

Santa Fe Interagency  
Hotshot Crew  
S.O.P.



2015



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This guide is designed to give the Santa Fe IHC overhead and crew members standard operational procedures (S.O.P.) in order to promote crew effectiveness and cohesion. All public laws and agency policies supersede this document.

## Santa Fe Interagency Hotshot Crew

### Our History...

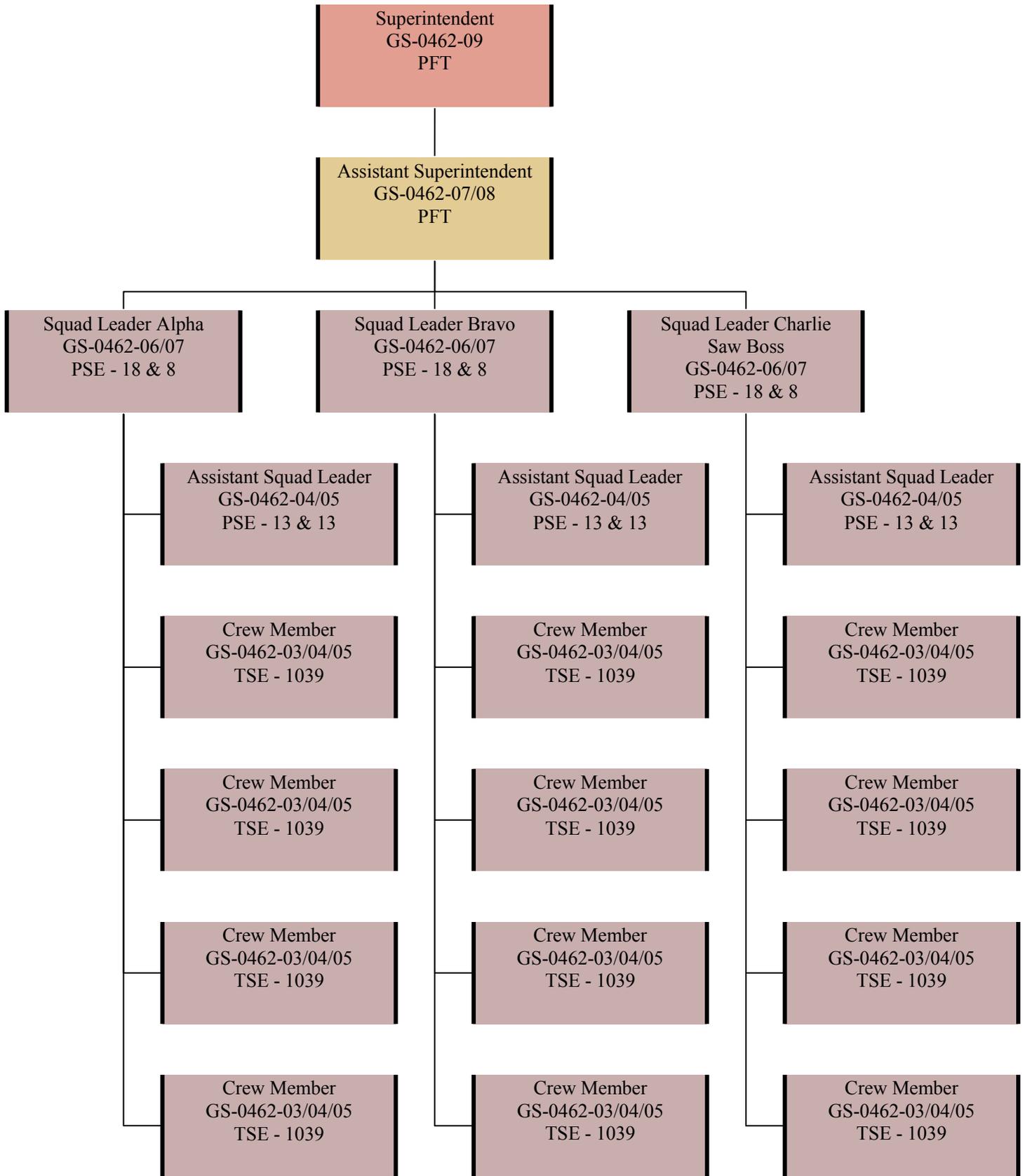
The Santa Fe Hotshots were established in 1977. A Fire Management Officer had wanted to call the crew the Redondo Hotshots (named after a prominent peak in the Jemez Mountains). After some negotiation the crew's name was chosen, and the Santa Fe Hotshots were formed. The crew was originally hosted by the Tesuque Ranger District, until that district combined with the Espanola Ranger District. The Santa Fe Hotshots are presently managed by the Supervisor's Office of the Santa Fe National Forest, but have a work center/base that they operate out of in downtown Santa Fe. The crew's current "Three Horsemen" logo represents the three dominant cultures in northern New Mexico: Native American, Anglo, and Spanish. It was originally drawn in 1997.

## Superintendents and Years of Service:

1977-1978	Al Lopez
1979-1984	Gary Olsen
1985	Bill Moulton
1986-1987	James Dean (JD) Killick
1988-1991	Alan Gillette
1991-1995	Andrew Serrano
1995-1996	Charlie Martin
1997	Robert Morales
1998-1999	Charlie Martin
2000-2006	Richard Tingle
2007	Vacant
2008-2010	Chris Tipton
2011-Current	David Simpson

## Our Mission...

The mission of Interagency Hotshot Crews is to provide a safe, professional, mobile, and highly skilled hand crew for all phases of fire management and incident operations.



# Crew Standards of Conduct

## General

- a. Insubordination will not be tolerated.
- b. Personnel are allowed a two-hour “call-back” after normal duty hours and on available days off. This is a maximum time frame, and every effort should be made to report as soon as possible.
- c. Incident response is not optional.
- d. All personnel will be ready for work at 0930 hrs or the required reporting time.
- e. All personnel will report for work “fire ready”. Fire ready includes boots, PPE, personal gear, and all assigned equipment.
- f. All personnel will be fit for duty. Unfit for duty is considered under the influence of alcohol or any illicit drug, or not sufficiently rested to safely perform assigned duties.
- g. All leave (except emergency/sick) requires prior approval.

## Crew Clothing

- a. Personnel will professionally wear and care for crew shirts and other miscellaneous items containing the Santa Fe Hotshot Logo. This will be your official uniform.
- b. Defacing of the Santa Fe Hotshot Logo is prohibited.
- c. Besides the official crew sweatshirt, ALL other jackets desired to be worn as part of the crew uniform must be black in color, and approved by the Superintendent.
- d. Those wishing to apply the crew logo, or embroider the crew name, onto any clothing must receive prior approval from the Superintendent.
- e. No synthetic material shirts may be worn under nomex.
- f. No shirts with a silk screen pattern or iron-on will be worn under nomex.
- g. Every effort will be made to wear a clean crew shirt while in fire camp. It is recommended that each crew member have at least 1 “work” shirt and 1 “camp” shirt.
- h. Shirts will be tucked in at all times.
- i. The crew hat is considered part of your uniform, and will be worn accordingly.
- j. No shirt with any image or wording that could be considered offensive, or generally unprofessional, will be permitted to be worn under your nomex shirt or for PT.

## Duty Station

- a. Try not to track mud/dirt into the building.
- b. Refrigerators, freezers, microwave, coffee pot, showers, toilets, etc., are for your use. Please clean up after yourself.
- c. All personnel will keep their gear and personal space neat and orderly.
- d. The hotshot training room will be kept clean and organized at all times.

## **Travel**

- a. All personnel will travel “fire ready” unless otherwise allowed by the Superintendent.
- b. Drivers will inform the Superintendent when vehicles are ready to depart from designated locations. It is the responsibility of the individual crew member to be ready and loaded.
- c. Meal breaks while traveling will be left to the Superintendent's discretion, they are not guaranteed.
- d. Lodging arrangements will be made as comfortable, convenient, and efficient as possible.
- e. All personnel will make an effort to travel in clean clothes.
- f. While in travel status, personnel will be on per diem. Be prepared to pay for your own meals. Lodging will be provided.
- g. While away from your home unit, crew members will be on call and fit for duty 24 hours a day, unless otherwise determined by the Superintendent.
- h. All personnel will travel with PT gear.
- i. All personnel will shower prior to leaving fire camp, when such facilities are available.

## **Fire Camp**

- a. All crew members will be ready for work as quickly as possible after wake up, unless otherwise instructed.
- b. For those crew members who choose to get up before the designated wake up time, please try not disturb others and rob them of needed rest.
- c. The crew will walk in a uniform line, except when informed that it is acceptable to do otherwise.
- d. All duties will be completed prior to personal endeavors. Any wandering must be approved by a supervisor.
- e. The crew will eat as a group, unless otherwise determined by the Superintendent.
- f. Whenever possible all personnel will wash their hands prior to eating.
- g. The crew will sleep in a designated area, determined by the crew overhead.
- h. Sleeping/camp areas will be kept neat and clean as conditions allow.
- i. Showers will be made available, if possible. Personnel are encouraged to use them.
- j. Porta John doors will be shut lightly. DO NOT allow Porta John doors to slam shut.

## **Rest & Recuperation**

- a. It is the policy of the Santa Fe IHC to take R & R at the home unit, except under rare circumstances.
- b. The crew may extend to 21 days if requested to do so by an IMT or host unit. The crew overhead will consider this request, and contact the Forest FMO and/or Fire Staff Officer to confirm our availability to extend. Once a decision has been made it will be communicated to the rest of the crew.

## **Safety & Accident Reporting Procedures**

- a. All accidents will be promptly reported to a supervisor.
- b. Pre-existing injuries and medical conditions may be disclosed to Crew EMTs.
- c. All involved parties must accurately fill out any required injury documentation.
- d. A job hazard analysis must be reviewed, and a tailgate safety meeting conducted, prior to beginning new activities.
- e. Near misses will be reported, discussed, and reviewed.
- f. All fire line safety issues will be immediately mitigated and discussed during fire AARs.
- g. Personnel are responsible for their individual safety, and for reporting unsafe conditions to a supervisor.
- h. Personnel must be able to successfully demonstrate their knowledge of *The 10 Standard Fire Orders & 18 Watch Out Situations*.

## **Employee Programs**

- a. Employee Assistance Program (EAP).
- b. Civil Rights Policy.
- c. SAFENET health and safety concerns reporting tool.
- d. All of the information listed above can be obtained from the base employee bulletin board, or from your Squad Leader.

## **Individual Performance Appraisals**

- a. Performance appraisals will be conducted in a three part series.
  - i. Part one will consist of an expectations and measures overview, and appraisal form initiation.
  - ii. Part two will consist of a mid-season review.
  - iii. Part three will consist of a season ending performance review, and summary rating.
- b. The performance appraisal plan will serve as the basis for employee evaluations. The performance appraisal tool, and field evaluation form, are to compliment or clarify mandatory elements and standards.
- c. Individual crew members rehire eligibility and future recommendations will be based on these performance appraisals.

## **Failure to Comply With Santa Fe IHC Standard Operational Procedures DISCIPLINARY PROCESS:**

**1<sup>st</sup> Violation:** Verbal warning and corrective instruction given by immediate supervisor, or supervisor who observes the infraction. Crew Superintendent will be informed. Written documentation made in the Crew Journal, and a written Letter of Warning may be issued.

**2<sup>nd</sup> Violation:** Verbal warning and corrective instruction given by immediate supervisor, or supervisor who observes the infraction. Crew Superintendent will be informed. Written documentation made in the Crew Journal, and a written Letter of Warning will be issued. A meeting will be held to review the situation with the employee, his or her Squad Leader, the Asst. Supt., and the Superintendent.

**3<sup>rd</sup> Violation:** Verbal warning and corrective instruction given by immediate supervisor, or supervisor who observes the infraction. Crew Superintendent will be informed. Written documentation made in the Crew Journal, and a written Letter of Warning will be issued. A meeting will be held to review the situation with the employee, his or her Squad Leader, the Asst. Supt., and the Superintendent. Forest AFMO informed of the situation. The employee may remain at the home unit during the next dispatch assignment, and the disciplinary action process initiated.

- **The Crew Superintendent reserves the right to modify this process based on the nature of the infraction.**
- **In severe circumstances employees may be removed from their position for failure to comply with Agency Policy, FS Regulations, or Santa Fe IHC Standard Operational Procedures.**

# Crew Operations

## Fire Line

- a. The 10 Standard Fire Orders will be adhered to at all times.
- b. All LCES concerns will be mitigated.
- c. All personnel will wear full PPE while on the fire line.
- d. All crew members will receive a proper briefing prior to each assignment. It is the right of all personnel to know that his or her assignment is safe, and to have the opportunity to ask questions.
- e. Escape routes and safety zones will be identified and made known to everyone.
- f. Crew members must inform overhead if leaving the crew for any reason, and upon returning.

