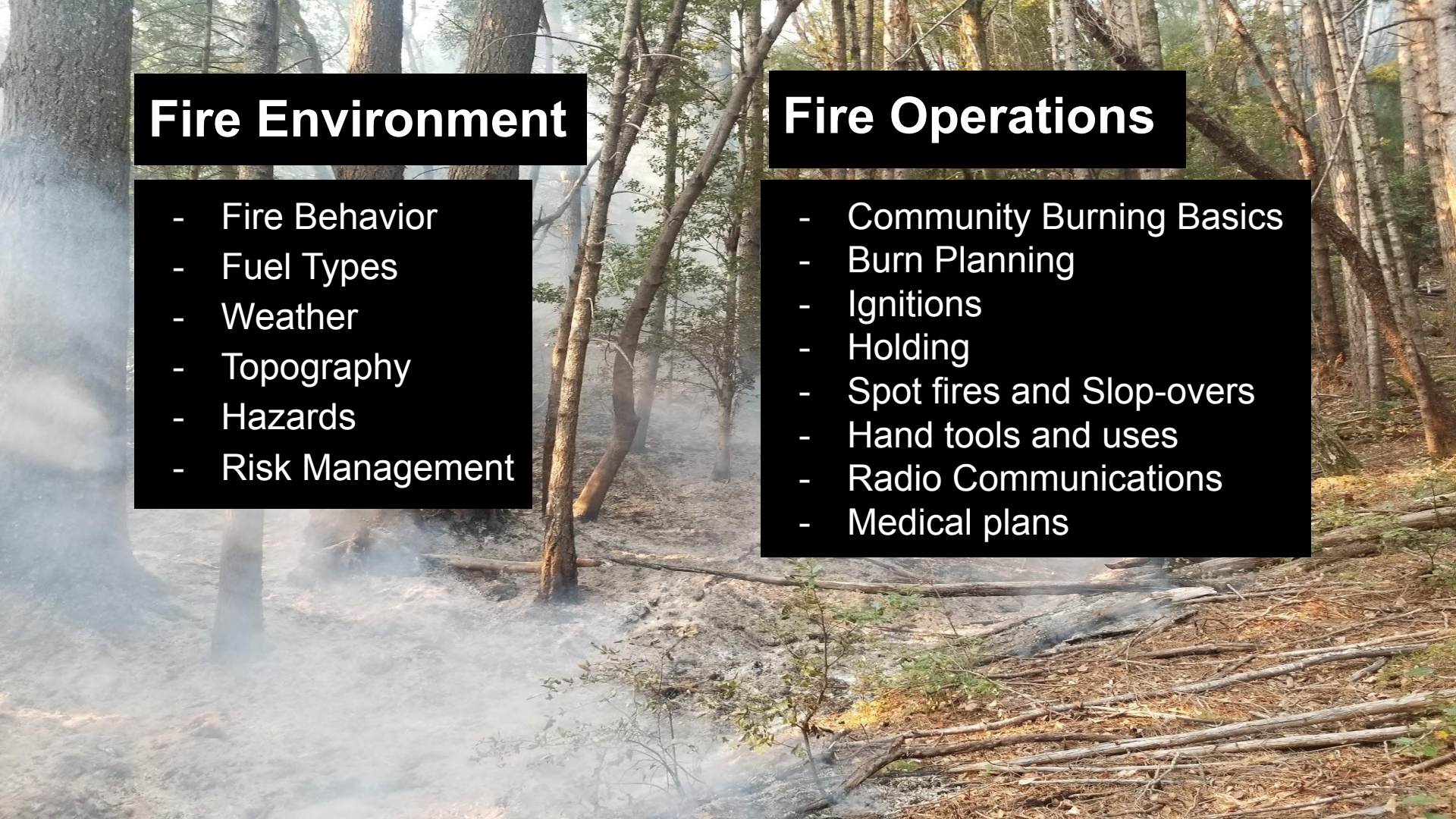




HumCo PBA Firelighter Training

Basics of the Fire Environment and Fire Operations



Fire Environment

- Fire Behavior
- Fuel Types
- Weather
- Topography
- Hazards
- Risk Management

Fire Operations

- Community Burning Basics
- Burn Planning
- Ignitions
- Holding
- Spot fires and Slop-overs
- Hand tools and uses
- Radio Communications
- Medical plans

Fire 'Worlds'

Agency Fire

- Federal, State, Local Govs, Tribal Govs, Contractors, some Non-profits
- Public, Tribal, and some Private Lands
- NWCG, CICCIS, CAL FIRE
- Qualifications and extensive PPE required
- Issue 'Red Cards' or equivalent
- Government/Grant funded

Community Rx Fire

- PBA's, Non-profits, Volunteer Fire Depts, Tribal Organizations, Private Landowners
- Private Lands
- Qualifications not always required, experience based.
- Common Sense PPE
- Grassroots organizing and funding

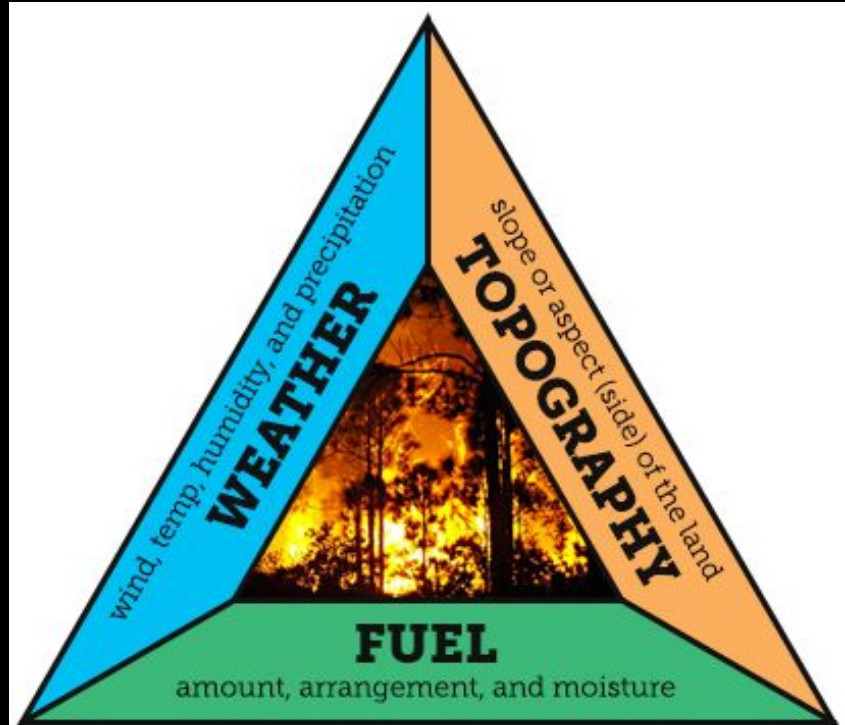
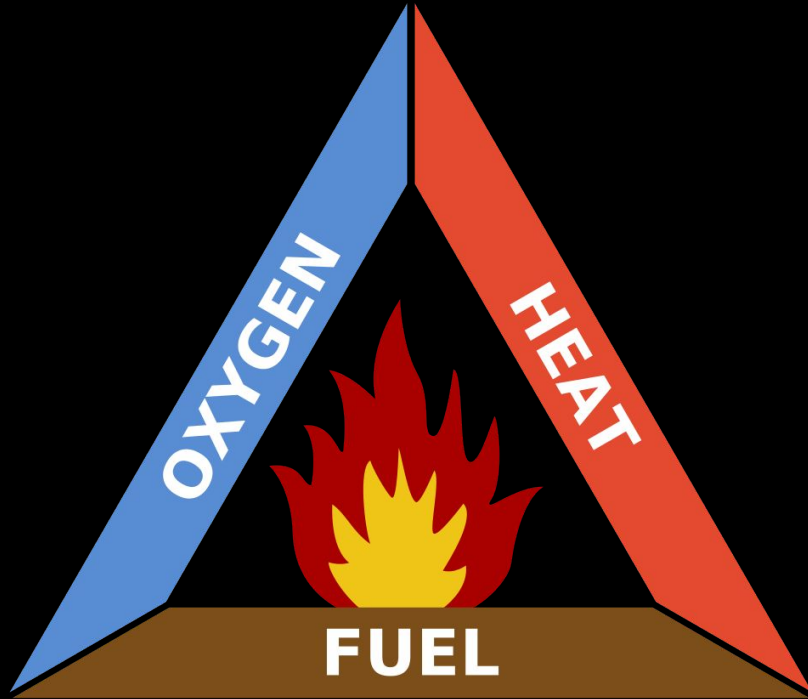
Cultural Fire

