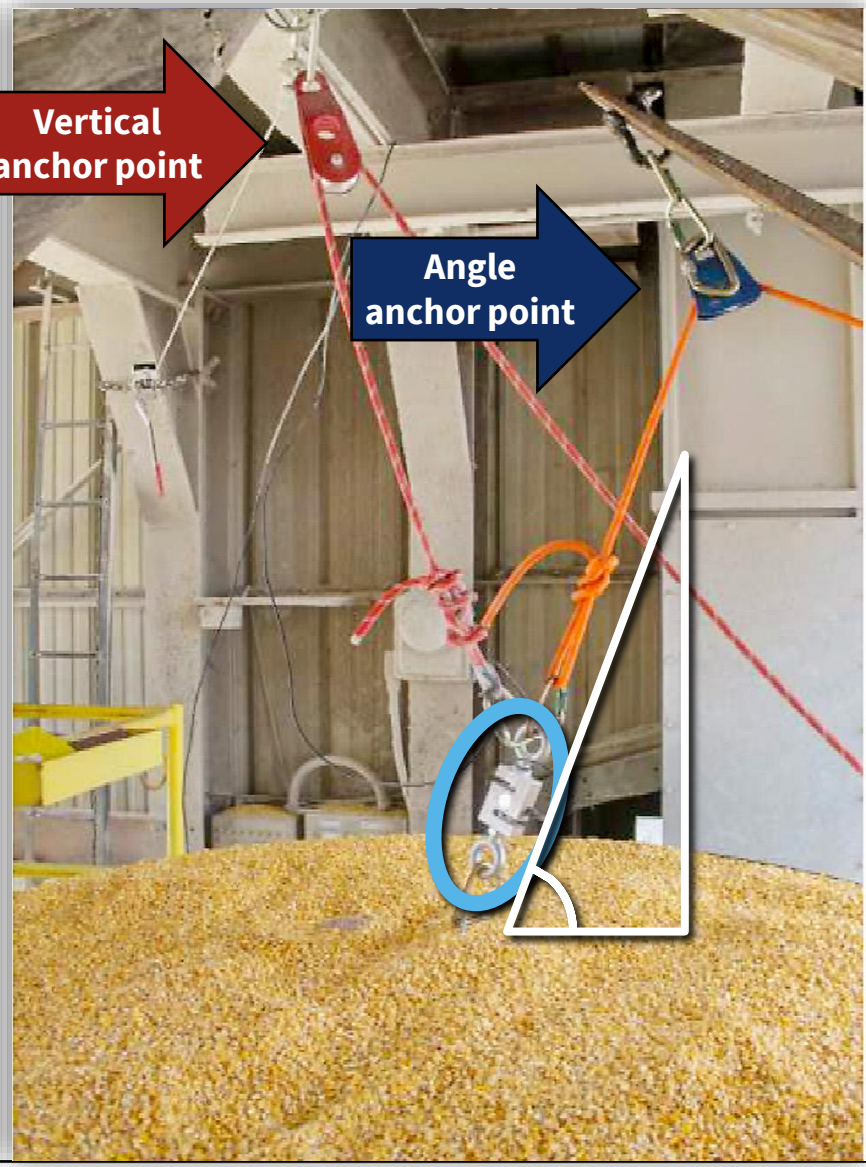


Grain Pressure Results

- Passive pressure
  - 4 inches = 0.87 psi
  - 8 inches = 1.06 psi
  - 12 inches = 1.28 psi
- 2-3 more pressure than water
- About 7% of cases of entrapment at chest/shoulder level still end in death

Force required to extricate mannequin

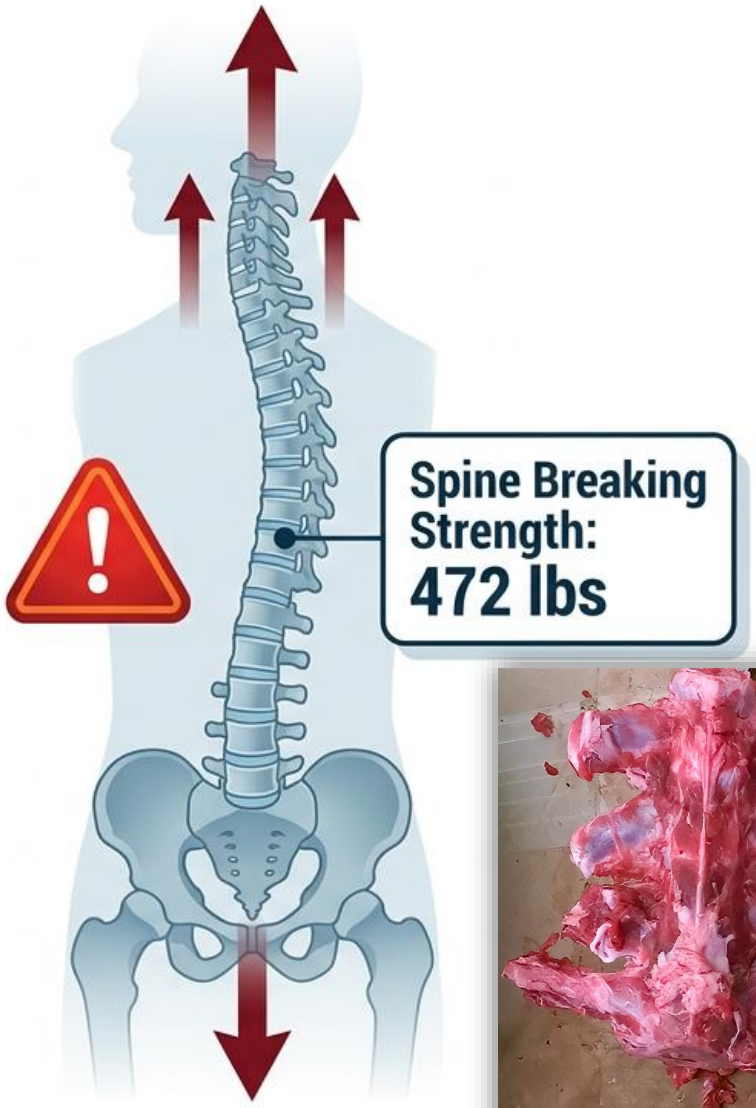
- Sharp angles increase force significantly for **corn**
  - **Max force:** 989 pound-force
  - **Min force:** 674 pound-force
- Corn and Soybean results are not significantly different.