## Training

- a. All personnel must complete the minimum required annual refresher training. Additional classroom and field training will be given as time allows.
- b. All crew members will receive a packet of training materials at the beginning of each season. It is the employee's responsibility to learn and care for these materials. Periodic testing may be conducted.
- c. Crew members may be permitted to initiate task books based on qualifications. It is the individual's responsibility to request training, and the trainer's responsibility to ensure proper documentation is completed.
- d. Crew members will be given the opportunity for on-the-job training based on seniority and situation analysis.
- e. All PTB trainees and trainers must complete any fire assignment training documentation as promptly as possible upon return to the home unit.
- f. Crew members with specialized experience may be called upon to assist with classroom and on-the-job training.
- g. Sundays will be designated as base training days (while not on assignment).
- h. Crew members will be given access to all available training materials.
- i. Lessons learned and accident investigation reports will be provided upon request.
- j. A reading library has been established for the benefit of all hotshots.
- k. Crew members are encouraged to participate in assignment AARs.

## Physical Training

- a. Upon initially reporting for duty, all personnel must take and pass the Work Capacity Test (WCT) at the arduous level. If necessary, re-testing will be done during the season to ensure an employee can safely work on the fire line. Failure to pass the test may result in termination.
- b. All personnel will actively participate in the physical training (PT) program.
- c. The physical training program will consist of running, hiking, and strength training. Daily activities will vary based on crew needs, and work assignments.
- d. Failure to participate in physical training due to injury or illness may result in the employee being made unavailable for fire assignment. The Superintendent will individually assess each situation.

## Equipment & Gear

- a. Personnel will be responsible and held accountable for all equipment and gear assigned to them.
- b. Lost, stolen, or damaged equipment must be immediately reported to a supervisor.
- c. Modification of gear, without supervisor approval, is prohibited.
- d. Personalization of any issued gear is prohibited.
- e. Nomex clothing will be kept as clean as possible, in order to maintain its effectiveness.
- f. Nomex clothing that is ripped and/or torn will not be permitted.

## Minimum Required Equipment

1. Personal Protective Equipment-
  - a. Hard Hat and Chin Strap
  - b. Safety Glasses (for both day and night operations)
  - c. Ear Protection
  - d. Nomex Shirt
  - e. Nomex Pants
  - f. Leather Gloves
  - g. 8" Leather Boots (Approved by the Superintendent)
2. I.A. Pack Required Items-
  - a. 1 MRE (24 Hours of Food)
  - b. 4 Fusees
  - c. 4 qts. of Water, and 1 Gatorade type beverage or electrolyte supplement
  - d. First Aid Equipment (meds or special items)
  - e. Fire Shelter
  - f. Head Lamp
  - g. Spare Batteries for head lamp, flashlight, GPS, etc. Spare Clam-Shell with fresh batteries, if assigned a radio.
  - h. Spare Ear Protection
  - i. Spare pair of Leather Gloves
  - j. Space Blanket
  - k. IRPG
  - l. 1 Trash Bag
  - m. 1 roll Pink Flagging (all crew members), 1 roll Killer Tree Flagging (saw team members), 1 roll Escape Route Flagging (overhead only)
  - n. 1 roll of Fiber Tape (all crew members on the dig)
  - o. Bastard File
  - p. T.P.
  - q. Permanent Marker
  - r. Pen (blue ink)
  - s. Pad of paper
  - t. FLHB appendix B/WX Charts (if assigned weather duties)
  - u. Compass (overhead and senior crew members only)
  - v. Signal Mirror (overhead and senior crew members only)
  - w. Aircraft Marker Panel (overhead only)
  - x. GPS (overhead and as assigned to crew members)
  - y. Kestrel or wind meter (if assigned weather duties)
  - z. Saw kit (if assigned a saw)

# Vehicles

- a. Vehicles will only be operated by qualified personnel. Daily inspections will be conducted and documented.
- b. Vehicles and compartments will be kept as clean as possible.
- c. It is the individual crew member's responsibility to maintain their seating area.
- d. Assigned personnel will maintain vehicle bins and onboard equipment.
- e. Crew members will not distract the driver while the vehicle is in operation.
- f. The backing of vehicles requires a spotter at all times.
- g. Vehicles will be chocked while unattended.
- h. Windows will be closed on all unattended vehicles. Screens will remain closed at all times.
- i. Receipts will be kept for all transactions using vehicle credit cards. Receipts are to be labeled with the appropriate job code and override, and placed in the mileage envelope.
- j. Mileage envelopes will be completed by drivers and submitted monthly by the crew fleet manager.
- k. Drivers will maintain a safe following distance at all times, based on road conditions and visibility.

## Seat Belt Policy

*All occupants of the vehicle are responsible for monitoring compliance with this policy.*

### Purpose:

To establish a policy to assure maximum operator and passenger safety, thus minimizing the possibility of injury or death as a result of a motor vehicle accident.

### Policy:

Safety belts shall be worn by drivers and passengers in all vehicles owned, or leased, by the agency at all times. This also applies to the operation of privately owned vehicles, if used for official duty.

### Procedure:

The driver is responsible for confirming that all seatbelts are buckled, and all cargo nets/tie-downs are secured, before putting the vehicle in motion. If any occupant in the vehicle observes another occupant with an unbuckled seatbelt, while the vehicle is in motion, it is their obligation to remind the unbuckled individual to fasten their safety belt.

No person shall operate an agency vehicle in which the safety belt in the driver's seating position is inoperable. No person shall be transported in a seating position in which the safety belt is inoperable.

Personnel who discover an inoperable restraint system shall report the defect to their immediate supervisor. Prompt action will be taken to replace or repair the system.

### Driver and/or Passenger Negligence:

If negligence or noncompliance with the requirements of this policy is displayed, and the behavior is not corrected, disciplinary action shall be initiated by the crew Superintendent.

## Use of Communication Devices While Driving

Forest Service employees should follow the direction issued in FSH 6709.11, Health and Safety Code Handbook. This PROHIBITS the USE of a HAND-HELD CELLULAR TELEPHONE while driving (Section 12.34.7); requires vehicle operators to comply with all traffic laws, regulations, and ordinances even in emergency driving situations (Section 12.3); and instructs employees not to compromise their safety, the safety of their passengers, or public safety when driving.

## Text Messaging While Driving by Federal Employees

Federal employees shall not engage in text messaging when driving a GOV, or a POV while on official Government business.

# **CREW MEMBER DUTIES & RESPONSIBILITIES**

## **GENERAL RULES FOR SQUAD MEMBERS**

- a. Any squad member that unlocks a crew carrier in the morning at the base must unlock all bins, and place the keys in the ignition.
- b. No reading material should be kept in the crew carrier that could be found to be offensive by other squad members (i.e., Maxim, FHM, etc.).
- c. Unless told otherwise, fire boots will be worn at all times in the crew carrier, and placed only on the floor.
- d. When in field, the batteries on each crew carrier will be shut off when the Squad Boss or Asst. Squad Boss goes to bed. Whoever is last on each rig, will shut them off. Batteries will not be left on overnight to charge cell phones.
- e. Crew members should arrive at work each morning with their phones fully charged. Charging cell phone batteries in the crew carriers, while at the base, will not be permitted.
- f. Cell Phone use will be permitted during lunch, before/after shift when on assignment, and in the crew carriers while in travel status. If you need to make a personal call during work, check with your supervisor before making the call. Also, please remember to be respectful of other squad members while making phone calls in the back of the crew carrier.
- g. Each person will be responsible for sharpening his or her own tool at the end of the day or shift, as part of their personal gear referb.
- h. The saw equipment on the crew carriers is to be utilized for fire assignments – NOT because you did not bring what you needed with you to a project work location. In the event that a squad member needs to use any equipment from the saw bins (i.e., srench, chain, etc.), *that person* has the responsibility of returning that item to where they got it, or informing the saw team that it needs replaced.
- i. Squad members need to pull their own sig or sigs from the sig bin at the beginning of each day or shift. After work, any used or partially used sig should be set next to the sig bin so that the saw team can refill them.
- j. Any damaged or broken equipment (i.e., tools, torches, etc.) will be flagged in pink with the problem indicated (e.g., loose handle, broken vent tube, etc.), and the proper squad member(s) notified.
- k. The priority of the cooler will be for water and Gatorade, when we have those available.
- l. No partial drinks are to be returned to the cooler.
- m. It is your responsibility to inform the lunch person if you want a veggie lunch.
- n. When on an incident, lunches should be cleaned out before leaving for the fire line.
- o. Seat Belts will be worn at all times, when in travel status. For example: to and from fire camp, project work, PT locations, etc.
- p. Squad members should keep their personal bins reasonably (this will be at the Squad Boss's discretion) clean and organized.

## **OVERHEAD DUTIES & RESPONSIBILITIES**

- a. Ensure a safe working environment is maintained at all times.
- b. Provide tactful direction and assistance to crew members during fire assignments, project work, and station maintenance. Serve as a leader for those to follow. Motivate and encourage as needed.
- c. Make certain crew members meet and complete required duties as assigned.
- d. Report all accidents or injuries to the Superintendent.
- e. Minimize time spent on the computer and/or in the office. Maximize time spent outside with the crew.
- f. Support and accurately relay overhead decisions in a professional manner.
- g. Serve as the drivers of the crew vehicles. Report for duty fit to drive and work.
- h. Ensure daily vehicle inspections are completed.
- i. Inform the Crew Assistant or Superintendent of any urgent needs.

1.	Superintendent	Crew Journal	IHC Program Management/ Performance Appraisals
		Budget	T&A Review and Approval
		IQCS Account Manager	Training Coordinator
		Purchasing	Perm Hiring
2.	Assistant Supt	Crew Time Reports	IHC Program Management/ Performance Appraisals
		IQCS Account Manager	Temp Hiring Lead
		Purchasing	PT Program Coordinator
3.	Squad A	Crew Carrier Operator/Inspections/Records	Temp Hiring/Time/Travel
		Purchasing	Facilities/Safety Program
4.	Squad B	Crew Carrier Operator/Inspections/Records	Temp Hiring/Time/Travel
		Fleet Maintenance/Management	Radios
5.	Saw Boss	Chase Truck Operator/Inspections/Records	Temp Hiring/Time/Travel
		Saw Training/Certification	Compound Yard/Saw Show
		Project Work Coordinator	Facilities/Fire Cache Manager
6.	Asst. Squad A	Vehicles Supplies	Airplane Loading
		Spike Camp Manager	Fire Camp Supply
7.	Asst. Squad B	Vehicle Supplies	Airplane Loading
		Spike Camp Manager	Fire Camp Supply
8.	Asst. Saw Boss	Saw Maintenance	Firing Equipment
		Burn Fuel/HazMat	Fuel Shed/Fire Cache Inventory
9.	Lead Sawyer A	Saw Maintenance	Saw Bin
10.	Lead Sawyer B	Saw Maintenance	Saw Bin
11.	Swamper A	Saw Maintenance	Gas/Oil Siggs
12.	Swamper B	Saw Maintenance	Gas/Oil Siggs
13.	Crew Member A-EMT	Squad/Crew Medical Assistance	Lunches
		Medical Supplies	Inside of Buggy
14.	Crew Member A	Tools	Parking Lot
			Base Trash
15.	Crew Member A	Water/Gatorade	Ice/Coolers
		Windows	Bathrooms
16.	Crew Member A	Supt Truck	Chock Block
		Training Room	Buggy Trash
17.	Crew Member B-EMT	Squad/Crew Medical Assistance	Lunches
		Medical Supplies	Inside of Buggy
18.	Crew Member B	Tools	Parking Lot
			Base Trash
19.	Crew Member B	Water/Gatorade	Ice/Coolers
		Windows	Bathrooms
20.	Crew Member B	Supt Truck	Chock Block
		Training Room	Buggy Trash
21.	Crew Member A/B		
22.	Crew Member A/B		