- Planned and Lead by Cultural Fire Practitioners
- Cultural Objectives, Methods, and Meaning
- No formal burn plans, qualifications or PPE required
- SB 310

A photograph of a forest with smoke rising from the ground, suggesting a fire environment. The smoke is thick and white, filling the lower part of the frame. The trees are tall and thin, with some showing signs of being charred or damaged. The ground is covered in dry leaves and twigs, some of which are on fire. The overall atmosphere is hazy and smoky.

Fire Environment

What is fire?



Fire Behavior Triangle

The Anatomy of a Fire

Front, Flanks, Heel

Head, Flanking, Backing

Islands, Fingers, Pockets

Spot fires and Slop overs



Fire Behavior Terms

- Flame Length
- Rate of Spread
- Ground Fire, Surface Fire, Crown Fire
- Smoldering, Creeping, Running
- Torching: Single Tree, Group, or Stand





Dead Fuel Classes

**1 hour - Less than
0.25in diameter**

10 hour (0.25-1in)

100 hour (1-3in)

1000 hour (3-8in)

“10,000-1,000,000
hour” (8in and up)





Dead Fuel Classes

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Dead Fuel Classes

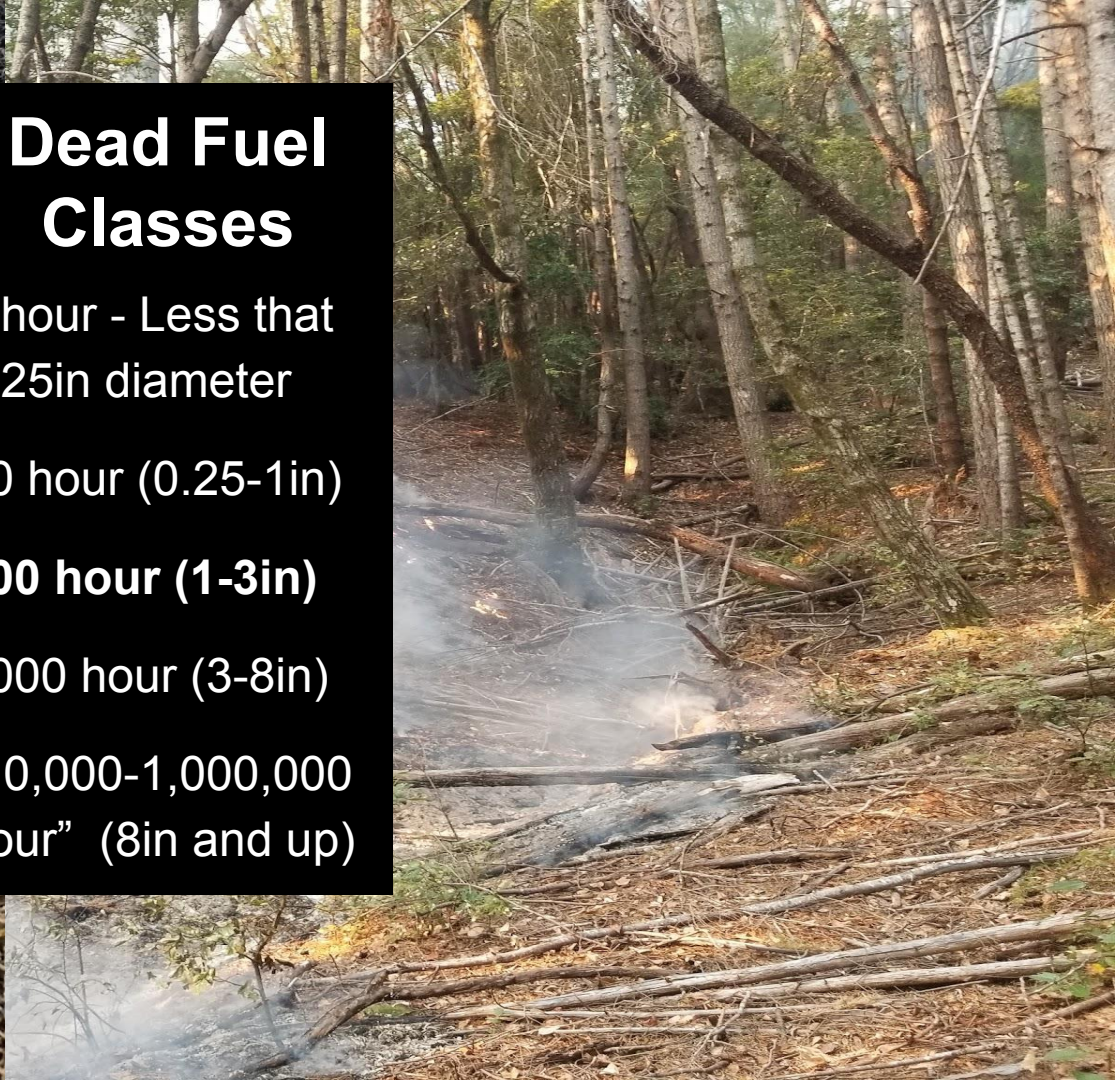
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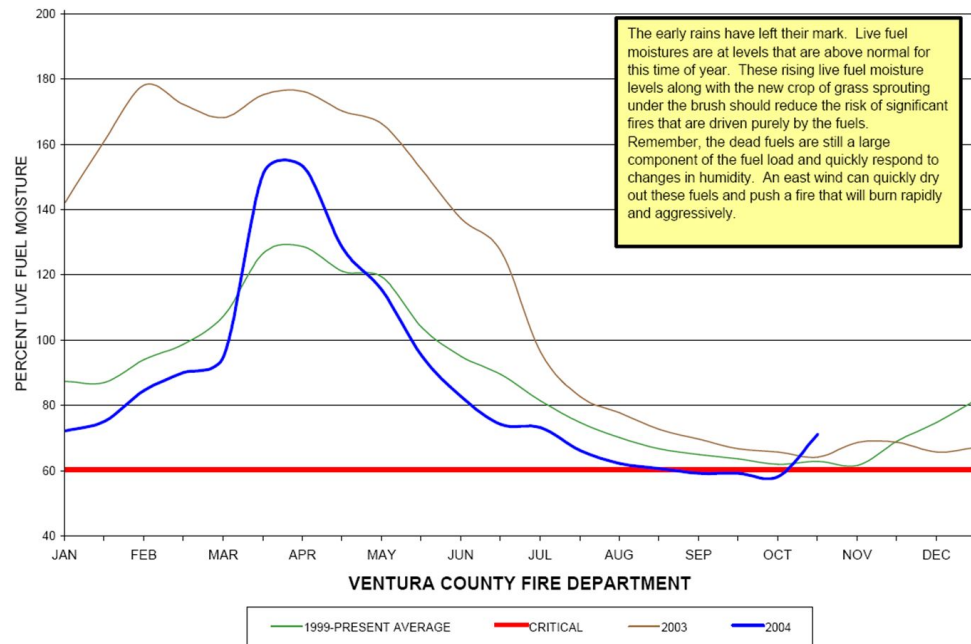
1000 hour (3-8in)