Spine Tensile Strength Experiment

Pulled lamb spines

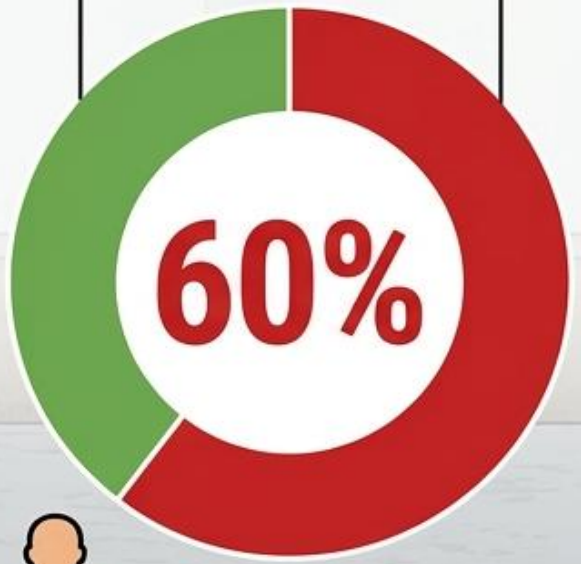
- Intervertebral discs + ligaments behaved like brittle material.
- Maximum tensile force required ranged from 382 pound-force to 562 pound-force.
- Average of 472 pound-force



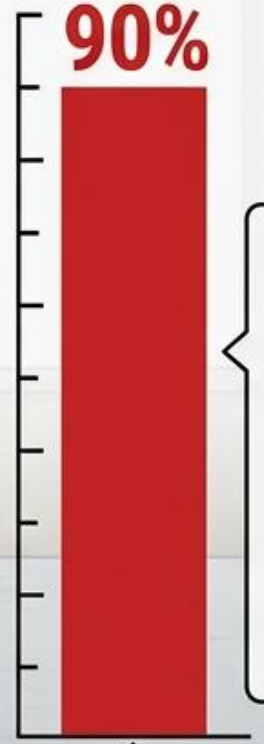
ROGUE RESCUES DO NOT END WELL

Rescuers Surviving

Rescuer Fatalities
(Trying to Help Others)



60% of rescuers end up dying in the bin trying to rescue someone else.



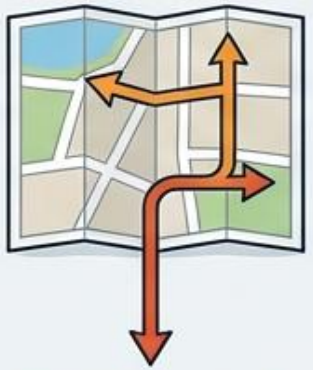
90%
of Rescuer Deaths are due to Bad Air Quality

This includes toxic gases like CO_2 and oxygen deficiency.