# Wildland Fire Leadership Values and Principles

<b>Duty</b>	<p><b>Be proficient in your job, both technically and as a leader.</b></p> <ul style="list-style-type: none"> <li>-Take charge when in charge.</li> <li>-Adhere to professional standard operating procedures.</li> <li>-Develop a plan to accomplish given objectives.</li> </ul>
	<p><b>Make sound and timely decisions.</b></p> <ul style="list-style-type: none"> <li>-Maintain situation awareness in order to anticipate needed actions.</li> <li>-Develop contingencies and consider consequences.</li> <li>-Improvise within the commander’s intent to handle a rapidly changing environment.</li> </ul>
	<p><b>Ensure that tasks are understood, supervised, and accomplished.</b></p> <ul style="list-style-type: none"> <li>-Issue clear instructions.</li> <li>-Observe and assess actions in progress without micro-managing.</li> <li>-Use positive feedback to modify duties, tasks and assignments when appropriate.</li> </ul>
	<p><b>Develop your subordinates for the future.</b></p> <ul style="list-style-type: none"> <li>-Clearly state expectations.</li> <li>-Delegate those tasks that you are not required to do personally.</li> <li>-Consider individual skill levels and development needs when assigning tasks.</li> </ul>
<b>Respect</b>	<p><b>Know your subordinates and look out for their well being.</b></p> <ul style="list-style-type: none"> <li>-Put the safety of your subordinates above all other objectives.</li> <li>-Take care of your subordinate’s needs.</li> <li>-Resolve conflicts between individuals on the team.</li> </ul>
	<p><b>Keep your subordinates informed.</b></p> <ul style="list-style-type: none"> <li>-Provide accurate and timely briefings.</li> <li>-Give the reason (intent) for assignments and tasks.</li> <li>-Make yourself available to answer questions at appropriate times.</li> </ul>
	<p><b>Build the team.</b></p> <ul style="list-style-type: none"> <li>-Conduct frequent debriefings with the team to identify lessons learned.</li> <li>-Recognize individual and team accomplishments and reward them appropriately.</li> <li>-Apply disciplinary measures equally.</li> </ul>
	<p><b>Employ your subordinates in accordance with their capabilities.</b></p> <ul style="list-style-type: none"> <li>-Observe human behavior as well as fire behavior.</li> <li>-Provide early warning to subordinates of tasks they will be responsible for.</li> <li>-Consider team experience, fatigue and physical limitations when accepting assignments.</li> </ul>
<b>Integrity</b>	<p><b>Know yourself and seek improvement.</b></p> <ul style="list-style-type: none"> <li>-Know the strengths/weaknesses in your character and skill level.</li> <li>-Ask questions of peers and superiors.</li> <li>-Actively listen to feedback from subordinates.</li> </ul>
	<p><b>Seek responsibility and accept responsibility for your actions.</b></p> <ul style="list-style-type: none"> <li>-Accept full responsibility for and correct poor team performance.</li> <li>-Credit subordinates for good performance.</li> <li>-Keep your superiors informed of your actions.</li> </ul>
	<p><b>Set the example.</b></p> <ul style="list-style-type: none"> <li>-Share the hazards and hardships with your subordinates.</li> <li>-Don’t show discouragement when facing set backs.</li> <li>-Choose the difficult right over the easy wrong.</li> </ul>

**Incident  
Command  
&  
ICS Forms**



## **Type 4 and 5 Incident Command Characteristics**

The Type 4 or 5 IC may assign personnel to any combination of ICS functional area duties in order to operate safely and effectively. ICS functional area duties should be assigned to the most qualified or competent individuals available.

**Do you have a plan? Is it a good plan? Will you follow the plan?  
Do you need a Delegation of Authority?**

### **Type 5 Incident Characteristics**

- Ad hoc organization managed by a Type 5 Incident Commander.
- Primarily local resources used.
- ICS command and general staff positions are not activated.
- Resources vary from two to six firefighters.
- Incident is generally contained within the first burning period and often within a few hours after resources arrive on scene.
- Additional firefighting resources or logistical support are not usually required.

### **Type 4 Incident Characteristics**

- Ad hoc organization managed by a Type 4 Incident Commander.
- Primarily local resources used.
- ICS command and general staff positions are not activated.
- Resources vary from a single resource to multiple resource task forces or strike teams.
- Incident is usually limited to one operational period in the contain phase. Mop-up may extend into multiple operational periods.
- Written incident action plan (IAP) is not required. A documented operational briefing will be completed for all incoming resources. Refer to the *Incident Response Pocket Guide* .



- Additional resource availability - "Will there be difficulty in getting additional resources (ground or air)?"

Fire behavior considerations:

- Combination of fuels, topography, and weather effecting rate of spread.
- How will this fire burn compared to others in similar areas?
- Is the fire danger increasing or decreasing?

Local weather indicators:

- Changes in wind speed and direction from initial reports.
- Presence of whirlwinds, dust devils as indicators of erratic winds.
- Changes in cloud cover and build-up.
- Unfavorable weather changes predicted.
- Diurnal winds effecting fire behavior.
- Observed weather conditions are much different from predicted conditions, especially wind speed and direction.

### **MAY WANT TO REQUEST A SPOT WEATHER FORECAST**

Smoke column indicators:

- The smoke column can give you some idea what you will be confronting.

### **Arriving On-Scene**

When approaching the scene:

- Use caution when approaching scene. Observe fire scene for "Look Up, Look Down, Look Around" concerns.
- Watch for people leaving the area, take information (license numbers, vehicle and suspicious person descriptions) that may assist with a fire investigation.
- Identify best access routes into fire and escape routes; pass information on to incoming resources.

Once on-scene:

- Advise dispatch and on-scene resources that you are on-scene and assuming command.
- Name fire, size-up fire conditions and potential, passing information onto agency dispatch and on-scene resources.
- Initiate Risk Management Process. (Refer to IRPG)

### **DO NOT CROSS THE FIRE'S HEAD UNLESS IT CAN BE DONE SAFELY!**

- Ensure that access into the fire scene is kept open and fire equipment is positioned to protect from fire damage and allow quick access out of the area.
- Attempt to locate fire origin and protect area (DO NOT remove any evidence unless necessary to prevent destruction).
- Account for all personnel and equipment that are already on-scene.
- Review Initial Attack Safety Checklist. (Refer to IRPG)

### **TAKING ON-SCENE ACTION**

**FIRES SHOULD BE FOUGHT AGGRESSIVELY, BUT SAFETY AND PROTECTION OF PERSONNEL AND EQUIPMENT MUST BE TOP PRIORITY. REMEMBER:**

- **STANDARD FIREFIGHTING ORDERS**
- **LCES**
- **WATCH OUT SITUATIONS**

Using the information from the fire size-up, develop incident objectives and fire suppression strategies, and ensure that assigned personnel know them.

**Incident objectives to consider are as follows:**

- **FIREFIGHTER SAFETY**
- Life hazard - "Protect residences leaving area."
- Property values - "Keep fire from reaching housing tract."
- Resource values - "Keep fire from reaching stand of timber."
- Keeping fire from spreading into heavier or more dangerous fuels.
- Keeping fire isolated on one side or in a single canyon or drainage.
- Keeping fire as small as possible within financial limits as determined by agency.
- Making sure that all assigned resources contribute to suppression efforts.

**Fire Suppression Strategy(s) used to control a fire will depend on:**

- Rate of spread
- Fire intensity (flame length)
- Spotting potential
- Values to be protected
- Kind and number of resources assigned

Present and predicted fire behavior and weather conditions will determine which strategy(s) and tactics you will use. It will be decided how close equipment and personnel work near or at the fire's edge by the flame length. Suppression action(s), whether direct or indirect attack, need to start from an anchor point (road, creek, burned out area, etc.). Always be aware of hazards in the fire area (power lines, snags, mines).

**Initial briefing of resources at or arriving on-scene:**

- Briefing should be face-to-face when possible.
- Briefing should include:
  - Incident objectives.
  - On-scene conditions (weather, fire intensity, rate of spread, potential).
  - Division/Group assignment.
  - Tactical and air-ground radio frequencies.
  - Safety concerns.
- Make sure personnel understand their assignment before going to work.
- Ensure that all responders are wearing the appropriate personal protective equipment (PPE).

**ASSESSMENT OF INCIDENT PROGRESS**

After resources have been deployed and suppression actions started, need to assess incident progress and make any changes to the incident action plan.

- View fire from a point where a complete picture of the fire can be obtained, use field observers as necessary.
- Is the incident action plan working? If not, make necessary changes.
- When making changes to the incident action plan, evaluate probability of success and consequence(s) of not changing plan.

**MAKE SURE THAT ALL AFFECTED RESOURCES ARE ADVISED OF INCIDENT ACTION PLAN CHANGES**

- Will changes in weather, fuel, or topography have enough of a fire behavior impact prior to control?
- Is rate of spread or fireline intensity increasing to a point where strategies may need to be changed?
- Are additional resources needed, including overhead (Div/Group Supervisors, etc.)? If so, place an order with dispatch.
- Can any resources be re-assigned or released?
- Has incident size and complexity reached a level where you are no longer qualified as an Incident Commander?

**DO NOT HESITATE IN ASKING FOR HELP!**

- Review the Initial Attack Safety Checklist as needed or when incident conditions change.

**UPDATING INCIDENT STATUS**

At the earliest opportunity, the following incident information should be forwarded to the agency dispatch (continue to keep dispatch updated of any significant changes and progress on the fire):

- Actual location
- Size of fire
- Rate of spread
- Fire potential (how large will/may fire get)
- Anticipated control problems
- Estimated control time
- Values threatened
- Fuel type
- Topography
- Weather conditions (especially if different from initial report)
- Resources on-scene
- Additional resource needs
- Resource releases
- Cause (if known)

## Logistical considerations per operational period

	QTY		# of Crews		# Overhead		Total Order
Food (MRE Case)	10	X		+		=	
Water (Cube)	10	X		+		=	
Gatorade (Case)	4	X		+		=	
Sleeping Bags	?	X		+		=	
Fuel (RAW Gas)	5 gal	X		+		=	
2 Cycle	6 pack	X		+		=	
Bar Oil	3 gal	X		+		=	
Batteries	1 flat	X		+		=	
Trash Bags	1 box	X		+		=	
Fiber Tape	2 rolls	X		+		=	
Snacks/Fruit	?	X		+		=	
Coolers(Cold Drink)	1	X		+		=	
Coffee Kit (Stove)	1	X		+		=	
Lunches	?	X		+		=	
Med Kit	1	X		+		=	
Evac Kit(SKED)	1	X		+		=	
Drip Torches	?	X		+		=	
Burn Mix (5 Gal)	?	X		+		=	
TP (Rolls)	6	X		+		=	
Hand Sanitizer	3	X		+		=	

**Considerations:**

- Hot cans
- IAP's
- News paper (Extended Spike)
- 2 week packs in lieu of Spike Bag
- Safety Officer (SOFR)
- Spike Camp Mgr (Big Groups)
- Line Medics (EMTS/Paramedic)
- Sleeping areas
- Food Cache (Wildlife)
- Pumps
- Hose
- Fittings
- Pump Fuel

## **Incident Action Plan Contents**

Assemble IAP in this order:

1. Incident Objectives (ICS 202)
2. Organization Assignment List (ICS 203)
3. Division Assignment List(s) (ICS 204)
4. Fire Weather Special Forecast Request
5. Incident Radio Communications Plan (ICS 205)
6. Safety Message
7. Medical Plan (ICS 206)
8. Incident Action Plan Safety Analysis (ICS 215A)
9. Air Operations Summary (ICS 220)
10. Map(s)
11. Unit Log (ICS 214)

# Operational Guidelines & Standards



## APPENDIX A

### STANDARDS FOR INTERAGENCY HOTSHOT CREW OPERATIONS MINIMUM CREW STANDARDS FOR NATIONAL MOBILIZATION

Minimum Standards	Type 1	Type 2 with IA Capability	Type 2
Fireline Capability	Initial attack/can be broken up into squads, fire line construction, complex firing operations(backfire)	Initial attack/can be broken up into squads, fireline construction, firing to include burnout	Initial attack, fireline construction, firing as directed
Crew Size	18-20		
Leadership Qualifications	Permanent Supervision Supt: TFLD, ICT4,FIRB Asst Supt: STCR, ICT4 3 Squad Bosses: ICT5 2 Senior Firefighters: FFT1	Crew Boss: CRWB 3 Squad Bosses: ICT5	Crew Boss: CRWB 3 Squad Bosses: FFT1
Language Requirement	All senior leadership including Squad Bosses and higher must be able to read and interpret the language of the crew as well as English.		
Experience	80% 1 season	60% 1 season	20% 1 season
Full Time Organized Crew	Yes (work and train as a unit 40 hrs per week)	No	No
Communications	5 programmable radios	4 programmable radios	
Sawyers	3 agency qualified	3 agency qualified	None
Training	As required by the <i>Standards for Interagency Hotshot Crew Operations</i> or agency policy prior to assignment	Basic firefighter training and/or annual firefighter safety refresher prior to assignment	Basic firefighter training and/or annual firefighter safety refresher prior to assignment
Logistics	Crew level agency purchasing authority	No purchasing authority	No purchasing authority
Maximum Weight	5300 lbs		
Dispatch Availability	Available nationally	Available nationally	Variable
Production Factor	1.0	.8	.8
Transportation	Own transportation	Transportation needed	Transportation needed
Tools & Equipment	Fully equipped	Not equipped	Not equipped
Personal Gear	Arrives with: Crew First Aid kit, personal first aid kit, headlamp, 1 qt canteen, web gear, sleeping bag		
PPE	All standard designated fireline PPE		
Certification	Must be annually certified by the local host unit agency administrator or designee prior to being made available for assignment.	N/A	N/A

## Resource Typing

### Engines

Components	Minimum Standards for Type						
	1	2	3	4	5	6	7
Pump Capacity (GPM)	1000	500	120	70	50	50	20
Tank Capacity (Gallons)	400	400	500	750	500	200	125
Hose, 2 ½ " (feet)	1200	1000	--	--	--	--	--
Hose, 1 ½ " (feet)	400	500	1000	300	300	300	200
Hose, 1" (feet)	200	300	800	300	300	300	200
Ladder (feet)	20	20	--	--	--	--	--
Heavy Stream (GPM)	500	--	--	--	--	--	--
Personnel (minimum number)	4	3	3	3	3	2	2

### Other Resources

Resource	Components	Minimum Standards for Type			
		1	2	3	4
Water Tenders	Pump, GPM Tank, Gallons	300 5000	200 2500	200 1000	-- 1000
Helicopters	Seats, including pilot (minimum)	16	10	5	3
	Card Weight Capacity (lbs)	5000	2500	1200	600
	Tank, gallons of Retardant (min)	700	300	100	75
	Examples:	Bell 214	Bell 204,205,212	Bell 206	Bell 47
Air Tankers	Minimum Capacity (Gal.)	3000	1800	600	100
	Examples:	C-130, P-3, DC-7	DC-4, SP2H, P2V	S-2	AT-802
Helitanker	<ul style="list-style-type: none"> <li>- Fixed Tank</li> <li>- Air Tanker Board Certified</li> <li>- 1, 100 Min. Gal. Capacity</li> </ul>				

## **INITIAL OUT OF UNIT ASSIGNMENT INFORMATION**

Minimum information to be obtained before departing:

- Fire name
- Fire location
- Reporting location
- Reporting time
- Travel instructions
- Any special communications instructions
- Resource Order number and request number (if applicable)

### **CHECK-IN PROCEDURES AT INCIDENT**

Check-in officially logs you in at the incident and provides important release and demobilization information. You only check in once. Check-in Recorders may be found at the following locations:

- Incident Command Post
- Base or Camp
- Staging Area
- Helibase
- If you are instructed to report directly to a line assignment, you should check-in with Division/Group Supervisor.