**“10,000-1,000,000
hour”(8in and up)**



Live Fuel Moisture

LIVE FUEL MOISTURE 1999-2004 AVERAGE ALL AREAS - CHAMISE



'Fuel Types' Grass



'Fuel Types' Shrub



'Fuel Types' Timber



'Fuel Types' Slash



Weather

-Temperature

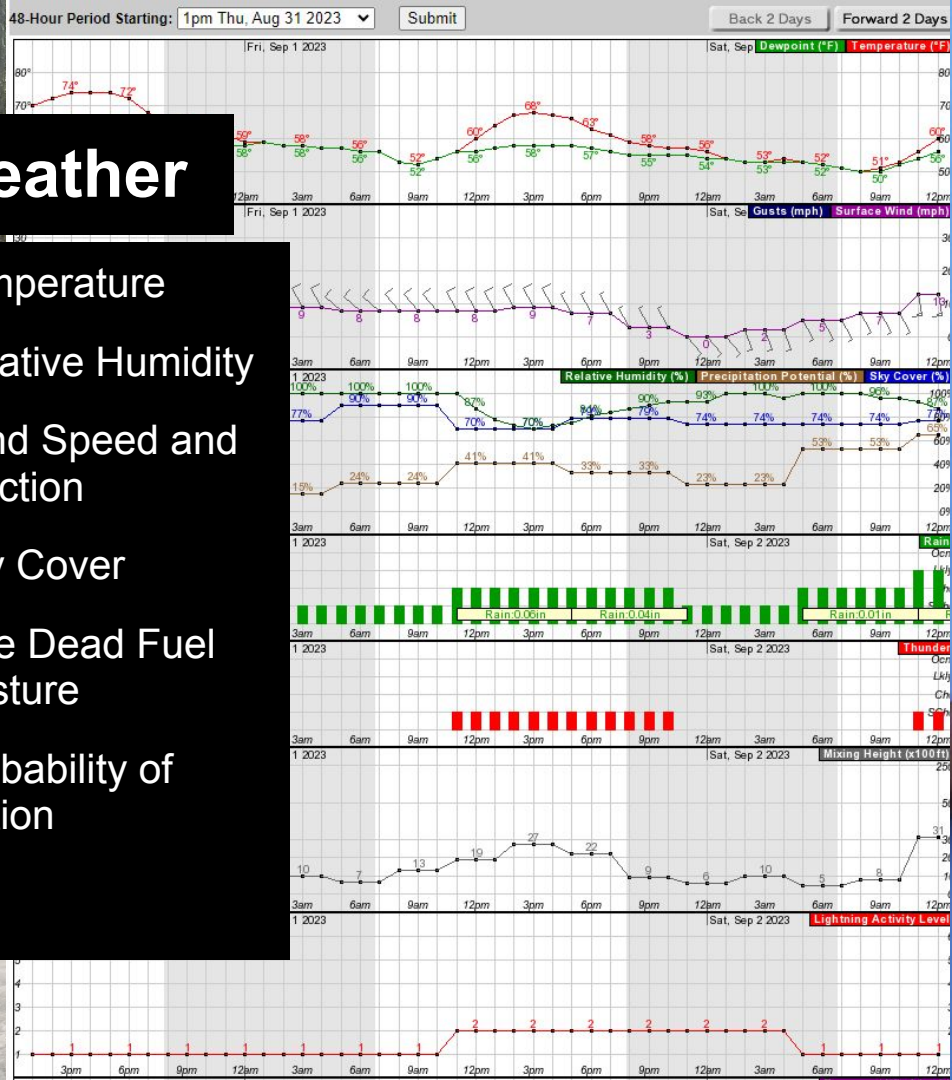
-Relative Humidity

-Wind Speed and Direction

-Sky Cover

-Fine Dead Fuel Moisture

-Probability of Ignition



KTREX SPOT Forecast

National Weather Service, Eureka, CA



Burn Location:	EMERSON
Forecast Issued:	Oct 10, 2022
Forecaster:	James White
Forecast Valid:	Oct 11, 2022

Weather Discussion:

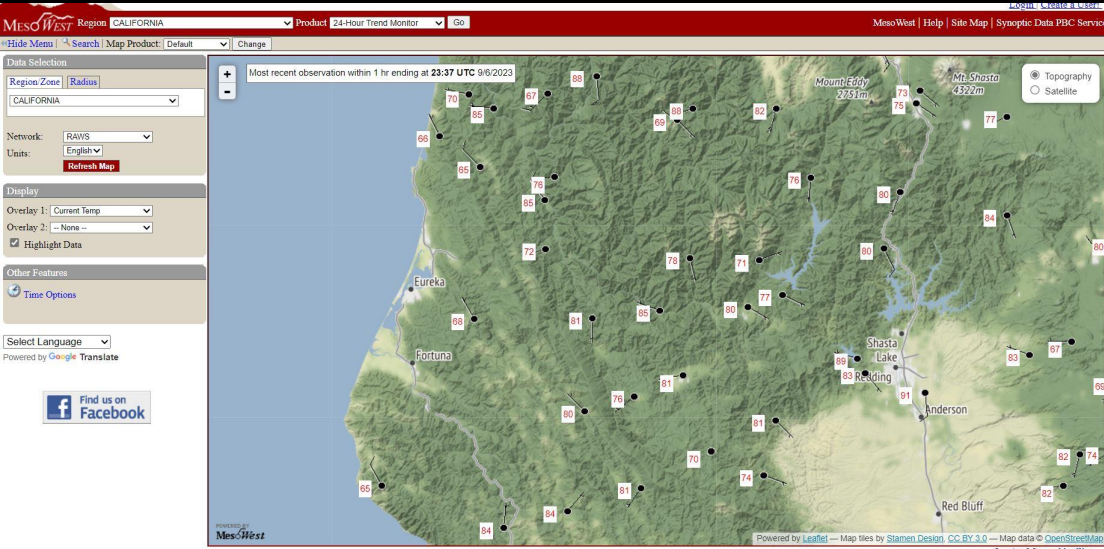
Northeast winds overnight will have disrupted the usual diurnal inversion, allowing for stronger winds and lower humidity in the morning than normal. Observations Monday night showed east winds 4-6 mph with gusts to 15 mph. Similar winds are expected to continue through the morning with speed starting to calm by mid afternoon. Temperatures will be slightly cooler than yesterday with highs in the low to mid 80s. Despite lower temperatures, conditions will remain dry with a minimum RH just below 20% late in the afternoon in direct sunlight. Calmer and more moist conditions are expected under canopy cover.

Today (Tuesday)	
Sky/Weather:	Sunny with few high clouds.
Max Temperature:	83 - 87 F
Relative Humidity:	60% late morning falling to 15-20% by mid/late afternoon.
Wind 20-foot:	Northeast 4-8 mph gusts 12-15 mph. Strongest late in the morning, decreasing by 1500.
Mixing Height:	1500-3500 feet.

Tonight (Tuesday night)	
Sky/Weather:	Clear with patchy valley fog possible.
Min Temperature:	52 - 56 F
Relative Humidity:	55-60%
Wind:	Light downvalley wind
Mixing Height:	100 feet.

Weather Reading Devices

- Belt Weather Kit
- Kestrel
- RAWS Station



Topography

Slope

Aspect

Position



Topographic Features

Chutes

Saddles

Knobs

Local
Examples?