SIMULATING A RESCUE

EMERGENCY CALL

LOCAL ROUTING



ASSESSMENT

MUTUAL AID PAGING

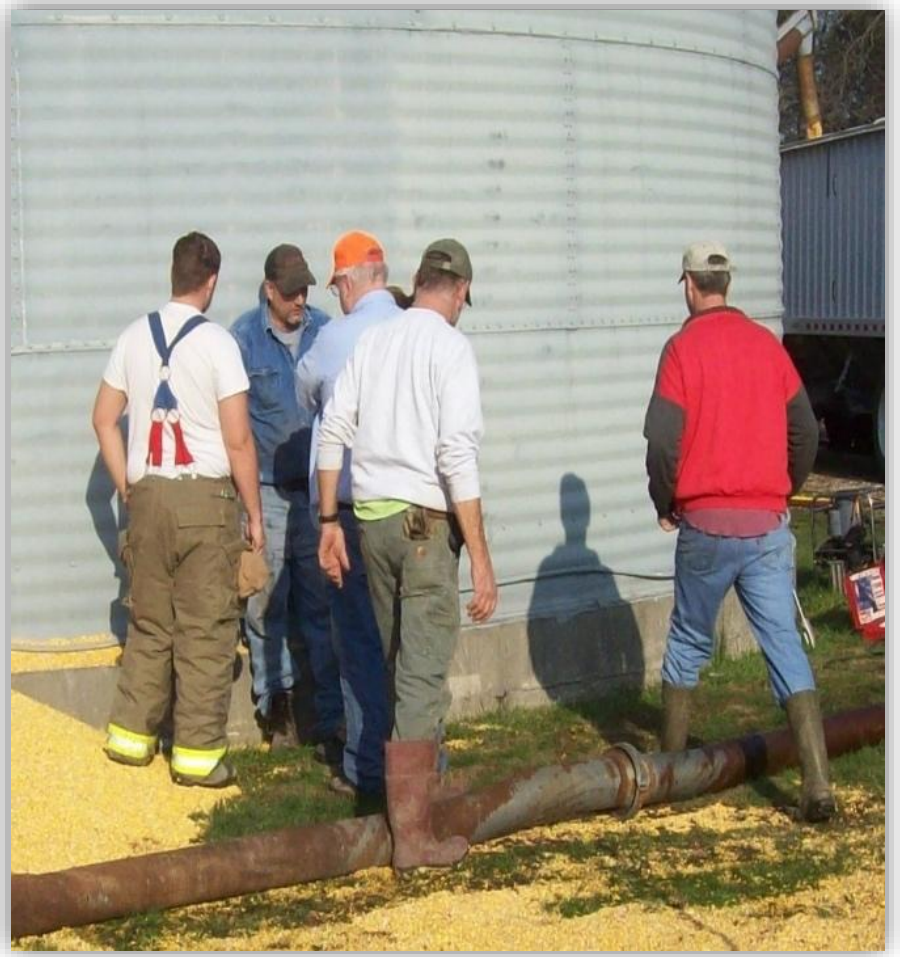
SCALING DEPLOYMENT

MULTI-AGENCY STAGING

How a rescue takes place

Identify / Size-up

- Review onsite permits
- Interview onsite personnel
- Assess bin hazards

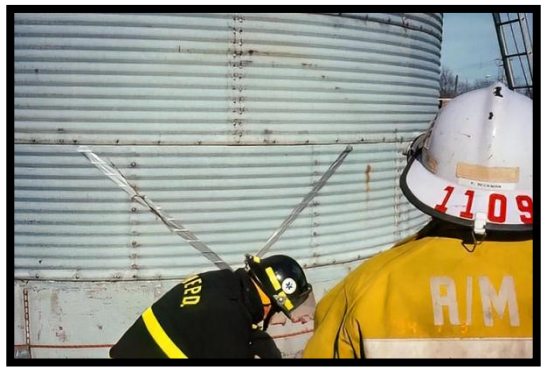


How a rescue takes place

- Isolate power sources that operate the grain bin machinery
  - All will be locked and tagged
- Bin will be checked for air quality
- Other

29 CFR 1910.147

How a rescue takes place

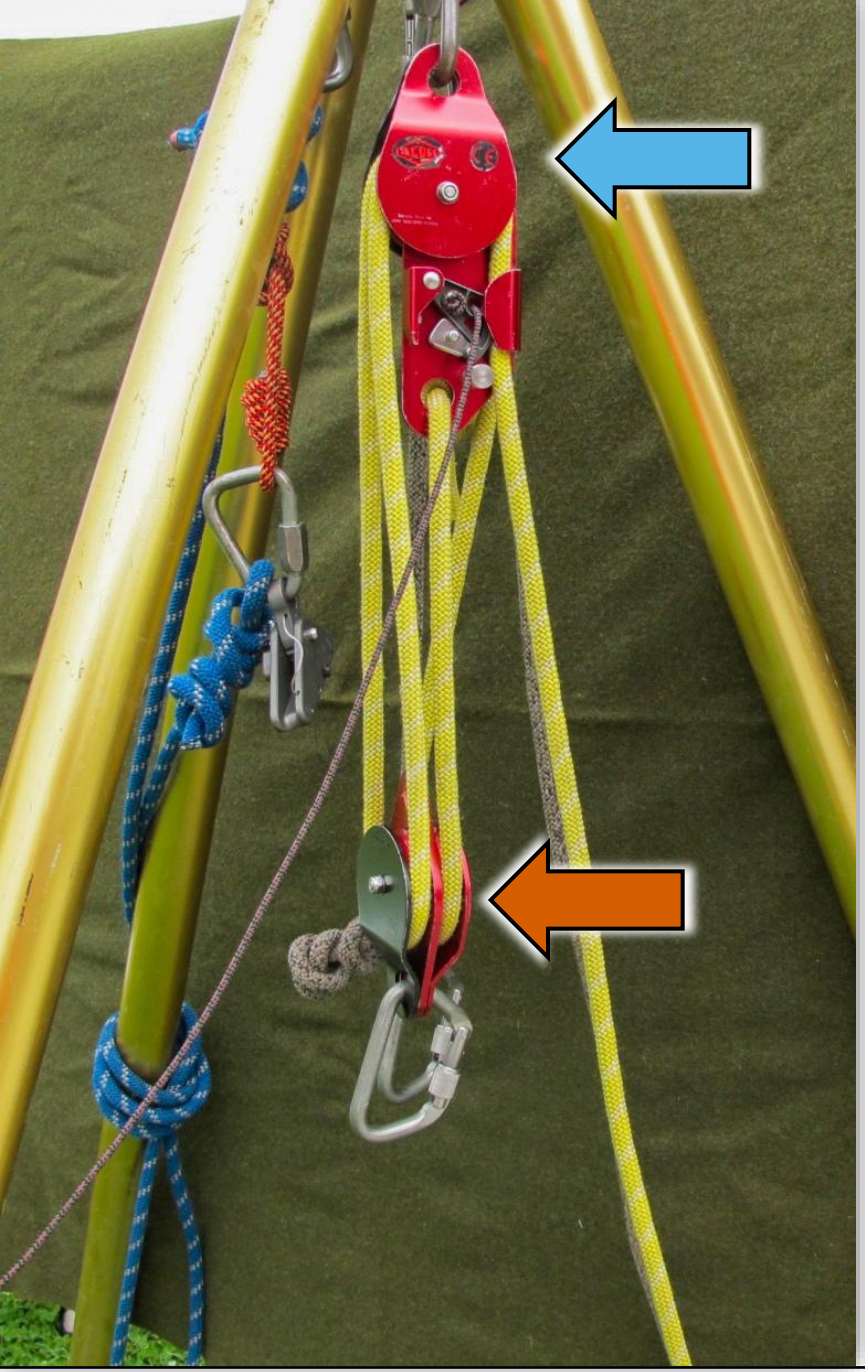


Stabilize the grain surface

If grain is too high, cut grain bin

How a rescue takes place

- Install ladder Jib in place
- This is for rigging an anchor point for harnesses