### **OBTAIN BRIEFING AND BRIEF SUBORDINATES**

After check-in, locate your incident supervisor and obtain your initial briefing. The items that you receive in your briefing, in addition to functional objectives, will also be needed by your subordinates in their briefing. Your briefing should include:

- Identification of work assignments.
- Identification of work area.
- Identification of other resources.
- Identification of eating and sleeping arrangements.
- Identification of operational period work shifts.
- Instructions for obtaining additional supplies.
- Clarification of any important points.

## **Division / Group Supervisor Team Assignment Checklist:**

### **Items you need to obtain initially:**

- Resource order, Reporting/Check-in location, Crew Time Report booklet, Transportation, Radio, Cell phone, GPS.

### **Other Handy Items You May Wish To Gather:**

- Map (Atlas), Notepad, pens, pencils, etc., Flagging, Fire line Handbook, Field Operations Guide, ICS form 214 Unit Log, ICS form 209 Resource Status Summary, First Aid kit, Fuses, AA batteries, Foam pad, Extra food and water, Belt weather kit.

**Division/Group Supervisor** is responsible for the implementation of the assigned portion of the Incident Action Plan.

### **Critical Safety Responsibilities:**

- Obtain briefing from Supervisor.
- Coordinate activities with adjacent Divisions.
- Keep supervisor informed of situation and resources status.
- Resolve logistics problems within the Division/Group.
- Keep supervisor informed of hazardous situations and significant events.

### **Other Duties:**

- Review the assignments with subordinates.
- Inform Incident Communications and/or Resource Unit of all status changes of resources assigned to the Division/Group.
- Ensure that assigned personnel and equipment get on and off line in a timely and orderly manner.
- Maintain Unit Log (ICS Form 214).
- Approve and turn in time for all resources in division/group to the time unit.
- Evaluate performance of Task Force/Strike Team Leader.

## **Task Force/Strike Team Leader**

The Task Force/Strike Team Leader reports to a Division Group Supervisor and is responsible for performing tactical missions as assigned on a division or segment. The Leader reports work progress, resource status, and other important information to a Division Group Supervisor and maintains work records on assigned personnel.

- Obtain briefing from Division Group Supervisor.
- Review assignments with subordinates and assign tasks.
- Travel to and from line with assigned resources.
- Monitor and inspect progress and make changes as necessary.
- Coordinate activities with adjacent strike team task forces and single resources.
- Keep supervisor advised of situation and resource status.
- Retain control of assigned resources while off line (i.e. feeding, time keeping, sleeping area assignment, etc.).
- Maintain Unit Log (ICS Form 214).

## **Single Resource Boss (Crew, Engine, Firing, Dozer)**

A Single Resource Boss is responsible for supervising and directing a fire suppression module such as a hand crew, an engine, a dozer, a tractor-plow, a firing team, or one or more fallers.

- Obtain briefing from the Task Force/Strike Team Leader.
- Review assignments with subordinates and assign work tasks.
- Obtain necessary equipment and supplies.
- Review current and predicted weather conditions and brief subordinates on expected fire behavior.
- Brief subordinates on safety items including escape routes and safety zones. Provide for their welfare.
- Monitor work progress.
- Ensure adequate communications with supervisor and subordinates.
- Keep supervisor informed of progress and any changes.
- Inform supervisor of problems with assigned resources.
- Brief relief personnel on the line at end of shift. Advise them of any changes in observed fire behavior.
- Return equipment and supplies to appropriate unit.
- Complete and turn in all time and use records on personnel and equipment.

## **Advanced Firefighter/Squad Boss (FFT1)**

A Squad Boss is a working leader of a small group (usually not more than nine members), is responsible for keeping assigned personnel fully employed on assigned jobs, and is normally supervised by a Crew Boss.

### **Critical Safety Responsibilities:**

- Understand exactly what the supervisor wants done.
- Ensure that personnel have proper safety equipment and tools, and know how to care for and use them.
- Look after the safety of assigned personnel.

### **Other Duties:**

- Ensure that personnel have water and lunches.
- Keep time when requested by supervisor.
- Report problems with personnel to supervisor.

## **Firefighter (FFT2)**

A firefighter is the basic resource used in the control and extinguishment of wildland fires and works either as an individual or as a member of a crew under the supervision of a higher-qualified individual.

### **Critical Safety Responsibilities:**

- Perform manual and semi-skilled labor as assigned.
- Ensure that objectives and instructions are understood.
- Perform all work in a safe manner.
- Keep personal clothing and equipment in serviceable condition.
- Report accidents or injuries to supervisor.
- Report hazardous conditions to supervisor.

# How to do what we do

## **Downhill Checklist**

Downhill fire line construction is hazardous in steep terrain, fast-burning fuels, or rapidly changing weather. Downhill fire line construction should not be attempted unless there is no tactical alternative. When building downhill fire line, the following is required:

1. Crew supervisor(s) and fire line overhead will discuss assignments prior to committing crew(s). Responsible overhead individual will stay with job until completed (TFLD or ICT4 qualified or better).
2. Decision will be made after proposed fire line has been scouted by supervisor(s) of involved crew(s).
3. L.C.E.S. will be coordinated for all personnel involved.
  - Crew supervisor(s) is in direct contact with lookout that can see the fire.
  - Communication is established between all crews.
  - Rapid access to safety zone(s) in case fire crosses below crew(s).
4. Direct attack will be used whenever possible; if not possible, the fire line should be completed between anchor points before being fired out.
5. Fire line will not lie in or adjacent to a chute or chimney.
6. Starting point will be anchored for crew(s) building fire line down from the top.
7. Bottom of the fire will be monitored; if the potential exists for the fire to spread, action will be taken to secure the fire edge.

## **FIRE SUPPRESSION STRATEGIES**

The strategy(s) used to control a fire depends on the rate of spread, intensity, spotting potential, values at risk, size, type of available resources, and other factors. Anchor control lines to an existing barrier such as a road, creek, burned area, etc., to minimize the chance of being flanked by the fire. Suppression action(s) may include one or a combination of the following strategies:

### **Direct Attack**

- Used when fire perimeter is burning at low intensity and fuels are light, allowing for safe operation at the fire's edge.
- Control efforts, including line construction, are done at the fire perimeter, which becomes the control line.
- Unless special situations dictate otherwise, line construction will start from an anchor point.

### **KEEP ONE FOOT IN THE BLACK WHEN POSSIBLE.**

#### ***Advantages of Direct Attack***

- Safest place to work. Firefighters can usually escape into burn area.
- There is minimal area burned.
- No additional area is intentionally burned.
- Full advantage is taken of burn out areas.
- May reduce the possibility of the fire moving into the crowns of the trees or brush.
- Eliminates the uncertain elements of backfiring.

#### ***Disadvantages of Direct Attack***

- Firefighters can be hampered by heat, smoke and flame.
- Control lines can be very long and irregular, because the line follows edge of fire.
- Firefighters may accidentally spread burning materials across line.
- Doesn't take advantage of natural or existing barriers.
- Usually more mop up and patrol.

## Indirect Attack

- Used when a direct attack is not possible or practical.
- Fireline is located some distance from fire's edge.
- Terrain, fuels, fire behavior, and available resources will dictate fireline placement.
- Burning out of indirect line is handled as a second phase of line construction.

### *Advantages of Indirect Attack*

- Can locate line along favorable topography.
- Take advantage of natural or existing barriers.
- Firefighters work out of smoke and heat.
- More time to construct line.
- Allows line to be constructed in lighter fuels.
- May be less danger of slopover.

### *Disadvantages of Indirect Attack*

- More acres will be burned.
- May be dangerous to firefighters, because they are some distance from the fire and can't observe it.
- Fire may cross line before it is fired out.
- Burning out may leave unburned islands.
- Brings into play the dangers of back firing.
- Fails to take advantage of line that has already burned out.

## FIRE SUPPRESSION TACTICS

### Fireline Location Guidelines

Locate line, after consideration of the following:

- Provide for safety of personnel.
- Locate line adequate distance from fire so it can be completed, burned out and held with predicted rate of spread and fire behavior.
- Allow adequate time to permit forces to build lines and also do other needed work, such as snag falling and burning out, in advance of severe burning conditions.
- Make line as short and straight as practical, use topography to your advantage.
- Use easiest routes for control without sacrificing:
  - Holding practicability.
  - Too much area or resource value.
- Eliminate possible hazards from fire area and provide adequate safe distance between lines and hazards that must be left in the fire area.
- Avoid undercut lines and sharp turns in the line.
- Use existing natural and person-made barriers.
- Use heavy equipment, where appropriate, for line construction.
- Encircle area where spot fires are so numerous that they are impractical to handle as individual fires. Burn out unburned fuels.
- Consider environmental effects and agency policy.
- See Downhill Checklist.

### Fireline Construction Guidelines

- Make the fire line adequate width to effectively stop fire progression; consider height of vegetation.
- Clean all lines to mineral soil.
- Discard unburned line construction material outside of the fireline.
- Scatter charred or burning material inside burned area.
- Below the fire on steep slope, construct trenched lines to catch rolling material.
- Increase effectiveness of line width by cooling down adjacent fire with dirt or water.
- Cover uncharred, rotten logs and stumps just outside the line with dirt or wet down.
- Fall or line snags near fireline before burnout if time permits.
- Build fireline as close to fire edges as conditions safely permit. Burn out fireline as control line proceeds.
- When building fireline uphill, burn out from the top down after line is tied in.
- Keep one foot in the black, where possible.
- Consider hotspot and cold training in applicable fuel types and conditions.

## Spot Fire Detection and Suppression

Gridding is used to locate spot fires. As is holding line (keep your eyes in the green) Once a spot fire is detected the first person on scene serves as "IC". That person needs to then give a rapid assessment of the situation. Consider some of the following:

- Size of the spot?
- Fire intensity (is it increasing or decreasing)?
- What resources you need. Location (Do we need to warn others)?
- Overhead will ask for additional assistance if needed.
- Try not to plug up the radio with needless information.
- Make sure to flag spots back to the line and make them know.
- Get GPS coordinates for spot fires when feasible. (We try to get them to the situation unit for mapping.)

When attacking a spot fire remember to establish a solid anchor point. Consider splitting your resources  $\frac{1}{2}$  on each flank. We need to be aggressive when attacking spot fires; they should be treated like IA. The pace of line construction is very rapid, just enough to hold the fire. Base your actions on fire behavior and likely hood of picking it up. Consider indirect, aircraft, additional crews, etc..... Once the spot is contained we then can go back and reinforce the line where needed.

Always remember if you have found one spot,  
You probably have more out there, keep looking.

Gridding Commands- Below is the common commands the Santa Fe IHC use during gridding operations.

- **I'm In**-Means when lining out to the initial spacing you have reached it and are dropping off.
- **Ready**-communicates to the line that they are in position and ready to start.
- **Moving**-communicates to the line to start moving. Remember it takes time to relay the message so don't just blindly start walking when you hear the command.
- **Working off the (left or right)**-communicates which side of the line is in command of the grid.
- **Shift (left or right)**-communicates to make a slight adjustment to the direction of travel.
- **Pivot (left or right)**-communicates that the "anchor" will not move, and the line will swing around in that direction.