Slope
Reversal



Hazards - Identifying and Managing Risk - Situational Awareness



Risk Management Process

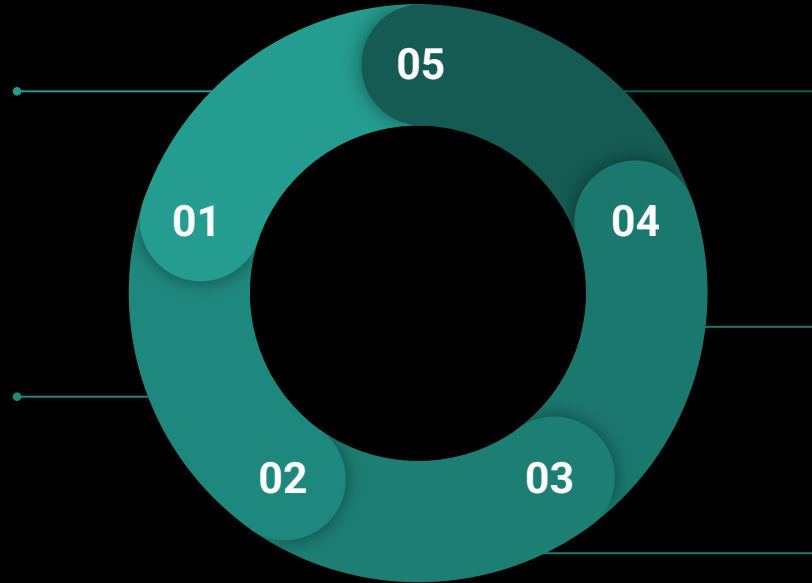
1. Identify Hazards

2. Assess Hazards

5. Supervise and Evaluate

4. Implement Controls

3. Identify Controls,
Make Decisions



Hazards



Hazards



Hazards



Hazards



A photograph of a forest fire. Thick white smoke rises from the ground and around the base of several trees. The ground is covered in dry leaves and fallen branches. The trees are mostly thin, with some larger ones in the background. The overall scene is hazy due to the smoke.

Rx Fire Operations

Community Prescribed Fire Basics

Personal Protective Equipment (PPE)

- Leather Shoes
- Leather Gloves
- Natural Fiber or FR Clothing
 - cotton, wool, nomex, etc.
- Long Sleeves and Pants
- Hat, or Hard Hat in Timber
- Eye Protection
- 2L Water Minimum
- Pocket Snacks



What to Expect

- Long work days
- Hot, sooty, smokey, and muddy work
- No structured breaks (rest when you can)
- Expect the unexpected

“We’re on the fire’s schedule now..”

Burner Expectations

- Arrive Hydrated, Healthy, Happy, and Helpful
- Bring required PPE and sufficient water
- Be accountable for yourself, your gear, and crew
- Occasionally assist with duties outside of burn day



Phases of a Prescribed Fire

1. Planning (months-years)
2. Preparation (weeks-months)
3. Ignitions (hours-days)
4. Burn-down (hours-days)
5. Securing (days-weeks)
6. Patrol (days-months)
7. Declared out (3 days no heat, no smoke)



Accountability

- Know who you work for
- Know who you work with
- Stay with your group, unless directed
- Communicate actively

AT ALL TIMES:

- Make sure your leader knows where you are
- Keep track of gear assigned to you

On ALL fires, **Accountability = Safety**



Firefighting SOP's and SOG's

Maintain Situational Awareness

“See Something, Say Something”

LCES

10 Standard Fire Orders

18 Watch Out Situations



Firefighting SOP's and SOG's

Lookouts

Communications

Escape Routes

Safety Zones



Radio Communication

“Hello you, this is me” or “To: > From:”

Like addressing a letter.

Use identifiers, not names

(especially in a medical emergency)

Clear text - no codes

Clear and concise - think, press, talk

Command (repeater) and **Tactical** (talk-around) channels

In case of emergency, let supervisor know:

Where you are, what you have, and what you need



Burn Plans

Goals and Objectives

- S.M.A.R.T (specific, measurable, attainable, relevant, and time bound)

Prescription

IAP - Incident Action Plan

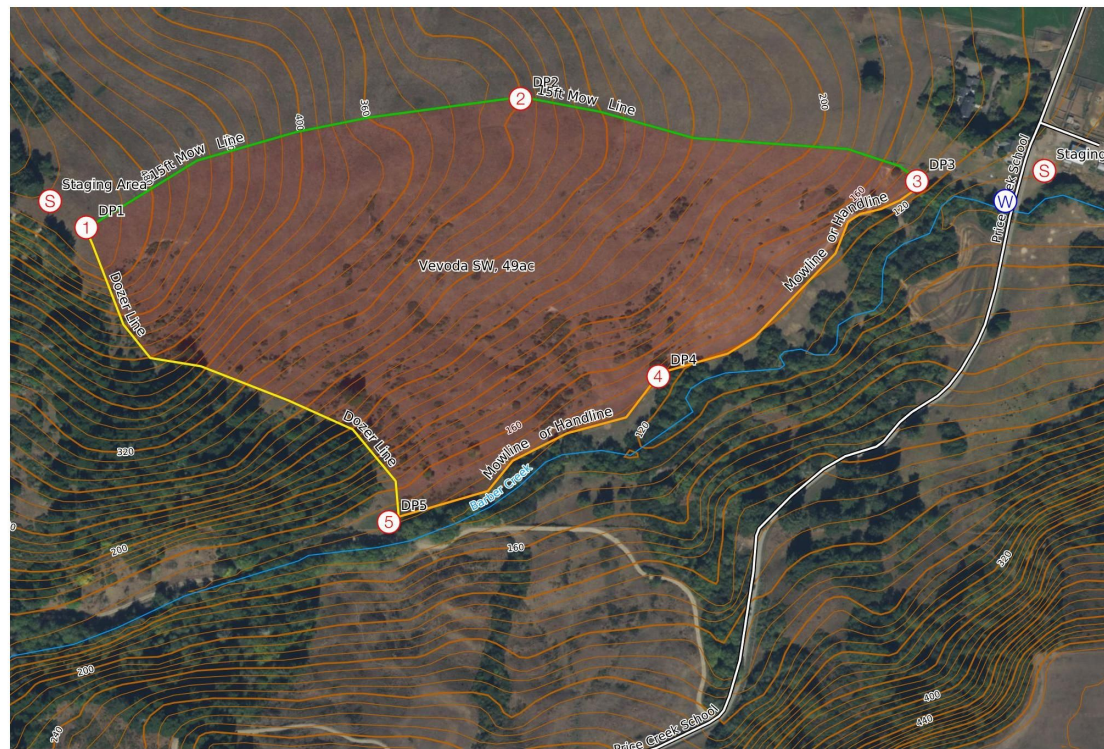
Project Name: Humboldt County Private Lands Prescribed Burning
ELEMENT 7: PRESCRIPTION

A. Environmental and Fire Behavior Prescription for both units

	Low (cool) end	Desired	High (hot) end
FUEL MODELS (FBPS)	SH7/GR4	SH7/GR4	SH7/GR4
1 HR FUELS %	10	7	5
TEMPERATURE (F)	50	70	90
RELATIVE HUMIDITY %	40	30	20
20 FT WIND SPEED (mph)	10	10	10
20 FT WIND SPEED DIRECTION	Any	Any	Any
TRANSPORT W/S DIRECTION	10 mph/Any	10 mph/Any	10 mph/Any
MIXING HEIGHT (feet)	>500	>2000	>5000
PROBABILITY OF IGNITION (%)	30	50	70
DAYS SINCE RAIN	2	5	>7
AMOUNT (inches)	≤ 0.2	0.1	None
FIRING TECHNIQUE	Backing/Flanking/ Head	Backing/Flanking/ Head	Backing/Flanking/ Head
SLOPE (AVERAGE) %	25	25	25
FLAME LENGTH (ft)	7 - backing 8 - flanking 8 -head	10 - backing 11 - flanking 11 -head	11- backing 11 - flanking 12 -head
RATE OF SPREAD (chs/hr)	13 - backing 15 - flanking 17 -head	18 - backing 21 - flanking 23 -head	19 - backing 22 - flanking 24 -head