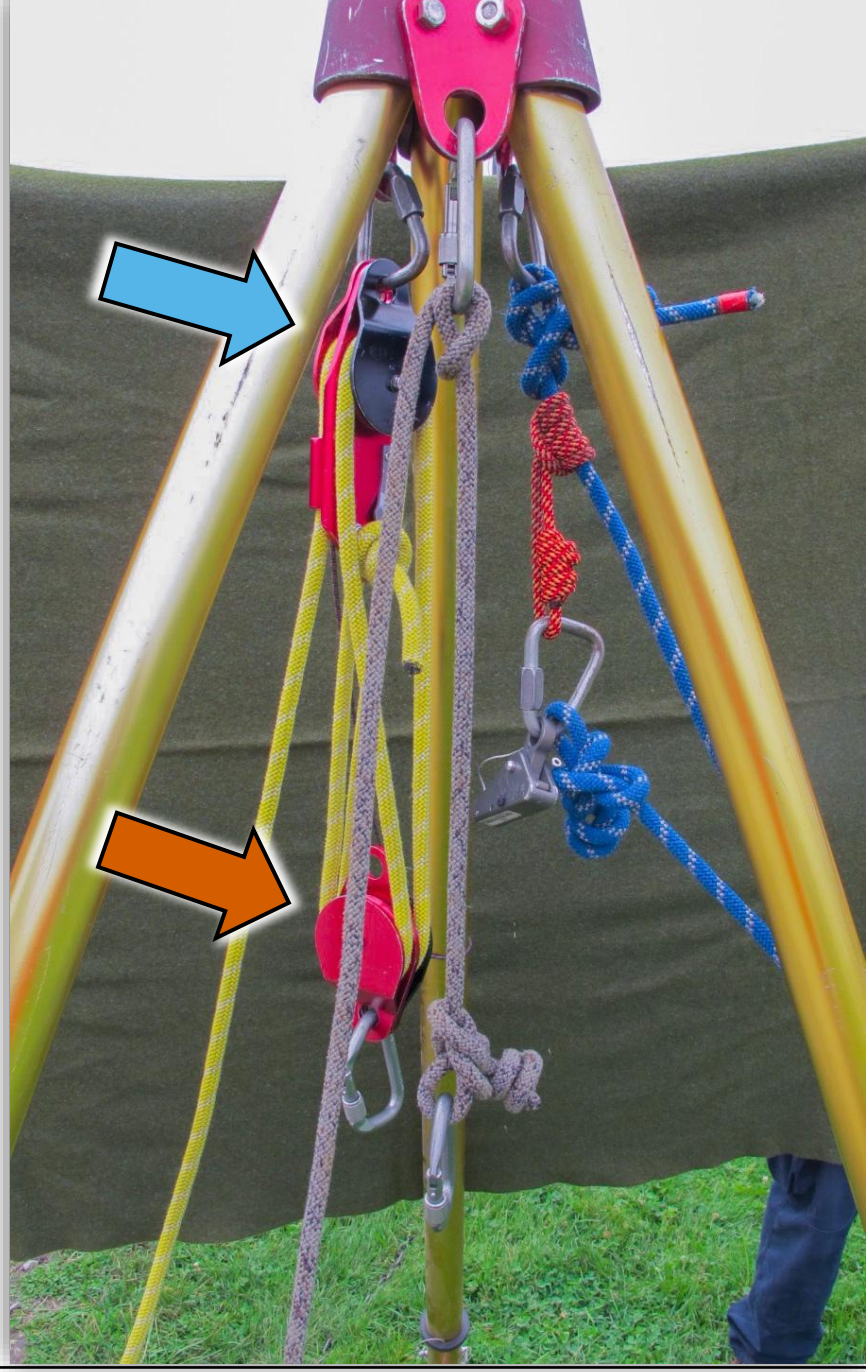


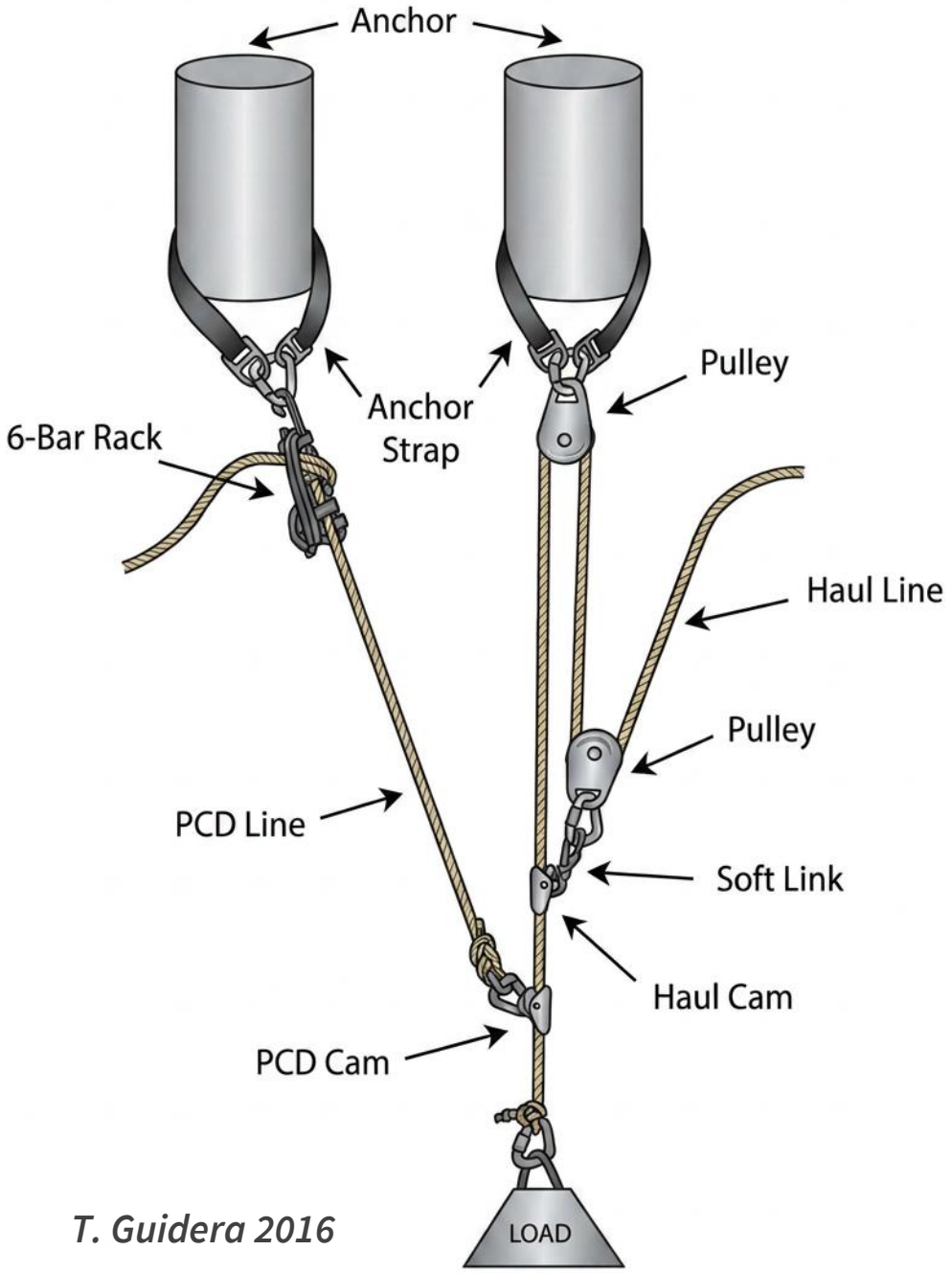
4:1 Block and Tackle Mechanical PCD

Progress Capture Device