Some helpful pointers:

- Try to stay about  $\frac{1}{2}$  step back of the person you are bumping off of.
- Never get ahead of the person you are bumping off of.
- Pass ALL messages up and down the line. (Remember it takes time to pass a message to 20 people)
- Make sure you understand the plan, if not ask questions.
- While gridding make sure you are looking UP, DOWN, BACK, FRONT, AND IN ANY RECEPTIVE FUEL BEDS (Spots can vary in size from acres down to the size of a penny with little or no visible smoke).

## Water Use Guidelines

- Use water sparingly when it is in short supply.
- Direct water at base of flame.
- Have hand tool personnel work with nozzle personnel to make most effective use of water, especially during mop-up.
- Require good communications between nozzle personnel and water source.
- Plan for ample water supply--request water tenders as needed.
- Coordinate so all units do not run out of water at once during critical period.
- Do not block roads.
- Keep engines pointed in a direction for quick escape.
- After direct attack with water, follow up with a fireline to mineral soil around the entire fire.
- Provide eye protection to all personnel working with nozzle.
- Use foam or other water additives to increase effectiveness and save water.

## **Class-A Foam Use**

- The addition of Class-A foam concentrate to water enhances water's natural ability to extinguish fires burning in Class-A combustibles only.
- Generally speaking, Class-A foams can be safely used on combustibles that leave a rember when consumed by fire.
- Class-A foams work by cooling combustibles below ignition temperature.
- Class-A foams reduce the surface tension of plain water that provides for deeper penetration into fuels.
- Mixture rates for Class-A foam may vary depending on the application from .1% to 1%.
- Class-A foams can be generated in dry or wet consistencies depending on the mixture rates and degree of aeration.
- Class-A foams may be introduced into water streams by any of the following methods:
  - Batch mixing directly into a water tank or water supply.
  - Through the discharge/intake side of the pump proportioning utilizing the Venturi Principle.
  - Positive pressurization that injects foam into the water stream.
- Class-A foams are subjected to tests for approval of acceptable corrosion levels and to establish toxicity levels. Only approved foams should be used.

## **Heavy Equipment Guidelines EQUIPMENT OPERATORS SHALL BE EQUIPPED WITH PERSONAL PROTECTIVE EQUIPMENT (PPE)**

- Ensure that all personnel are aware of location of working equipment.
- Be certain all dozers or tractors used are in good mechanical condition, have approved spark arrestors, have safety canopy, have a clean belly pan and have been signed up under rental agreement, if required.
- Equipment operators have required communications with incident.
- Take advantage of favorable fuels and topography.
- Consider working equipment in tandem especially when working near a fast moving fire for increased production and safety.
- Buck logs and fall trees or snags in fireline as needed.
- Push flammable material to outside of line.
- Any burning material should be pushed well inside the fireline and scattered.
- Allow no one, other than the operator, to ride on equipment.
- During mop-up:
  - Rehab Lines - water bar where necessary.
  - Scatter large logs or hot piles into burned area.
  - Scatter piles on outside of line.

## **Principles of Retardant Application**

- Determine tactics direct or indirect based on fire size-up and resources available.
- Establish an anchor point and work from it.
- Use the proper drop height.
- Apply proper coverage levels.
- Drop downhill and down-sun when feasible.
- Drop into the wind for best accuracy.
- Maintain honest evaluation and effective communication between the ground and air.
- Use direct attack only when ground support is available or extinguishment is feasible.
- Plan drops so they can be extended or intersected effectively.
- Monitor retardant effectiveness and adjust its use accordingly.
  - Must have an air attack and a lead plane on scene in the WUI.
  - Reinforce your retardant lines with crews where possible.

## Directing Retardant and Bucket Drops

- Give general location on incident.
- Finalize location with:
  - Clock direction - straight in front of the aircraft is 12 o'clock, out the right door is 3 o'clock, the tail is 6 o'clock, and the left door is 9 o'clock. When giving direction, remember that helicopters and air attack generally orbit in a right-hand pattern and air tankers in a left-hand pattern.
  - Position on slope - lower third, upper third, mid slope, top of ridge, etc.
  - Aspect - direction slope is facing.
  - Describe prominent landmarks - Don't say, "I have a red hard hat. I'm wearing a yellow shirt. I'm waving. I'm by a big rock. I'm by the big tree." Visualize what the pilot sees from the air and describe the target.
  - Use signal mirrors - use smoke or fusee, if a mirror is unavailable. Stand in drop location (when safe) for identification and move away before drop.
- Describe target from your location and explain mission. The pilot will decide drop technique and flight path.
- Assure pilot all personnel are safe and know aircraft intentions before the drop.
- Give feedback to pilot about drop accuracy. Be honest and constructive. Let the pilot know if drop is early, late, uphill, downhill, on target too high, or too low. Report low drops immediately.

## Helicopter Use Guidelines

Helicopters may be the first unit to arrive at the fire. They are often used to drop water, foam, or fire retardant. The initial attack incident commander should integrate this resource into the control action.

- Helicopters may be used for reconnaissance work.
- Helicopters may be used to transport equipment, supplies, or personnel if certified to do so.

## Burning Out Guidelines

- Always have an anchor point to support burning operations.
- Do not start burning out until a control line has been prepared and adequate firefighting forces are available to hold line.
- Fall snags and remove ladder fuels before burning out.
- When possible, fire from the top down in steep topography; fire into the wind; fire from the lee side or ridge top; fire from a wide canyon bottom; fire from roads or benches.
- You must manage the amount of heat generated; too much heat may cause fire to jump control lines; not enough heat will cause an unclean burn and require extensive mop-up.
- Burning operations must not adversely affect the actions of other firefighting forces.
- Keep those around you informed when burning out; firefighters not kept informed may see the burning operation and think it's a flare-up or slopover.
- Remember the patterns 3-2-1, 1-2-3 depending on the wind and the fire activity.
- Space and stagger your burners to achieve desired results, (hotter or colder).

## INCIDENT MOP-UP

Start mop-up as soon as line construction and burnout operations are completed. All material near the fireline needs to be extinguished to prevent a rekindle and possible escape. Mop-up can be done with water (wet mop-up) or without water (dry mop-up).

## Rules of Mopping Up a Fire

*Rule:* Start work on each portion of line as soon as possible.

*What?* Start with the most dangerous line first. Work from the fireline toward the center of the fire. Small fires are totally extinguished. On larger fires, mop up a minimum of 100 feet, or to such a distance that nothing will blow, roll, or spot across the line.

*Rule:* Secure and extinguish burning materials.

*What?* Arrange burning fuels so they can't roll across the line. Spread smoldering fuels and apply water so they will cool. Scatter fuels away from the line.

*Rule:* Deal with special hazards INSIDE the line.

*What?* Fall snags; extinguish logs and stumps. If you can't fall the snag, clear around the base, so that burning materials will not fall into flammable fuels.

*Rule:* Deal with special hazards OUTSIDE the line.

*What?* Move slash back, away from the fireline. Fall snags and cover with dirt. If stumps are close to the line, cover them with dirt.

*Rule:* Reinforce the fireline.

*What?* Widen and clean the fireline. Reinforce any undercut line. Burn out or cold trail islands. Dig out roots that cross under the fireline. Feel for hot material along the fireline.

*Rule:* Check for spot fires.

*What?* CONSTANTLY check for spot fires, especially downwind from the fireline. CHECK heavier fuels (logs, snags, slash, etc.) for smoldering material.

## **Principles of Mop-Up**

- Start mop-up as soon as line construction and burnout are complete. Mop-up most threatening situations first.
- Allow fuel to burn up if it will do so promptly and safely.
- Mop-up entire area, if practical, on small fires.
- Mop-up large fires far enough inside the fireline to ensure that no fire can blow out, spot, or roll burning materials over the fireline under the anticipated worst possible conditions.
- Fell only those snags which could result in spotting or fire spread across the line.
- Search for smoldering spot fires.
- Consider potential for problems from snags, punky logs, and fuel concentrations outside the control line.
- Search for and dig out burning fuels to reduce heat and danger of spotting.
- Trench below, block, or turn heavy logs, stumps, or material so they cannot roll.
- Feel with the back of your hands for possible smoldering spots close to the line (use care, go slow).
- Use water in conjunction with hand tools. In dry mop-up, stir and mix hot embers with dirt.
- Use water sparingly, but use enough to do the job. Match the amount of water to the job.
- When using water to mop up deep-burning fuels such as peat, duff, or needles, scrape or stir the fuel while applying water.
- Adding wetting agents or foam to water will greatly increase effectiveness of water, especially in deep burning fuels.
- Cold trail.

## **Patrolling the Fire**

- Begins right after fireline has been constructed.
- Intensity of patrol decreases as the danger of a rekindle decreases.
- Assigned specific sections of fireline for patrolling.
- Constantly move along fireline, watching for smoke both inside and outside the fireline, feeling for heat build up in fuels not completely burned up.
- Pay particular attention to areas where only water was used in suppression.

## **HELICOPTER FLIGHTS**

- Prep gear.
- Fasten and secure all straps and buckles to pack.
- Make sure all loose items are secure (shake pack upside down).
- Check with overhead on protocol about fusee, gas and saw prep.
- Insure flaps are over fusee and strikers are down.
- Tape tools edge and put in bundles of 4 to 5. Leave tab on tape for easy access.
- Check saws for leaks (gas, oil).
- Put chaps over bar and wrap power head with bag.
- Never leave gear behind. (tools, packs, saws and radios).
- Line out gear and be prepared to leave at any time.
- PPE-Hard hat, chin strap, eye protection, gloves, ear protection, sleeves rolled down, top button buttoned up.
- Carry tools parallel to the ground.

## AIRPLANE

- Pack only the personal gear you will need until the vehicles arrive.
- The weight limit for the crew is 5300 lbs.
- No contraband or fusees.
- Empty water from canteens and camel packs.
- Be prepared to weigh gear and yourself.
- Secure bags and straps.
- Lineout gear in neat orderly fashion.
- Sit as crew on plane, unless told otherwise.

## Spike / Coyote camp

**Spike Camp:** When the crew is required to stay out in the field without returning to base camp or the Hotshot vehicles to complete a task. The extended amount of time in the field is determined based on the complexity of the fire and the crew supervisor.

- A “Spike Camp manager” will always be designated by a supervisor. He or she will be assigned spike camp duties and responsibilities.
- Everyone is required to pack their own gear first, then assist others with packaging and loading crew gear and equipment.
- Miscellaneous gear and equipment will be loaded into additional flight bags when necessary.
- Specialty bags will be packed by the Spike Camp Managers (e.g. squad spike bag should consist of enough supplies to last 10 people 48 hours. Examples: TP, Batteries, Tarps for crew gear, fiber tape, trash bags.
- Sleeping areas will be maintained daily. All gear will be secured every morning.
- “Hooch’s, Lean-to, Foxhole etc.” will be allowed only upon the discretion to the superintendent or assistant. Everyone is expected to take a turn with meal set up and break down as determined needed by the Spike Camp managers.
- All areas will be inspected for snags by the saw boss.

**Chainsaws  
&  
Pumps**



## **Chainsaw Operations**

### **CROSSCUT AND CHAIN SAW POLICY FOR REGION 3**

1. **Supervision of New Operators.** Class A Sawyers must be supervised by a Class B or Class C Sawyer. Sawyers certified at the B or C levels are not considered new operators and therefore do not require supervision by a higher level operator.
2. **Certification Procedures**
  - a. **Who may be certified.** Forest Service employees and volunteers under agreement that have successfully completed training may be certified as set forth in this directive.
  - b. **Restrictions.** The certifiers have complete authority to impose restrictions. This may include project or size limitations.
  - c. **Instruction and Certification Authority for C Sawyers.** C Sawyers can instruct at the A, B, and C levels. C Sawyers can field certify at the A and B levels, but cannot certify C Sawyers.
  - d. **Instruction and Certification Authority for C Certifiers.** C Certifiers can teach at the A, B, and C levels, and can field certify C Sawyers.
  - e. **C Certifier Qualifications.** A C Sawyer may become a C Certifier by demonstrating advanced communications skills and the ability to transfer and relate concepts to others. It is suggested that "C" Certifiers attend M-410 Facilitative Instructor Training.
3. **Roles and Responsibilities.**
  - a. **First Line Supervisor.** First line supervisors are responsible for ensuring that operators have received proper training and certification prior to the operation of a saw. Training shall include proper PPE and use, first aid, CPR, and bloodborne pathogens and RT-212, Saw Refresher.
  - b. **Certifiers.** Certifiers are responsible for:
    - Assessing the skill of the operator, and documenting that on the Field Evaluation Form.
    - Signing and issuing certification cards for Class A, B, and C operators that have attended the appropriate training and have demonstrated the appropriate level of proficiency.
    - Identifying operating limitations when appropriate. Limitations should refer to operations such as "limbing only," "bucking only," "limbing and bucking only," or "brushing only."
    - Providing documentation to the forest coordinators of who they have certified each year.