Rx Unit Layout

Firing and Holding plans



Mercator Projection

WG584

UTM Zone 10T



0.1 0.2 0.3 0.4 0.5 0.6 0.7 km

0.1 0.2 0.3 0.4 mi

Scale 1:4308 1 inch = 359 feet



MN
14.00



Hand Tools

Cutting Tools - Removes vegetation
(Chainsaw, Brush Hook, Pulaski)

Grubbing Tools - Removes roots and
loosens dirt
(Pulaski, Rhino, Hoe)

Scraping Tools - moves loose material out
of the line
(Hoe, Mcleod, Shovel)

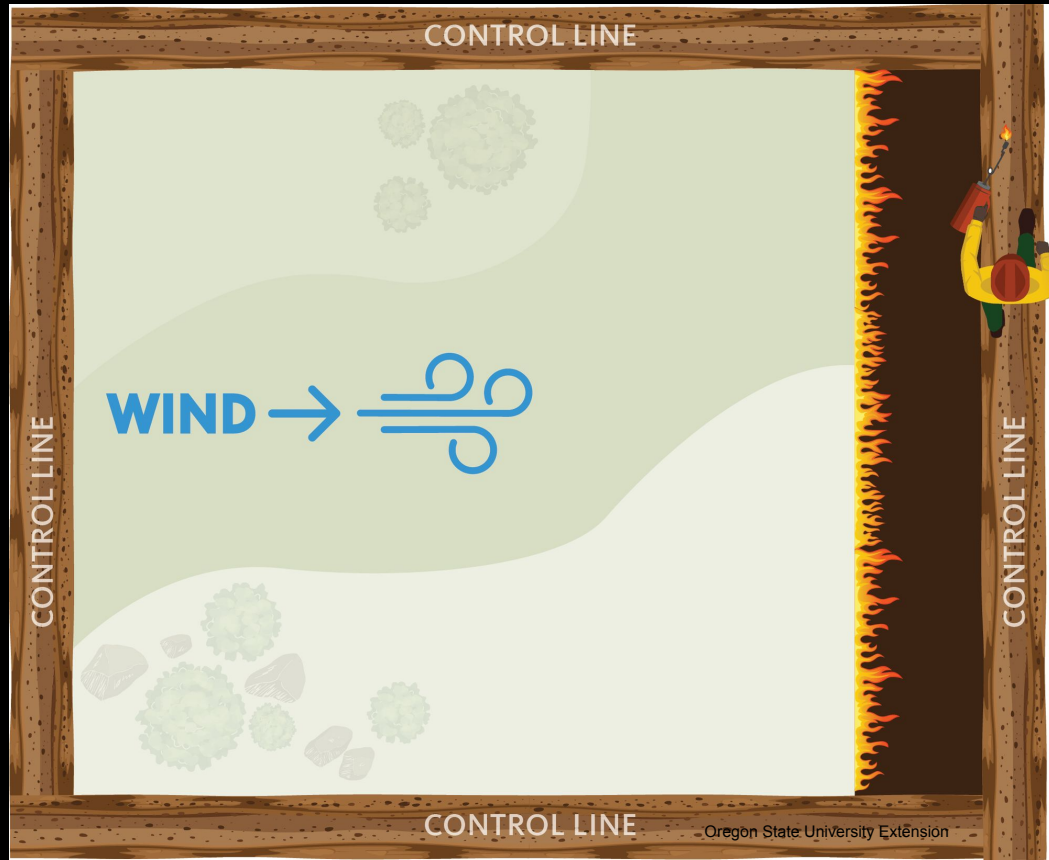


Firing Devices

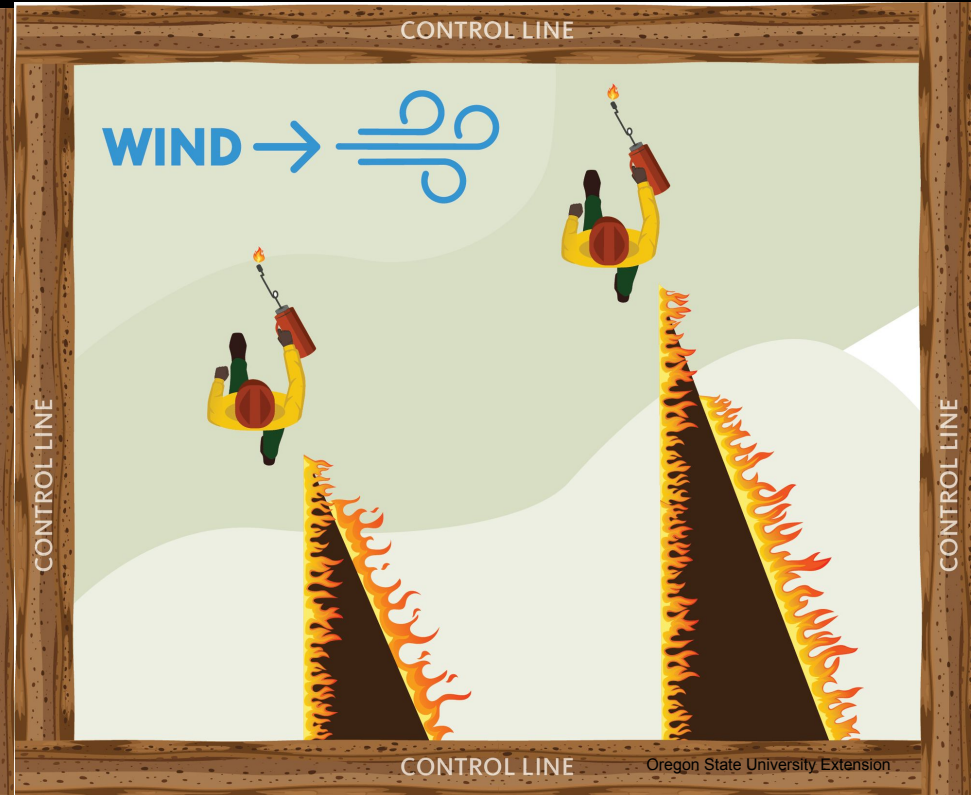
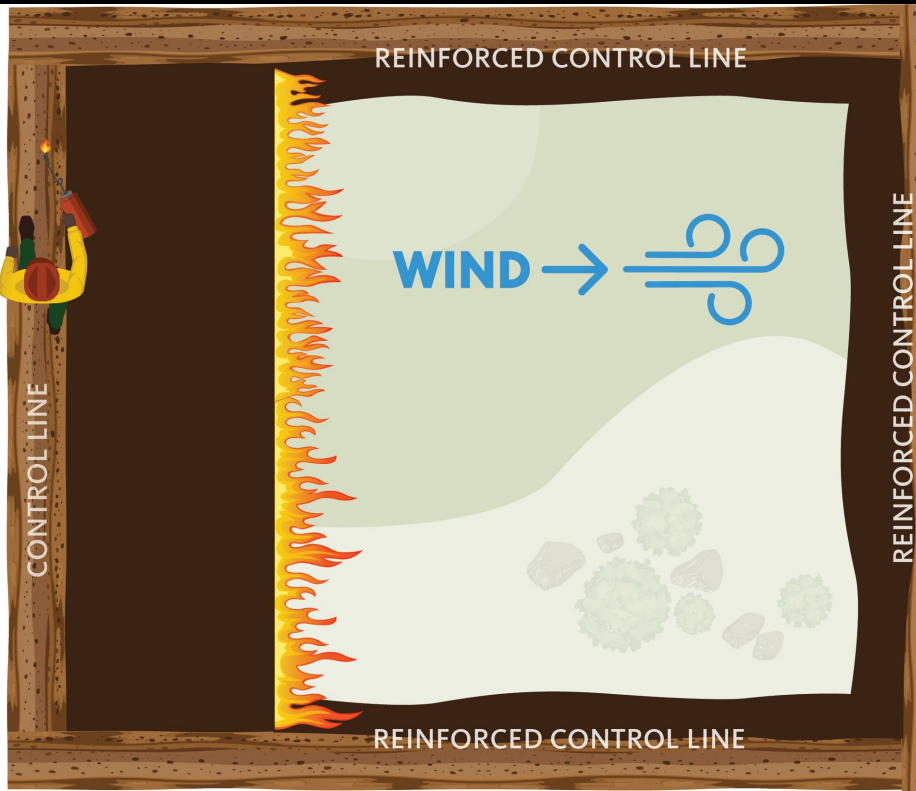
- Drip Torch
- Propane Torch
- Very Pistol
- Fusee
- Stubbies (AKA Chubbies, Chuckers, Flares, Bombs, Etc.)