Block Pulley

Tackle Pulley





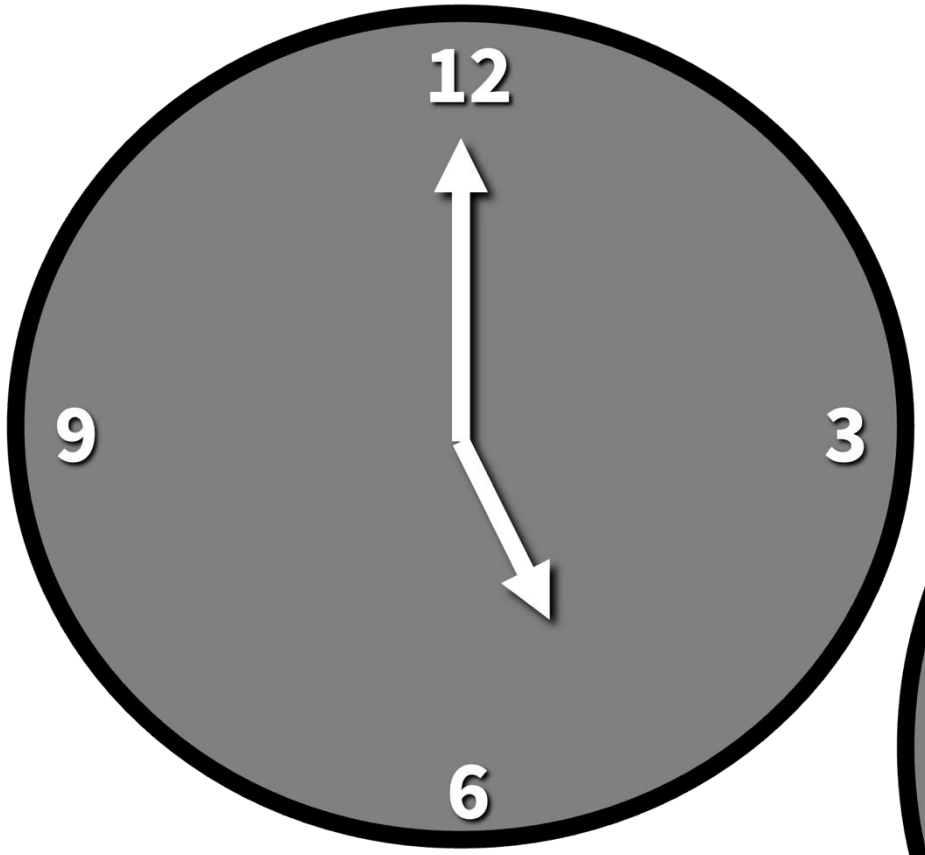
T. Guidera 2016

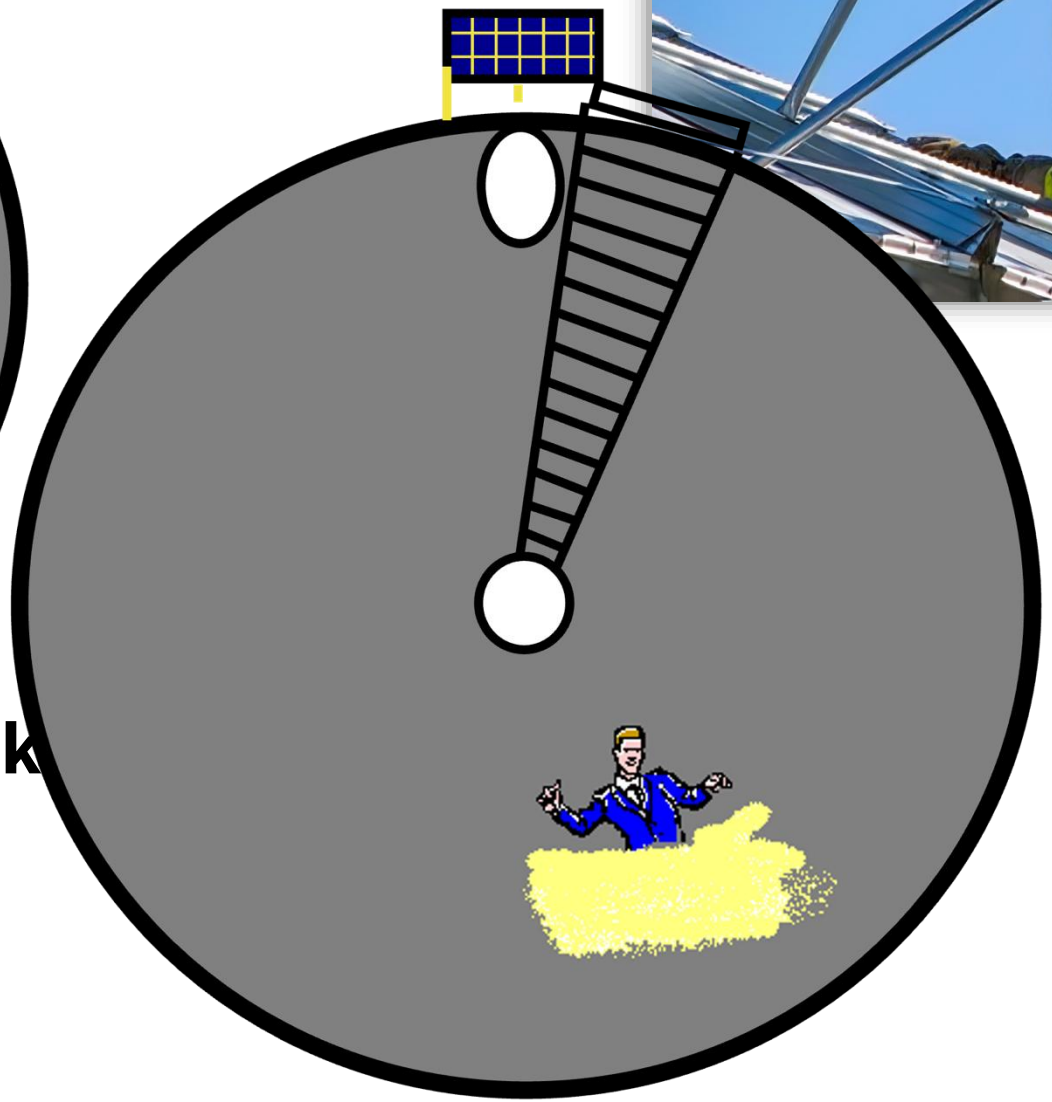
3:1 Haul System (Z-rig)