Following are suggested review elements:

- (1) Use of personal protective equipment.
- (2) Review of JHA's.
- (3) Safety and tailgate meetings.
- (4) Observation of unsafe practices; corrective actions.
- (5) Review of supervision and instruction of operators who are in training status or who have a restricted operation.
- (6) Use of stump reading to judge the quality of felling work.
- (7) Encouragement of both announced and unannounced saw project inspections.
- (8) Steps to ensure the safety of anyone not directly involved with the felling operation.
- (9) Review of minor chain and crosscut saw accidents with forest safety officer.

# REGION 3

## CHAIN SAW / CROSSCUT OPERATOR EVALUATION

Name: \_\_\_\_\_ Date: \_\_\_\_\_

District/Agency: \_\_\_\_\_ Forest: \_\_\_\_\_

Address: \_\_\_\_\_ Phone: \_\_\_\_\_

Previously Certified: Chainsaw? Yes \_\_\_\_\_ No \_\_\_\_\_ Level: \_\_\_\_\_ Where: \_\_\_\_\_ Year: \_\_\_\_\_

Crosscut? Yes \_\_\_\_\_ No \_\_\_\_\_ Level: \_\_\_\_\_ Where: \_\_\_\_\_ Year: \_\_\_\_\_

Note to Instructors: Use (G)Good, (F)Fair, or (P)Poor to identify proficiency in each area. N/A means applicant was not tested in this area. All blanks need to be filled in.

### SAFETY EQUIPMENT

- Hard Hat
- Long Sleeve Shirt
- Gloves
- Boots
- Wedges (appropriate)
- Eye Protection
- Ax
- Chaps (chainsaw only)
- Ear Protection (chainsaw only)
- Saw Sheath

### HAZARD ANALYSIS

- Top
- Widow Maker
- Bark
- Leaners
- Hang-ups
- Determine Soundness and Lean(s)
- Snags/Green Tree Hazards
- Root Wads/Loose Logs
- Other

### SAW USE

- Saw and Ax Condition
- Safe, Comfortable Body Position
- Throttle Lock Use (chainsaw only)
- Thumb Placement (chainsaw only)
- Starting Procedure
- Bar Tip Use--general (chainsaw only)
- Boring--specific (chainsaw only)
- Handle Placement (crosscut saw only)
- Ax/Saw Selection (crosscut saw only)
- Cut Preparation--bark removal (crosscut saw only)
- Saw Passing (crosscut saw only)

### FELLING PROCEDURE

- Escape Routes/Alternates/Safe Zones
- Swampout
- Plumbing Lean
- Thumb Placement (chainsaw only)
- Undercutting
- Wedging Procedure
- Warning Shout
- Backcutting
- Cutting with Head Up
- Handle Removal (crosscut saw only)
- Gunning cut
- Use of Gunning Sights
- Use of Escape Path/Safe Zone
- Leave It

### STUMP ANALYSIS

- Felled to Desired Lay
- Felled to Other Lay
- Undercut Positioning
- Backcut
- Horizontal Cut
- Sloping Cut
- Undercut as Whole
- Holding Wood
- Stump Shot (height)
- Stump Shot (holding wood)
- Dutchman--one corner
- Dutchman--both corners

### FELLING AREA

- Crew Safety
- Secure Area
- Communication
- Clean Up

**LIMBING**

- Overhead dangers
- Body Positioning
- Thumb Placement (chainsaw only)
- Spring Poles/Tension/Compression
- Limb Removal Sequence
- Use of Bar Tip (chainsaw only)
- Use of Ax (*crosscut saw only*)

**BUCKING**

- Overhead Analysis
- Ground/Hazard Analysis
- Bind/Tension & Compression Analysis
- Thumb Placement (chainsaw only)
- Use of Wedge/Pie Cut (chainsaw only)
- Wedge Techniques (*crosscut saw only*)
- Cut Sequence
- Kerf Observation
- Release Cut Movement
- Protection of saw (*crosscut saw only*)
- Double Bucking (*crosscut saw only*)
- Compound Cut
- Underbucking (*crosscut saw only*)
- Single Bucking (*crosscut saw only*)
- Offset Cutting (*crosscut saw only*)
- Drop Cutting

**COMMENTS:** *i.e., Attitude, Technical Skills, Verbal Skills, Weak-Strong, etc. (be specific):*

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**SKILL LEVEL**

Chain Saw \_\_\_\_\_ (A) Apprentice      \_\_\_\_\_ (B) Intermediate      \_\_\_\_\_ (C) Advanced  
 Crosscut Saw \_\_\_\_\_ (A) Apprentice      \_\_\_\_\_ (B) Intermediate      \_\_\_\_\_ (C) Advanced

Instructor/Certifier: \_\_\_\_\_ Chain Saw: \_\_\_\_\_ Crosscut: \_\_\_\_\_ Level: \_\_\_\_\_

**RESTRICTIONS** (if any):

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Classroom Instruction Given at: \_\_\_\_\_ Date: \_\_\_\_\_

Instructor's Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Level: \_\_\_\_\_

Recommended By (if applicable): \_\_\_\_\_ Title: \_\_\_\_\_

Field Examination Given at: \_\_\_\_\_ Date: \_\_\_\_\_

Examiner's Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Level: \_\_\_\_\_

Supervisor's Signature: \_\_\_\_\_ Title: \_\_\_\_\_ Date: \_\_\_\_\_

# Chain Saw Operations

- Use all of your PPE, always, carry a whistle for signaling

## Hazard Trees

- Trees have been burning for an extended period.
- High-risk tree species (rotten and shallow root system).
- Numerous down trees.
- Dead or broken tips and limbs overhead.
- Accumulation of down limbs.
- Absence of needles, bark, or limbs.
- Leaning or hung-up trees.
- Presence of snags in the fire area.

## Hazard Tree Safety

Environmental conditions that increase snag hazards:

- Strong winds
- Night operations
- Steep slopes
- Diseased or bug-kill areas

## Felling

Felling of snags or large trees (over 20 inches DBH) shall be done by a qualified Class B or C faller. Personnel felling trees less than 20 inches DBH shall be supervised by certified personnel. Tree/snag felling shall meet specific agency faller qualification requirements. Select a clear escape route(s) before starting the cut.

- The area opposite the planned fall of the tree may be the most dangerous. An escape route at right angles to the planned direction of fall, preferably on the contour, should be chosen, unless special circumstances exist.
- If possible, stand behind another tree of sufficient size to provide protection.
- Watch for whiplashed branches and other broken tree parts.
- Stay clear of the butt—be aware of a tree "kicking back" as it falls.
- Watch for falling branches; continue to watch until all broken branches have fallen.
- Be aware of other nearby crews. Notify crewmembers not on the felling team when tree felling will be occurring in their work area.
- Do not fell trees up hill (or upslope) of other crews.
- When felling trees, station a lookout to assist with cutting area control, and to watch and warn the sawyer of falling limbs and tops. Due to power saw noise provide the lookout with a system, such as portable air horn, to signal the sawyer in the event of danger.

## Basic Felling

### Situational Awareness

Analyze the felling job by considering:

- Species (live or dead).
- Heavy snow loading.
- Size and length.
- Bark soundness.
- Soundness or defects.
- Direction of lean.
- Twin tops.
- Degree of lean (slight or great).
- Widow makers and or hangups.
- Head lean or side lean.
- Frozen wood.
- Nesting or feeding holes.
- Rusty (discolored) knots.
- Splits and frost cracks.
- Punky (swollen and sunken) knots.
- Deformities, such as those caused by mistletoe.
- Footing.
- Heavy branches or uneven weight.
- Damage by lightning or fire.
- Spike top. Analyze the base of the tree for: • Thud (hollow) sound when struck.
- Insect activity.
- Conks and mushrooms.
- Feeding holes.
- Rot and cankers.
- Bark soundness.
- Shelf fungi or "bracket".
- Resin flow on bark.
- Wounds or scars.
- Unstable root system or root
- Split trunk. protrusions. Examine surrounding terrain for:
  - Steepness.
  - Stumps.
  - Irregularities in the ground.
  - Loose logs.
  - Draws and ridges.
  - Ground debris that can fly
- Rocks. or kick up at the sawyer. Examine immediate work area for: • People, roads, or vehicles.
- Reserve trees.
- Powerlines.
- Structures.
- Hang ups and widow makers.
- Openings to fall trees.
- Other trees that may be affected.
- Snags.
- Fire-weakened trees.
- Other trees that may have to be felled
- Hazards such as trees felled first
- Rocks, brush, low-hanging limbs.

## Chain Saw Operations Useful Reminders

\*this page is intended to serve as a reminder and supplement training and safety practices\*

- Remember on a saw team you may be separated from the crew and have to make decisions based on, fire behavior, fire location, safety and survival. Keep your Situational Awareness up and constantly reevaluate your escape and safety. Communicate often and know your location.
- Clean your saw every chance you get
  - Check the air filter and clean often, avoid getting fuel on the pre filter
  - Check the chain, is it sharp, is it in good condition, is it on the right way
  - Is the chain tensioned properly
  - Remember a dirty saw still runs, but a dull saw is useless!
  - Is the saw FULL of fuel and bar oil
  - Check the bar nuts
- Avoid using fire saws for project work unless necessary
- Are the dolmars and siggs full?
- Consider # of saw teams needed for operation
- Consider the type of saw line needed (IA, P-line Snagging, Progressive, Leap Frog, Fuel Break, etc...)
- Consider options for saw line placement (direct vs. indirect), and flag appropriately for sawyers
- **CUT YOUR STOBS AND PUNJI STAKES LEVEL AND LOW!**
- Space direct line so that the “scrape can get there before the fire!
- Use natural barriers where available
- Do not forget additional fuel on long operations (bring dolmars if needed)
- Ensure communications are established with every saw team
- Use a procedural approach when felling and bucking, develop good habits
- **DO NOT DROP START THE SAW!**
- When felling trees and snags do a size up on all trees to be felled include the following
  - Scene safety, post a lookout, they may save your life on marginal trees!
  - Approach the tree and assess the surrounding area
  - Look at the tree and conduct your size up
    - Observe top
    - Establish lay
    - Check for snags
    - Swamp out base and escape route
    - Check lean, sounding, disease
    - Walk the lay if needed
    - Double check your escape and safety
    - Warning and Listen
    - Face the tree
    - Clean if needed (no Dutchmen, remember don't over do it)
    - Check the gunning sites (aim the tree!)
    - Warning and listen again
    - Back cut (make it level and leave the appropriate amount of holding wood)
    - Wedge if necessary
    - Escape the stump
    - Analyze operation and move on
- Make sure you cut your share, don't “p line” it and leave the slack for others to pick up
- When swamping make sure the material is out of the way of the scrape
- Have the sawyer cut “windows” if needed
- Swamping is a marathon not a sprint set, a pace and develop good techniques

## Saw Kit Inventory STIHL MS 440/460

ITEM	QUANTITY	STIHL PART #
Spark Plug	1	Bosch WSR 6 F
Rim Sprocket 3/8" 7T	1	1128-007-1000
7/32 Round Files	2	0811-412-8108
Needle Cage	1	9512-933-2380
Tank Vent	1	0000-350-5800
Starter Rope	1	0000-930-2267
Air Filter	1	
Sharp Spare Chains	2	
Bar Nuts	2	0000-955-0801
E Clips	2	9460-624-0801
Raker File	1	0814-252-3356
Raker Gauge *	1	1110-893-4000
Tuning Screwdriver	1	0000-890-2300
Tachometer *	1	
Scrench	1	0812-370-1000
Star Wrench	1	1129-890-2401
Fill Cap	1	0000-350-0525
Killer Tree Flagging	1	NFES 6066

\* Optional  
Chainsaw Reference Card

SAW	PITCH	GUAGE	LENGTH	# DRIVELINK
044/440/046/460	3/8, 0.375	.050	24, 25 inch	84
044/440/046/460	3/8, 0.375	.050	28 inch	91
044/440/046/460	3/8, 0.375	.050	32 inch	105
044/440/046/460	3/8, 0.375	.063	36 inch	114
066/660	3/8, 0.375	.063	42 inch	135
066/660	3/8, 0.375	.063	50 inch	157

### Carburetor Settings

SAW	IDLE	High Output Range	MAX RPM
044/440	2500	12,500 – 13,200	14,000
046/460	2500	12,000 – 12,800	13,500
066/660	2500	12,000 – 12,800	13,500