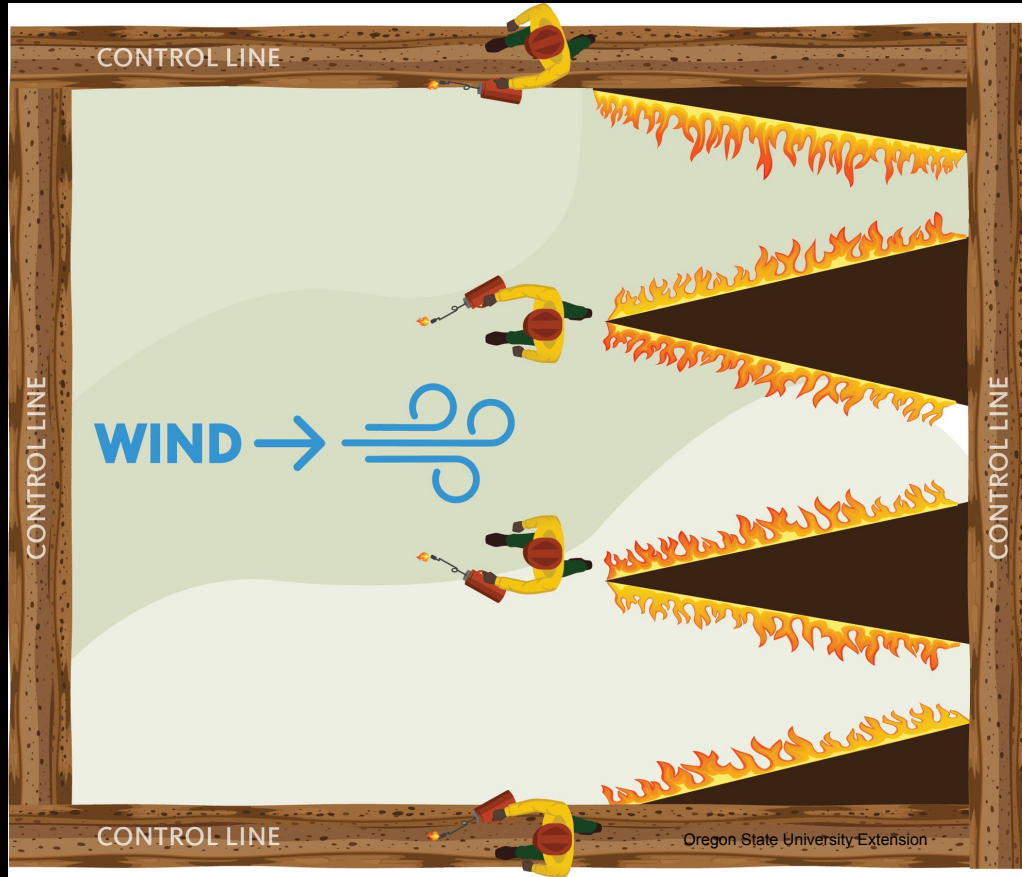
Firing Patterns - Backing or Black Lining



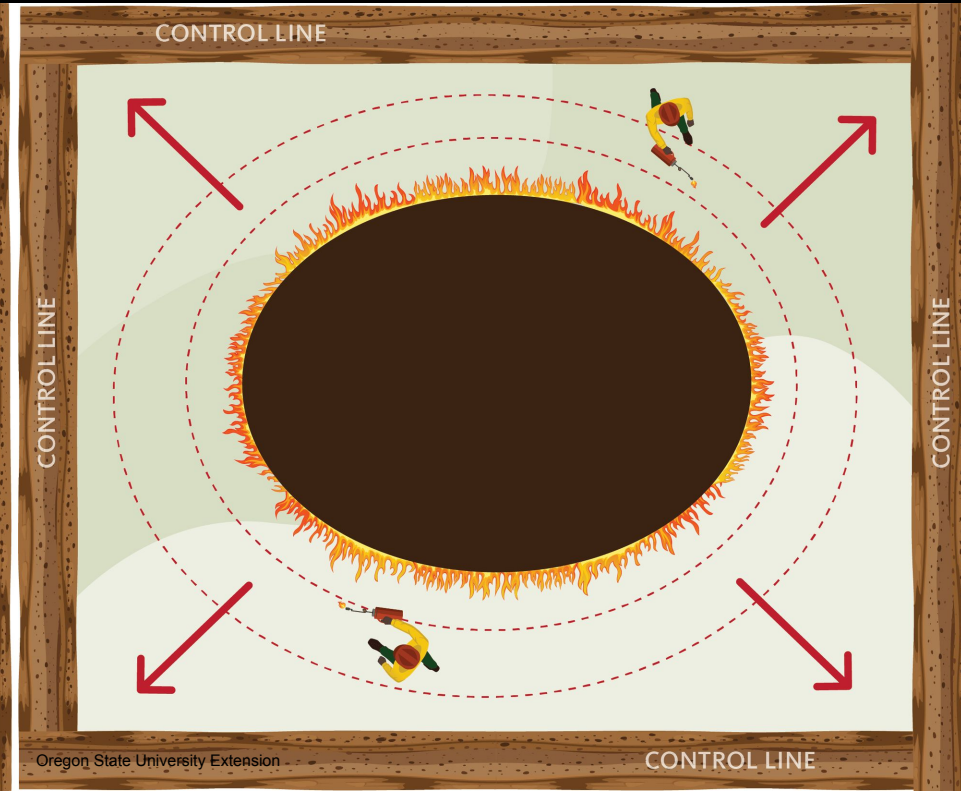
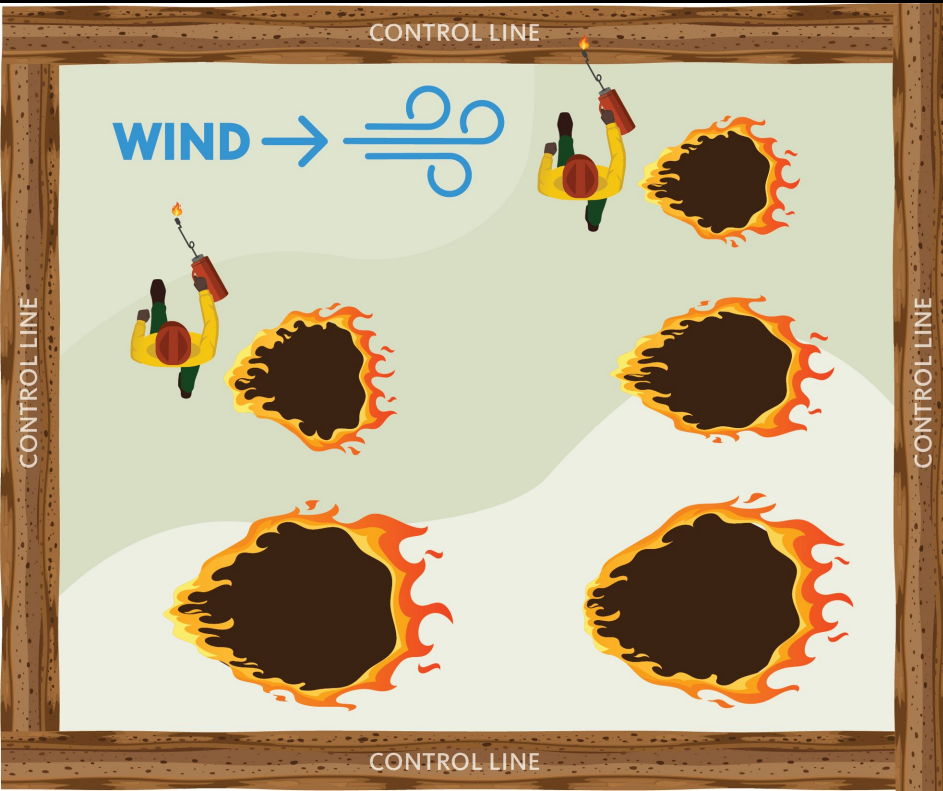
Firing Patterns - Head and Strip Head Firing