How a rescue takes place

Prepare to enter bin

Use 2-L coke bottle cases to help distribute weight and walk on grain.





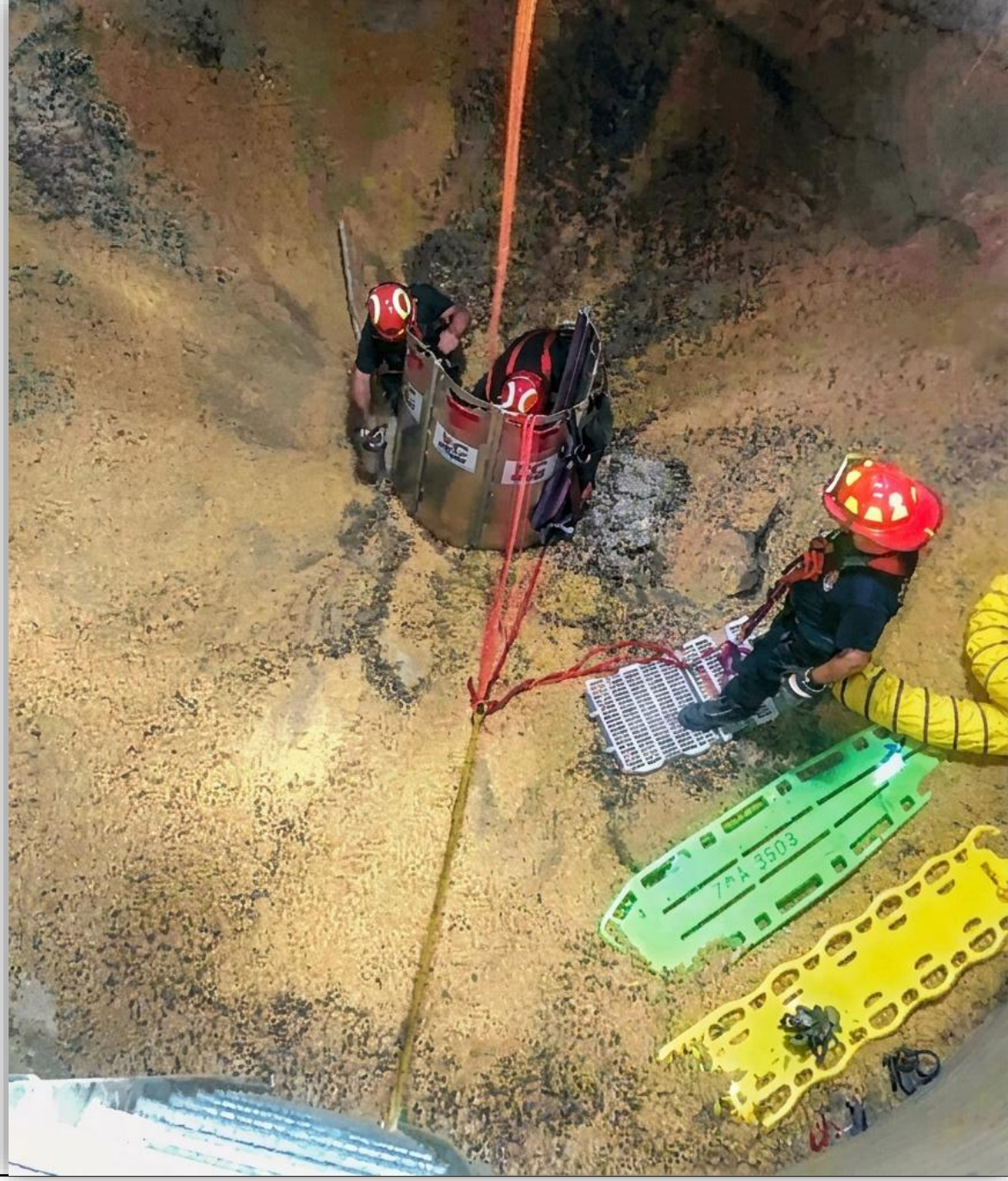
Think of Grain Bin as a Clock to help communicate location of victim.

Victim at 5:00

How a rescue takes place

Install tubes

Attach harness to victim



Grain Rescue Tubes

Features:

- May different types and manufacturers
- 60” tall by about 30” diameter
- 27 lbs per section
- 4-6 sections
- Plastic or metal
- Stops flow of grain toward victim
- Blocks pressure on victim

How a rescue takes place

- Drain grain with auger system attached to drill
- Remove victim from tube into packaging device