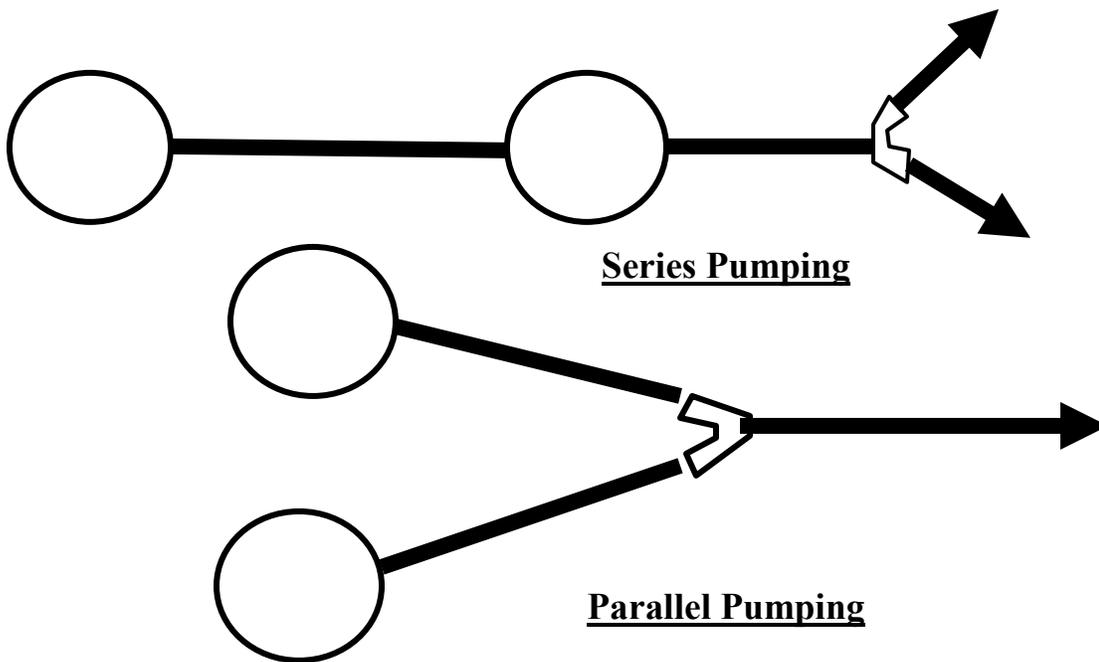
\* Clockwise adjustment increases idle speed and high output \*

### Series Pumping

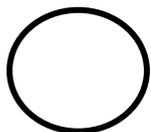
- Can be “pump to pump” or “pump to tank to pump”.
- Used when the pressure generated from a single pump is not sufficient.
- Volume is equal to a single pump, pressure is increased.
- Pumps may be directly in line with each other, or spread out over several thousand feet.
- Knowledgeable operators needed to prevent damage from cavitation.

### Parallel Pumping

- Two pumps into one line via “Siamese” valve.
- Utilize similar pumps whenever possible (ie. 2 Mark III’s).
- Used when additional volume (GPM) is needed.
- Pressure is equal to single pump, volume is increased.
- Considered when multiple laterals will be in use at the same time.



### KEY:



= Pump



= Hose



= Nozzle



=Wye/Siamese

## PORTABLE PUMP OPERATING INSTRUCTIONS

### FUEL

- Use **24:1** mix (that's 5 gal. / ½ qt. oil) Consumption: Mark III, 5 gal. / 3 hours.  
Shindawa 5 gal. / 10 hours.
- Connect fuel can line to tank with quick connect. Loosen lid on tank for venting.

### CAUTIONS:

- Do not run engine at full speed until it is thoroughly warmed up (1 minute).
- Do not run engine with draft hose disconnected.
- Do not run pump dry.
- Do not use suction hose without foot valve strainer.
- Remove and drain pump after final use, and at night if temperatures below freezing.

### SETTING UP AND STARTING MARK III AND MARK 26 PUMPS

- Connect fuel line to fuel can and pump as specified above.
- Connect suction hose to the pump. Be sure to connect the foot valve to the male end of the suction hose. Make sure that the rubber gasket or washer is in place before attaching the female end to the pump. **Tighten firmly with a spanner wrench.** Put the foot valve inside the canvas bucket in the pump kit, and/or use rope or a float to the strainer to keep it from being too close to the water surface or resting on the bottom in the mud.
- Attach wye valve to discharge side of pump. Hand tighten only. Twist priming pump onto one leg of the wye and hose on the other. Close valve to the hose, leave primer valve open. Stroke primer till water squirts out the small holes, or until resistance is too great to keep at it. After priming, close valve to primer and open valve to hose.
- Pull the decompression switch out until it comes to a "click" stop. (New pumps don't have decompression switches).
- Put the choke on START, if the engine is cold.
- Move throttle to "START AND WARM UP" position.
- Give starter rope several quick, steady pulls until engine starts or pops. Turn choke off immediately after engine makes any noise to prevent flooding on the next pull.
- Put choke on RUN and pull engine over until it starts usually 1 to 3 pulls.
- Push decompression switch fully in as soon as engine starts.
- Allow engine to warm up fully (hot to the touch) before using full throttle.

### STOPPING A MARK III OR MARK 26 PUMP

- Move throttle lever to "stop" position.
- Let pump run for about two minutes in this position.
- Press and hold stop switch until engine is fully stopped.

### ORDERING PUMPS:

- Order two pump kits (one is probably short something you really need).
- Hose and appliances: Figure 100 ft. 1" laterals for every 200 ft. 1 ½" trunk line.
- Remember: Gated "Y's", nozzles, hose clamps, reducers, etc.

# Weather Charts



**SPOT REQUEST**

(See reverse for instructions)

Please call the NWS Weather Forecast Office (WFO) when submitting a request and also after you receive a forecast to ensure request and forecast were received.

Please provide feedback to WFO on forecast.

1. Time†	2. Date	3. Name of Incident or Project	4. Requesting Agency
----------	---------	--------------------------------	----------------------

5. Requesting Official	6. Phone Number	7. Fax Number	8. Contact Person
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9. Ignition/Incident Time and Date	12. Reason for Spot Request (choose one only) <input type="radio"/> Wildfire <input type="radio"/> Non-Wildfire Under the Interagency Agreement for Meteorological Services (USFS, BLM, NPS, USFWS, BIA) <input type="radio"/> Non-Wildfire State, tribal or local fire agency working in coordination with a federal participant in the Interagency Agreement for Meteorological Services <input type="radio"/> Non-Wildfire Essential to public safety, e.g. due to the proximity of population centers or critical infrastructure.	13. Latitude/Longitude:	
------------------------------------	---	-------------------------	--

10. Size (Acres)	14. Elevation (ft, Mean Sea Level) Top:                      Bottom:		
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11. Type of Incident <input type="checkbox"/> Wildfire <input type="checkbox"/> Prescribed Fire <input type="checkbox"/> Wildland Fire Use (WFO) <input type="checkbox"/> HAZMAT <input type="checkbox"/> Search And Rescue (SAR)	15. Drainage		16. Aspect 17. Sheltering <input type="checkbox"/> Full <input type="checkbox"/> Partial <input type="checkbox"/> Unsheltered
--	--------------	--	---

18. Fuel Type:    Grass    Brush    Timber    Slash    Grass/Timber Understory    Other \_\_\_\_\_  
 Fuel Model: 1,2,3    4,5,6,7    8,9,10    11,12,13    2,5,8

19. Location and name of nearest weather observing station (distance & direction from project):

20. Weather Observations from project or nearby station(s): (Winds should be in compass direction e.g. N, NW, etc.)

Place	Elevation	†Ob Time	20 ft. Wind		Eye Level Wind		Temp.		Moisture		Remarks <i>(Relevant Weather, etc)</i>
			Dir	Speed	Dir	Speed	Dry	Wet	RH	DP	

21. Requested Forecast Period Date  Start _____ End _____  Forecast needed for: <input type="checkbox"/> Today <input type="checkbox"/> Tonight <input type="checkbox"/> Day 2 <input type="checkbox"/> Extended	22. Primary Forecast Elements (Check all that are needed) <i>(for management ignited wildland fires, provide prescription parameters):</i>  Needed: Sky/Weather <input type="checkbox"/> Temperature <input type="checkbox"/> Humidity <input type="checkbox"/> 20 ft Wind <input type="checkbox"/> Valley <input type="checkbox"/> Ridge Top <input type="checkbox"/> Other (Specify in #23) <input type="checkbox"/>	23. Remarks (other needed forecast elements, forecast needed for specific time, etc.)
--	--	---

24. Send Forecast to: ATTN:	25. Location:	26. Phone Number: Fax Number:
--------------------------------	---------------	----------------------------------

27. Remarks (Special requests, incident details, Smoke Dispersion elements needed, etc.):

EXPLANATION OF SYMBOLS: † Use 24-hour clock to indicate time. Example: 10:15 p.m. = 2215; 10:15 a.m. = 1015  
 Indicate local standard time or local daylight time

TA No. 454-0-1E  
10-63

U. S. DEPARTMENT OF COMMERCE  
WEATHER BUREAU



RELATIVE HUMIDITY  
and  
DEW POINT TABLE

Pressure 30 Inches of Mercury

For use at elevations between 0 and 500 feet above sea level  
(In Alaska use at elevations between 0 and 300 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC



# 0-500 ASL

## WET BULB TEMPERATURES

40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65														
-21	-4	+5	12	18	23	27	30	34	36	39	42	44	46	48	50	52	54	56	58	59	61																		
61	3	7	11	15	19	23	27	31	36	40	44	49	54	58	63	68	73	78	84	90	100																		
-44	-12	+1	9	15	20	25	29	32	35	38	41	43	45	48	50	52	54	57	59	60	62																		
62	4	8	12	16	20	24	28	32	37	41	45	50	54	59	64	69	74	79	84	89	95	100																	
-23	-5	+5	12	18	23	27	31	34	37	39	42	44	46	49	51	53	55	56	58	60	61	63																	
63	2	6	10	14	17	21	25	29	33	38	43	46	51	55	60	64	69	74	79	84	89	95	100																
-50	-13	0	+9	15	19	23	26	30	34	39	43	47	51	56	60	65	70	74	79	84	89	95	100																
64	1	4	8	11	15	19	23	27	31	34	37	40	42	45	49	53	57	59	60	62	63	65	66	67	68	69	70												
-25	-5	+5	12	18	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	60	62	63	65	66	67	68	69	70											
65	6	9	13	16	20	24	28	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50												
-57	-13	0	+9	15	19	23	26	30	34	39	43	47	51	56	60	65	70	74	79	84	89	95	100																
66	7	10	14	18	21	25	29	33	36	39	42	44	46	48	51	54	56	58	60	61	63	64	66																
-26	-6	+3	12	18	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	61	62	64	65	67															
67	2	5	9	12	15	18	21	24	27	31	34	37	41	45	49	54	58	62	66	71	76	80	85	90	95	100													
-14	0	+9	15	19	23	26	30	34	39	43	47	51	56	60	65	70	74	79	84	89	95	100																	
68	2	5	9	12	15	18	21	24	27	31	34	37	41	45	49	54	58	62	66	71	76	80	85	90	95	100													
-26	-6	+3	12	18	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	61	62	64	65	67															
69	2	5	9	12	15	18	21	24	27	31	34	37	41	45	49	54	58	62	66	71	76	80	85	90	95	100													
-14	0	+9	15	19	23	26	30	34	39	43	47	51	56	60	65	70	74	79	84	89	95	100																	
70	3	6	9	12	15	18	21	24	27	31	34	37	41	45	49	54	58	62	66	71	76	80	85	90	95	100													
-25	-5	+5	12	18	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	61	62	64	65	67															
71	2	5	8	11	14	17	20	23	27	30	34	37	41	45	48	52	56	60	64	68	73	77	81	86	90	95	100												
-13	+1	10	16	22	26	30	34	37	40	43	45	47	50	52	54	56	58	59	61	63	64	66	68	69	71	72													
72	3	6	9	12	15	18	21	24	27	31	35	38	42	45	49	53	57	61	65	69	73	77	82	86	91	95	100												
-26	-5	+6	13	19	24	29	32	36	39	42	44	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73												
73	2	4	7	10	13	16	19	22	25	29	32	35	39	42	46	50	54	58	62	66	70	74	78	82	86	91	95	100											
-13	+1	10	16	22	26	30	34	37	40	43	46	48	50	52	54	56	58	60	62	63	65	67	68	70	71	73	74												
74	3	6	9	12	15	18	21	24	27	31	34	37	41	45	48	52	56	60	64	68	72	76	80	84	88	92	96	100											
-25	-4	+6	14	20	25	29	33	36	39	42	45	47	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	74										
75	2	4	7	10	13	16	19	22	25	29	32	35	39	42	46	50	54	58	62	66	70	74	78	82	86	91	95	100											
-57	-12	+2	11	17	23	27	31	35	38	41	44	46	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	74	75									
76	6	9	12	15	18	21	24	27	31	34	37	40	43	46	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	74	75							
-23	+3	+7	15	21	25	30	33	37	40	43	45	48	50	52	54	56	58	60	62	63	65	67	68	70	71	73	74	75	76	77	78	79	80						
77	2	4	7	9	12	15	18	20	23	26	29	32	35	39	42	45	49	52	56	59	63	67	71	75	79	83	87	91	95	100									
-69	-11	+3	12	18	23	28	32	35	39	41	44	47	49	51	53	55	57	59	61	63	65	66	68	69	71	72	74	75	77	78									
78	3	5	8	10	13	16	19	21	24	27	30	33	36	39	43	46	49	53	56	60	63	67	71	75	79	83	87	91	95	100									
-21	-2	+8	15	21	26	30	34	37	40	43	46	48	51	53	55	57	59	61	62	64	66	67	69	70	72	73	75	76	78	79									
79	2	4	6	9	12	14	17	20	22	25	28	31	34	37	40	43	47	50	53	57	60	64	68	71	75	79	83	87	91	95	100								
-43	-9	+4	12	19	24	29	33	36	39	42	45	47	50	52	54	56	58	60	62	64	65	67	68	70	72	73	75	76	78	79									
80	3	5	8	10	13	15	18	21	23	26	29	32	35	38	41	44	47	50	54	57	61	64	68	71	75	79	83	87	91	95	100								
-19	-1	+9	16	22	27	31	35	38	41	44	46	49	51	53	55	57	59	61	62	64	65	67	68	70	72	73	75	76	77	79	80								
81	2	4	6	9	11	14	16	19	21	24	27	30	33	35	38	42	45	48	51	54	58	61	65	68	72	76	80	83	87	91	95	100							
-37	-7	+5	13	20	25	29	33	37	40	43	45	48	50	52	54	56	58	60	62	63	65	67	68	70	71	73	74	76	77										
82	1	3	5	7	10	12	15	17	20	22	25	28	31	33	36	39	42	45	48	52	55	58	62	65	69	72	76	80	83	87	91	95	100						
-16	0	+10	17	23	28	32	35	39	42	44	47	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	74	75	77	78									
83	2	4	6	9	11	13	16	18	21	23	26	29	31	34	37	40	43	46	49	52	55	59	62	65	69	73	76	80	84	88	92	96	100						
-6	+6	14	21	26	30	34	37	41	43	46	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	75	76	78	79	80	82	83						
84	-3	1	3	5	7	10	12	14	17	19	22	24	27	29	32	35	38	41	43	46	49	52	55	59	62	65	69	73	76	80	84	88	92	96	100				
-14	+2	11	18	24	28	33	36	39	42	45	48	50	52	54	56	58	60	62	63	65	67	68	69	71	72	73	75	76	78	79	80	81	83	84					
85	2	4	6	8	11	13	15	18	20	22	25	28	30	33	36	39	42	45	48	51	54	58	61	65	68	72	76	80	84	88	92	96	100						
-4	+8	15	22	27	31	35	38	41	44	46	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	75	76	78	79	80	81	82	84	85				
86	2	4	6	9	12	14	16	18	21	23	26	29	31	34	37	40	43	46	49	52	55	59	62	65	69	72	76	80	84	88	92	96	100						
-11	+3	12	19	25	29	33	37	40	43	46	49	51	53	55	57	59	61	62	64	65	67	68	69	71	72	73	75	76	78	79	80	81	82	83	85	86			
87	2	4	6	8	10	13	15	17	19	22	24	27	29	32	34	37	40	43	46	49	52	55	59	62	65	69	72	76	80	84	88	92	96	100					
-22	-2	+9	17	23	28	32	36	39	42	45	48	50	52	54	56	58	60	62	63	65	67	68	69	71	72	73	75	76	78	79	80	81	82	83	84	86	87		
88	-3	1	3	5																																			