Firing Patterns - Flanking or 'Chevrons'



Firing Patterns - Dots and Rings



Firing Patterns - Dots and Rings

- Minimize intensity
- Protect values
- 'Hunt and Peck' or 'Seek and Destroy'



Firing Terminology

Spacing - distance between igniters/strips

Stagger - distance each ignitor lags behind each other

3-2-1 - Firing team formation (1 is always closest to the line)

Black lining - utilizing backing fires to reinforce or create a fireline

Depth - distance of black between control line and unburned fuels

Good Black - Burned area with no reburn potential

Dirty burn - Burned area with reburn potential

Patchy burn - Mix of burned and unburned within fire area

Bellies - pockets of unburned fuel encompassed by fire
(created by uneven ROS)

“Paint the corner”- (Jeff-ism) build depth in right angle corners
before progressing



Torch Techniques

- Boxes
- Zig-Zags
- Dots
- Rings or half rings
- The Flick'
- Anything else?



Firing Principals

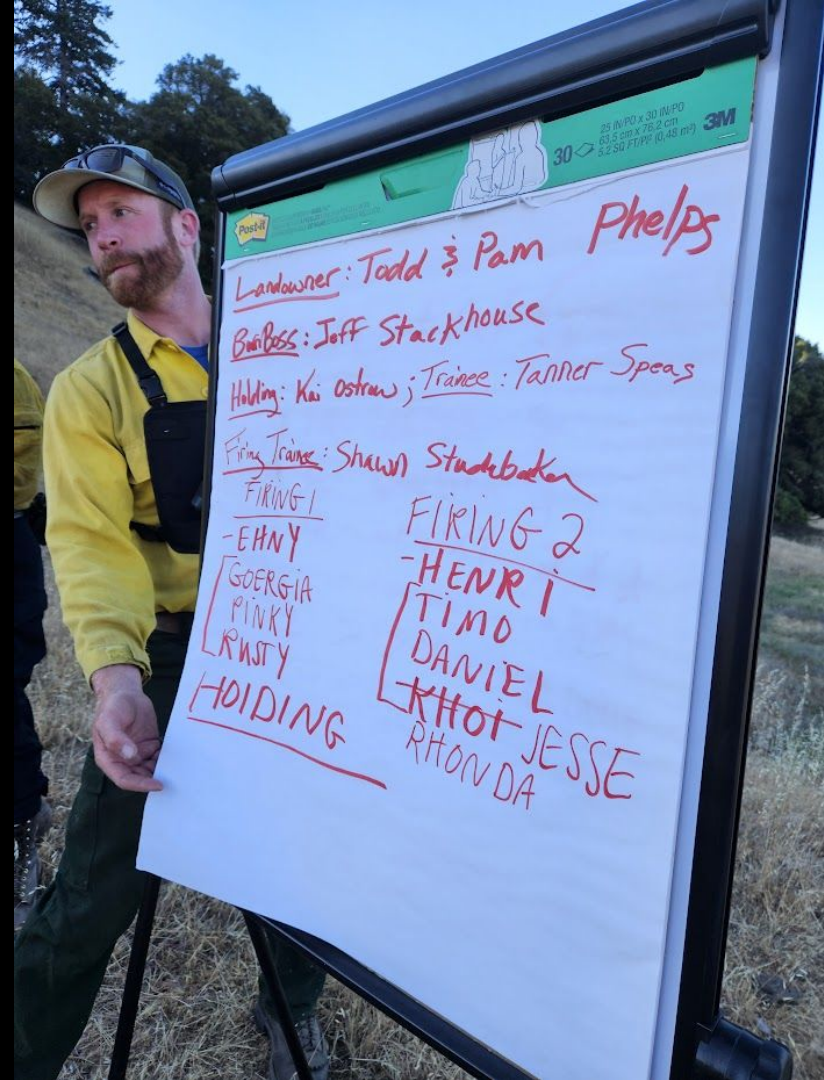
- Light as you walk. Pay attention to your path, then look back to evaluate behavior
- Ensure you have a path forward or path of escape before lighting
- Never light below or upwind of someone
- Never send head fire toward an unburned control line
- Keep edge fire ahead of interior fire
- Always tie in to existing black or control lines
- Practice good torch etiquette



Firing Organization

Burn Boss (strategy) > Firing Boss (strategy/tactics) >
Firing Team Leader (tactics) > Igniter (implements tactics)

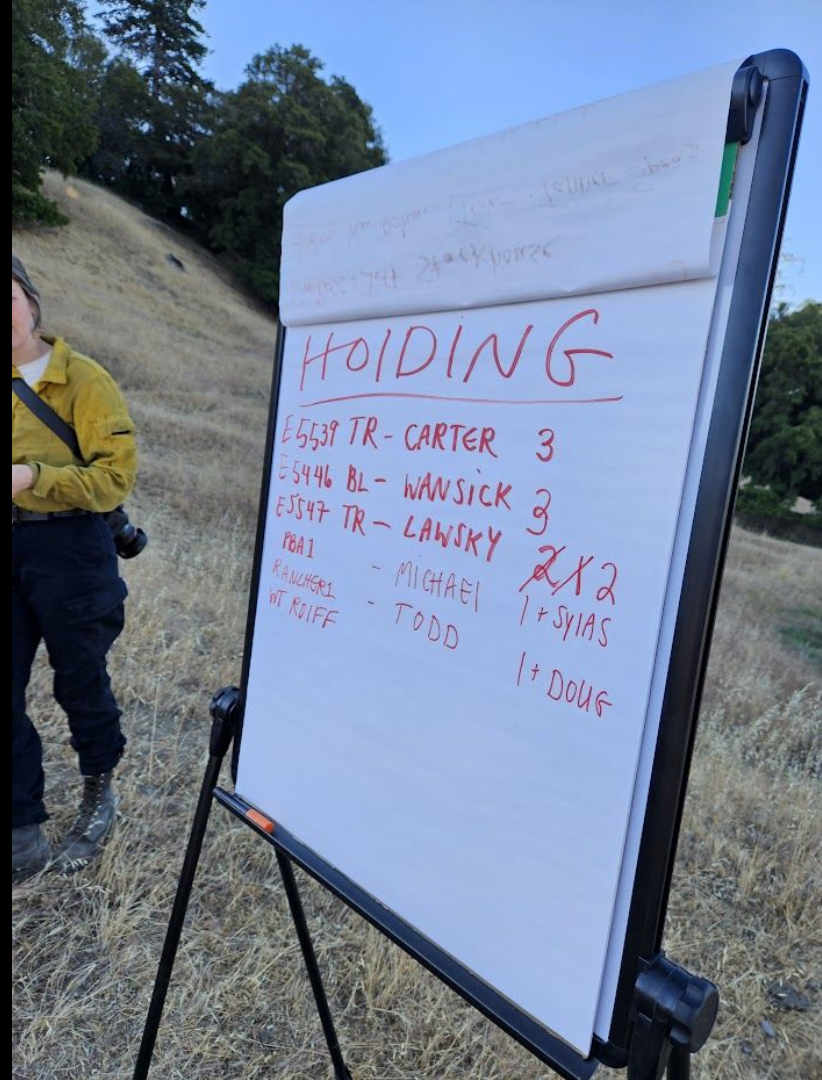
Mission: Utilize firing personnel, devices, patterns and techniques to ignite in a way that accomplishes unit goals and objectives.