SKED
Most common

Reeves Sleeve

1,000 lb max load capacity

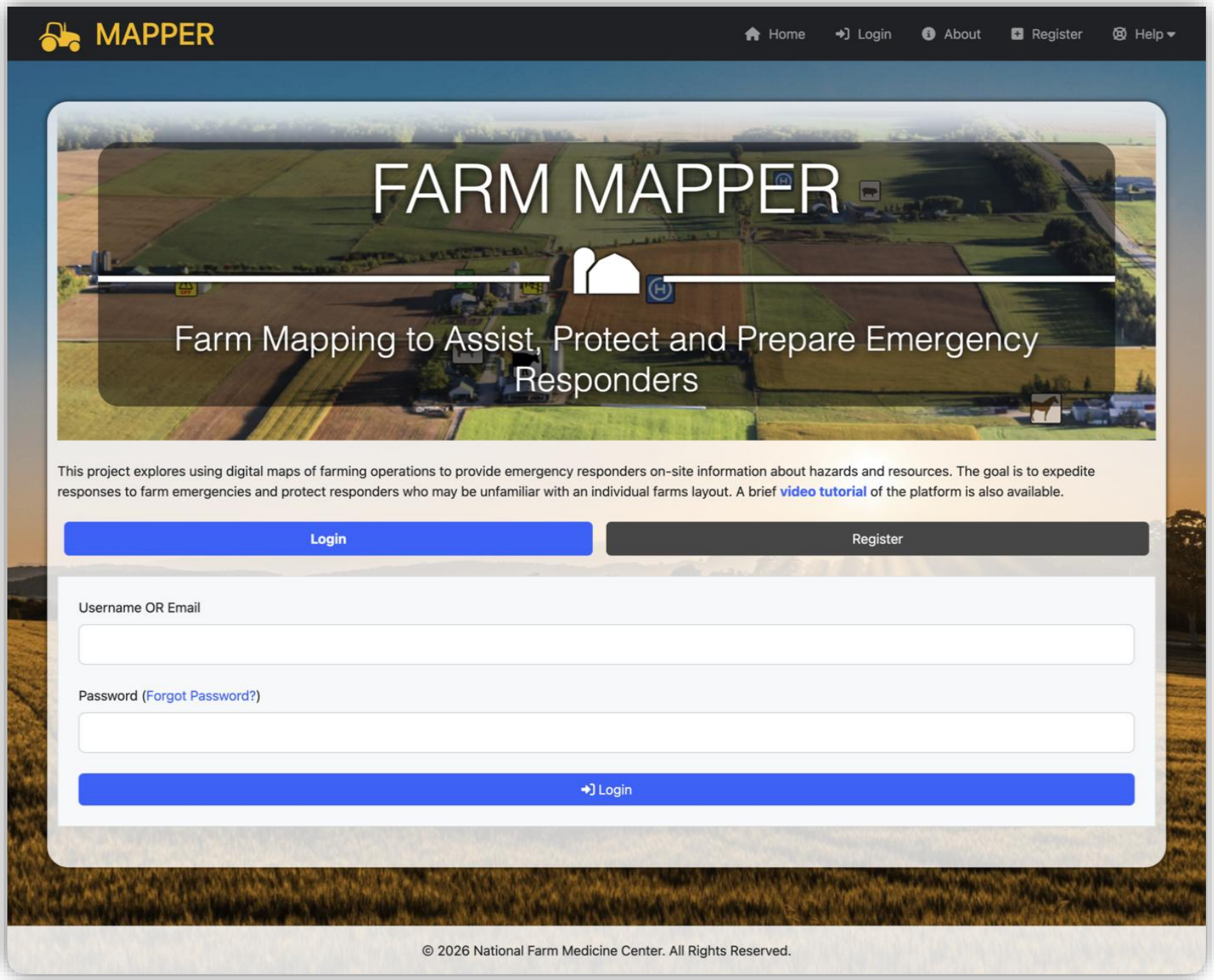
If possible, pull victim out from hole made in grain bin earlier (30 in wide)

Otherwise use rope system to pull out from top of the bin

THINGS THAT COMPLICATE THE RESCUE

How can Farmers assist

- If you make 911 call **do not enter bin**.
  Stay outside and keep rescuers updated.
- Information to provide fire departments
  - Electrical and mechanical control
  - Familiarity with the scene
- Help with crowd control
- Prepare grain vac and loader to move grain out of the way.
- Incorporate elevators also into rescue
  (alerting and asking for assistance in moving grain).



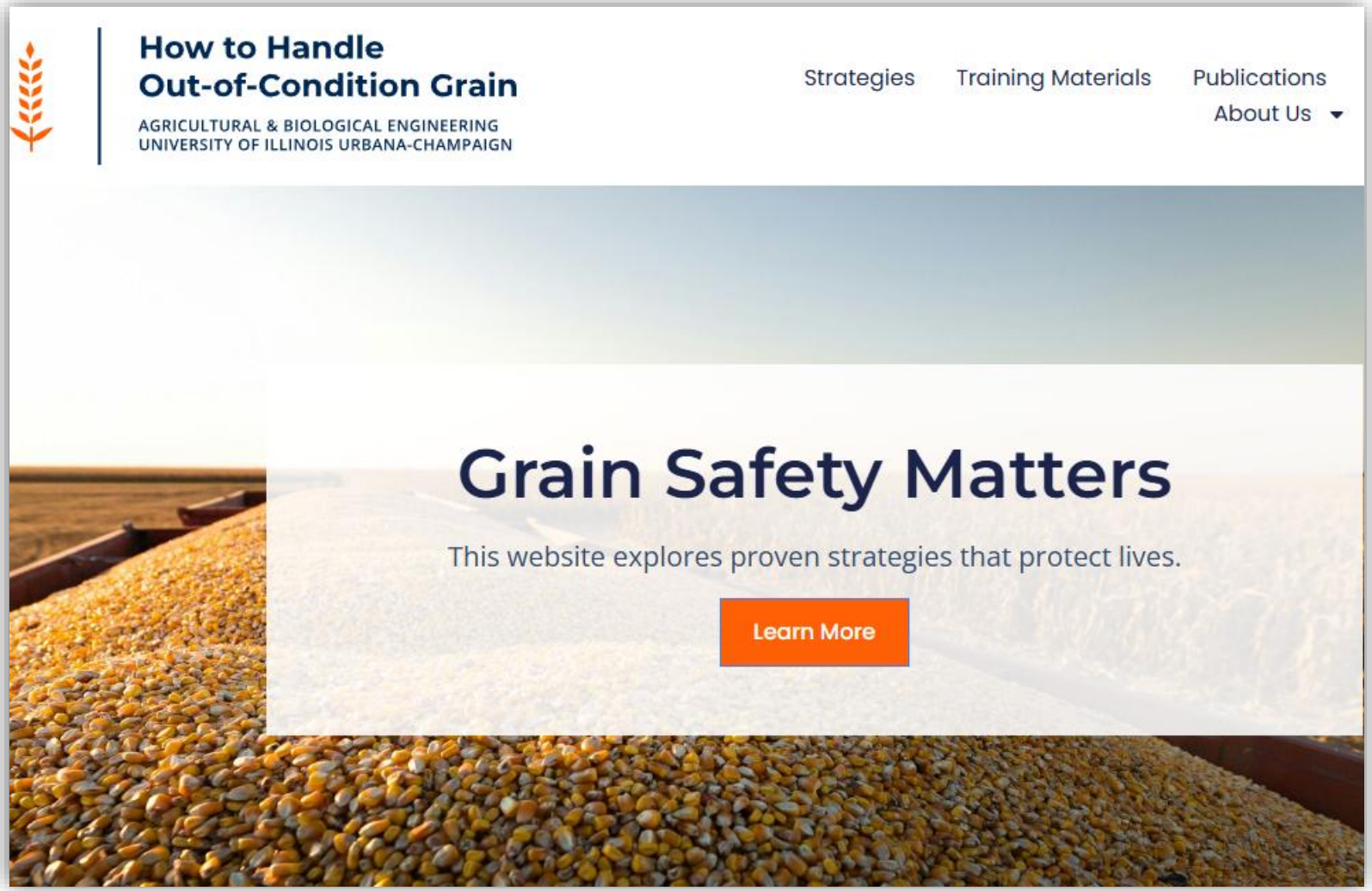
Preparedness and Prevention

Share your farm maps with local firefighter department

National Farm Medicine Center

farmmapper.org

Preparedness and prevention



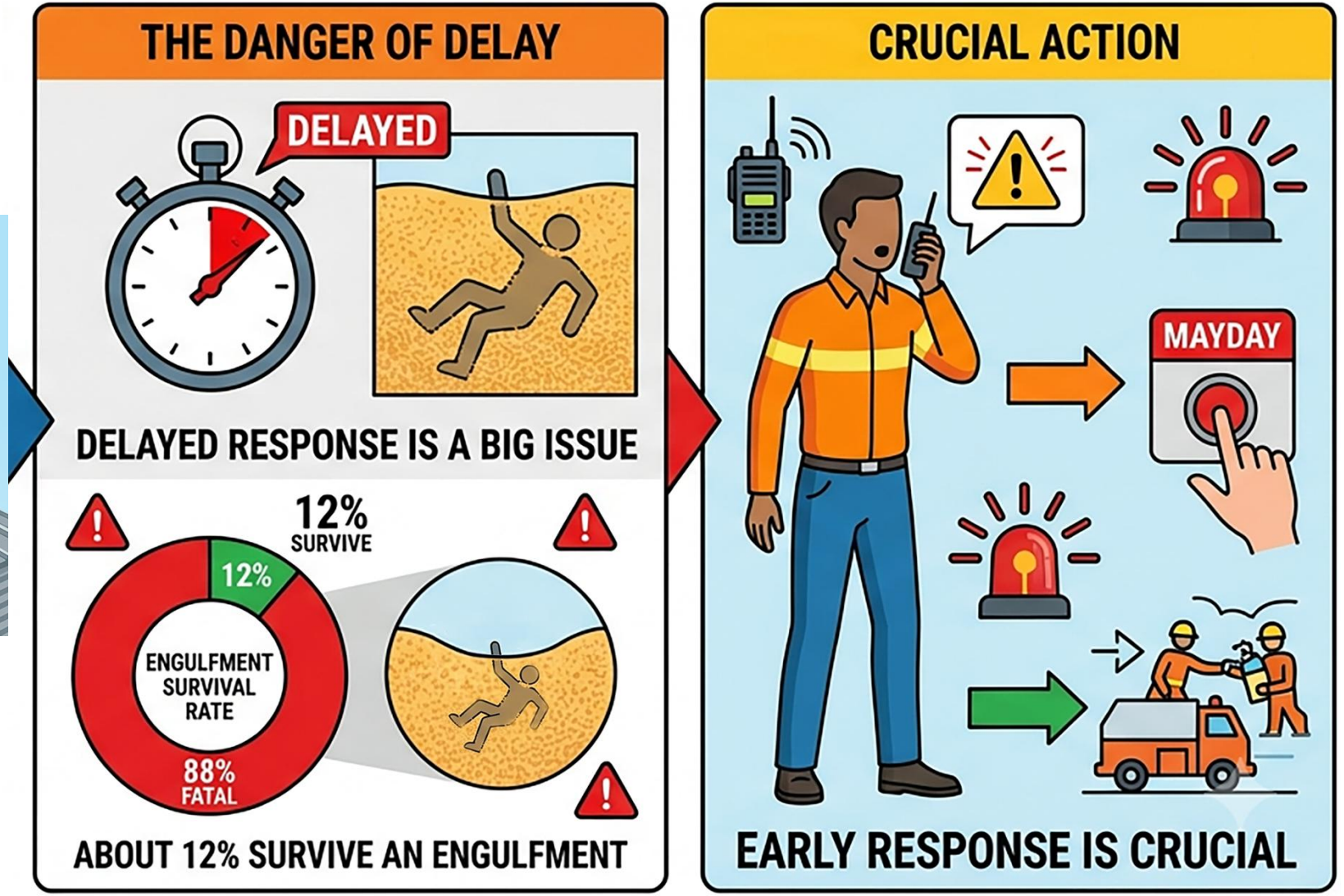
Monitor grain quality

Develop strategies to extricate grain **without entering the bin**

https://grainsafety.web.illinois.edu/

Preparedness and prevention

Have an observer any time someone enters a bin



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September 9: Field Fires

October 14: Farmer Mental Health

November 11: Manure Pit Gases

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Grain entrapment is a frequently fatal agricultural hazard that occurs when workers enter silos to clear blockages, a problem that has recently seen a disproportionately high number of cases in Illinois. To combat this issue, the program is researching high-pressure air extraction methods, developing machine learning models to predict entrapments, and offering specialized safety training.