Holding Organization

Burn Boss (strategy) > Holding Boss (strategy/tactics) >
Holding resources (Crews, Engines, Water Tenders, Heavy
Equipment, Aircraft)

Mission: Utilize resources not assigned to firing
or contingency to keep the fire within the control
lines.



Holding Principals

- Eyes on the Green!
(Especially when smoke is blowing over the line)
- Stay active and alert.
(You're not needed until you're very needed)
- Alert line supervisor to any holding concerns, issues or hazards.
- Mitigate holding concerns before they are ignited, when possible.
- Practice size-up reports, know how to describe your location.



Holding Resources

Hand Crews (Hotshot, Type 2IA, Type 2, Wildland Fire Module, Suppression Module)

Fire Engines (Types 3, 4, 5, 6, 7)

Water tenders (various tank sizes and capabilities)

Heavy Equipment (Type 1, 2 and 3 Dozers, Skidders, Feller Bunchers, Skidgeons)

Aircraft (Type 1 and 2 Helicopter, Tanker, LAT, VLAT)

Portable Tanks (Blivits, Bladders, Pumpkins, Fold-a-Tanks)



Spot Fire - An independent fire outside of the designated fire area (in the green).

Slop-over - A fire edge that crosses a control line.



Causes of Control Issues

- Embers blown across the line
- Snags / aerial dead wood
- Falling trees
- Rolling material
- Flare ups of unburned material near the line
- Roots
- Animals
- **Burner Error**



Spot Fires and Slop-overs

Utilize chain of command

Give good size up to supervisor

- **Where am I, what do I have, what do I need**
- Fire size up: **Size, ROS, fuel type, behavior, cause, hazards**

Do not engage until properly briefed

Knock down flames with water or hand tools, if possible, then construct direct line.

Anchor and flank



Incident Within an Incident (IWI)

Medical Plan (found in the IAP)

Steps:

- Take a deep breath
- Begin patient care
- Give accurate size-up to supervisor
(**Where you are, what you have, what you need**)
- Come up with transport plan

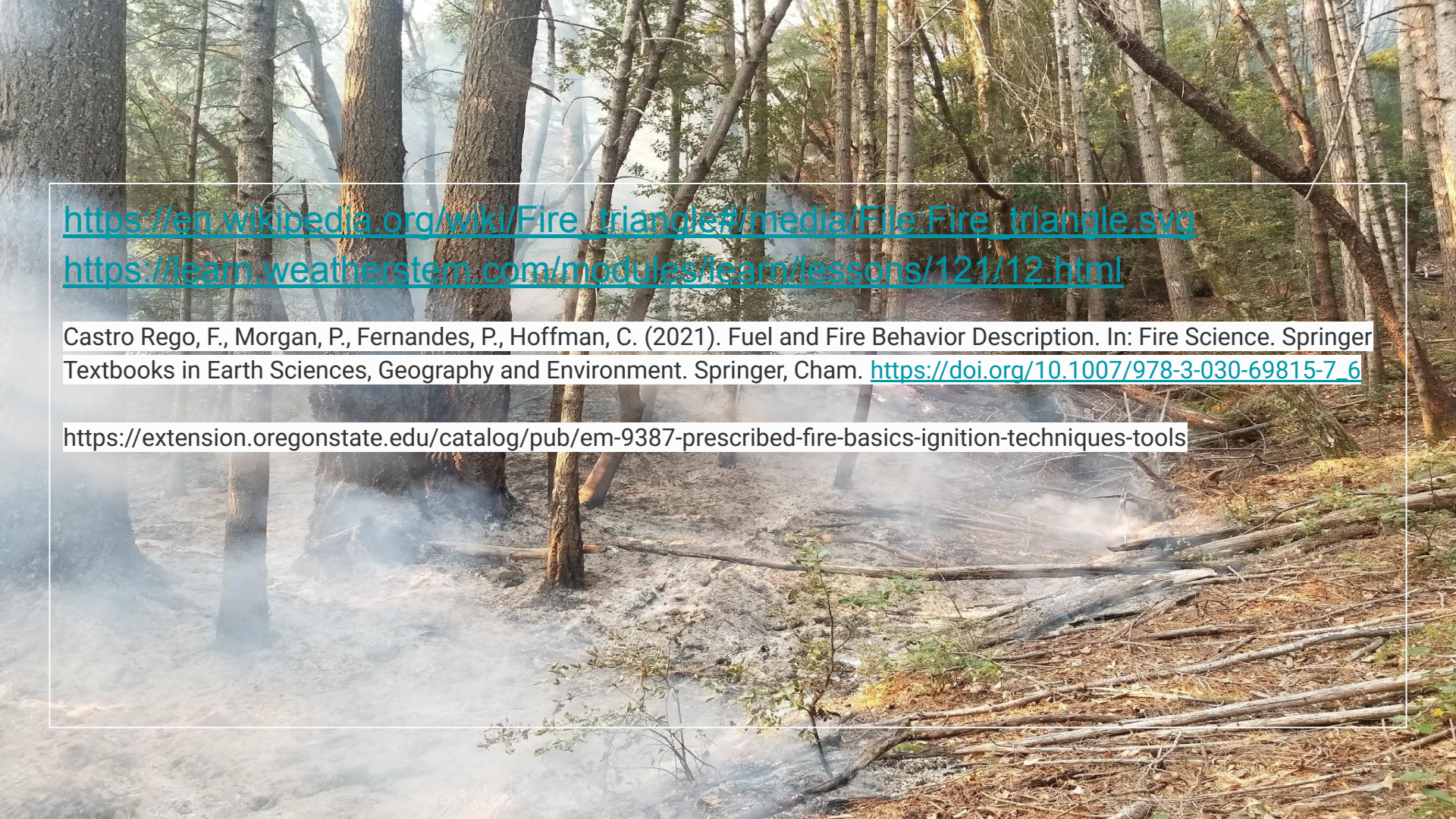
8-line (medical report to dispatch)

Or **CALL 911**



Final Thoughts

- Work Hard
- Have Fun
- Stay Hydrated
- Learn something new every day



https://en.wikipedia.org/wiki/Fire_triangle#/media/File:Fire_triangle.svg
<https://learn.weatherstem.com/modules/learn/lessons/121/12.html>

Castro Rego, F., Morgan, P., Fernandes, P., Hoffman, C. (2021). Fuel and Fire Behavior Description. In: Fire Science. Springer Textbooks in Earth Sciences, Geography and Environment. Springer, Cham. https://doi.org/10.1007/978-3-030-69815-7_6

<https://extension.oregonstate.edu/catalog/pub/em-9387-prescribed-fire-basics-ignition-techniques-tools>