TA No. 454-0-1D  
10-63

U. S. DEPARTMENT OF COMMERCE  
WEATHER BUREAU



# RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 29 Inches of Mercury

For use at elevations between 501 and 1900 feet above sea level  
(In Alaska use at elevations between 301 and 1700 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

## HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC

# 501-1900 ASI

## WET BULB TEMPERATURES

21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
30	-25	-10	0	7	12	16	20	24	27	30				
31	-17	8	17	27	37	46	57	67	77	88	99			
32	-10	5	14	23	32	41	50	59	68	78	88			
33	-3	12	21	30	39	48	57	66	75	84	93			
34	4	13	22	31	40	49	58	67	76	85	94			
35	11	20	29	38	47	56	65	74	83	92	101			
36	18	27	36	45	54	63	72	81	90	99	108			
37	25	34	43	52	61	70	79	88	97	106	115			
38	32	41	50	59	68	77	86	95	104	113	122			
39	39	48	57	66	75	84	93	102	111	120	129			
40	46	55	64	73	82	91	100	109	118	127	136			
41	53	62	71	80	89	98	107	116	125	134	143			
42	60	69	78	87	96	105	114	123	132	141	150			
43	67	76	85	94	103	112	121	130	139	148	157			
44	74	83	92	101	110	119	128	137	146	155	164			
45	81	90	99	108	117	126	135	144	153	162	171			
46	88	97	106	115	124	133	142	151	160	169	178			
47	95	104	113	122	131	140	149	158	167	176	185			
48	102	111	120	129	138	147	156	165	174	183	192			
49	109	118	127	136	145	154	163	172	181	190	199			
50	116	125	134	143	152	161	170	179	188	197	206			
51	123	132	141	150	159	168	177	186	195	204	213			
52	130	139	148	157	166	175	184	193	202	211	220			
53	137	146	155	164	173	182	191	200	209	218	227			
54	144	153	162	171	180	189	198	207	216	225	234			
55	151	160	169	178	187	196	205	214	223	232	241			
56	158	167	176	185	194	203	212	221	230	239	248			
57	165	174	183	192	201	210	219	228	237	246	255			
58	172	181	190	199	208	217	226	235	244	253	262			
59	179	188	197	206	215	224	233	242	251	260	269			
60	186	195	204	213	222	231	240	249	258	267	276			

## DRY BULB TEMPERATURES

46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
47	48	49	50	51	52	53	54	55	56	57	58	59	60	
48	49	50	51	52	53	54	55	56	57	58	59	60		
49	50	51	52	53	54	55	56	57	58	59	60			
50	51	52	53	54	55	56	57	58	59	60				
51	52	53	54	55	56	57	58	59	60					
52	53	54	55	56	57	58	59	60						
53	54	55	56	57	58	59	60							
54	55	56	57	58	59	60								
55	56	57	58	59	60									
56	57	58	59	60										
57	58	59	60											
58	59	60												
59	60													
60														





U. S. DEPARTMENT OF COMMERCE  
WEATHER BUREAU



RELATIVE HUMIDITY  
and  
DEW POINT TABLE

Pressure 27 Inches of Mercury

For use at elevations between 1,900 and 3,900 feet above sea level  
(In Alaska use at elevations between 1,700 and 3,600 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

WET BULB TEMPERATURES

20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35									
-45	-17	-6	+2	8	13	17	21	24	27	30														
3	12	21	30	39	49	58	68	78	89	99														
	-31	-13	-3	+5	10	15	19	22	25	28	31													
	5	14	23	32	41	50	60	69	79	89	99													
	-23	-8	0	+7	12	16	20	24	27	29	32													
	8	17	25	34	43	52	61	71	80	90	100													
	-43	-16	-5	+3	9	14	18	22	25	28	31	33												
	2	11	19	27	36	45	54	63	72	81	91	100												
	-29	-12	-2	+5	11	16	20	23	26	29	32	34												
	5	13	21	29	38	46	55	64	73	82	91	100												
	-21	-7	+1	8	13	17	21	25	28	30	33	35												
	8	16	23	31	40	48	57	65	74	83	91	100												
36	-39	-15	-4	+4	10	15	19	23	26	29	31	34	36	37	38	39	40							
	3	10	18	26	33	42	50	58	66	75	83	91	100											
37		-27	-10	0	+7	12	17	21	24	27	30	32	35	37										
		5	13	20	28	35	43	51	59	67	75	83	92	100										
38		-57	-18	-6	+3	9	14	19	22	26	28	31	34	36	38									
		1	8	15	22	30	37	45	53	60	68	76	84	92	100									
39		-33	-12	-2	+6	11	16	20	24	27	30	32	35	37	39									
		3	10	17	24	32	39	47	54	61	69	76	84	92	100									
40		-23	-7	+2	8	14	18	22	25	28	31	33	36	38	40									
		6	13	19	26	34	41	48	55	62	69	77	84	92	100									
41		-43	-15	-3	+5	11	16	20	23	26	29	32	34	37	39	41								
		2	8	15	22	28	35	42	49	56	63	70	77	85	92	100								
42		-27	-9	0	+8	13	18	21	25	28	31	33	36	38	40	42								
		4	11	17	24	30	37	43	50	57	64	71	78	85	92	100								
43		-18	-5	+4	10	15	19	23	26	29	32	34	37	39	41	43								
		1	7	13	19	26	32	38	45	51	58	64	71	78	85	93	100							
44		-32	-11	-1	+7	12	17	21	24	28	30	33	36	40	42	44								
		3	9	15	21	27	33	39	46	52	59	65	72	79	86	93	100							
45		-21	-6	+3	9	14	19	23	26	29	32	34	37	39	41	43	45							
		5	11	17	23	29	35	41	47	53	59	66	72	79	86	93	100							
		-38	-13	-2	+6	12	16	21	24	27	30	33	36	38	40	42	44							
		2	8	13	19	25	30	36	42	48	54	60	67	73	80	86	93	100						
46		-24	-7	+2	9	14	18	22	26	29	32	34	37	39	41	43	45	47						
		4	10	15	21	26	32	37	43	49	55	61	67	74	80	87	93	100						
47		-46	-15	-3	+5	11	16	20	24	27	30	33	36	38	40	42	44	46	48					
		1	6	12	17	22	28	33	39	44	50	56	62	68	74	80	87	93	100					
48		-26	-9	+1	8	13	18	22	26	29	32	34	37	39	41	43	45	47	49					
		3	8	13	18	24	29	34	40	45	51	57	63	68	75	81	87	93	100					
49		-57	-17	-4	+4	11	16	20	24	27	30	33	36	38	40	42	44	46	48					
		1	5	10	15	20	25	30	36	41	46	52	57	63	69	75	81	87	94	100				
50		-31	-11	0	+7	13	18	22	26	29	32	34	37	39	41	44	46	47	49	51				
		2	7	12	17	22	27	32	37	42	47	53	58	64	70	75	81	88	94	100				
		-20	-5	+4	10	15	20	24	27	30	33	36	38	40	42	44	46	48	50	52				
		9	14	18	23	28	33	38	43	48	54	59	65	70	76	82	88	94	100					
51		-36	-12	-7	+1	7	13	18	22	25	29	32	34	37	39	42	44	46	48	50				
		6	11	15	20	24	29	34	39	44	49	54	59	65	71	76	82	88	94	100				
52		-22	-6	+3	9	14	19	23	26	29	32	34	36	38	41	43	45	47	49	51				
		4	8	12	17	21	26	30	35	40	45	50	55	60	66	71	77	82	88	94	100			
53		-42	-14	-2	+6	12	17	22	25	29	32	35	37	40	42	44	46	48	50	52				
		1	5	9	14	18	23	27	32	36	41	46	51	56	61	66	72	77	83	89	94	100		
54		-25	-7	+2	9	15	20	24	27	30	33	36	39	41	43	45	47	49	51	53	54	56		
		3	7	11	15	20	24	28	33	37	42	47	52	57	62	67	72	78	83	89	94	100		
55		-50	-15	-2	+6	12	17	22	26	29	32	35	37	40	42	44	46	48	50	52	54	56		
		1	5	9	13	17	21	25	30	34	39	43	48	53	57	62	67	73	78	83	89	94	100	
56		-27	-8	+2	9	15	20	24	27	30	33	36	39	41	43	46	48	50	52	54	56	58	60	
		2	6	10	14	18	22	26	31	35	40	44	49	53	58	63	68	73	78	83	89	94	100	
57		-16	-3	+6	12	17	22	26	29	32	35	38	40	42	45	47	49	51	52	54	56	57	59	
		4	8	12	16	20	24	28	32	36	41	45	50	54	59	64	69	73	79	84	89	94	100	
58		-29	-9	+2	9	15	20	24	28	31	34	37	39	41	44	46	48	50	52	53	55	57	58	
		1	5	9	13	17	21	25	29	33	37	41	46	50	55	59	64	69	74	79	84	89	94	100
59		-42	-14	-2	+6	12	17	22	25	29	32	35	37	40	42	44	46	48	50	52	53	55	57	
		1	5	9	14	18	23	27	32	36	41	46	51	56	61	66	71	77	82	88	94	100		
60		-25	-7	+2	9	15	20	24	27	30	33	36	39	41	43	45	47	49	51	53	54	56	58	
		3	7	11	15	20	24	28	33	37	42	47	52	57	62	67	72	78	83	89	94	100		
61		-50	-15	-2	+6	12	17	22	26	29	32	35	37	40	42	44	46	48	50	52	54	56	58	
		1	5	9	13	17	21	25	30	34	39	43	48	53	57	62	67	73	78	83	89	94	100	
62		-27	-8	+2	9	15	20	24	27	30	33	36	39	41	43	46	48	50	52	54	56	57	59	
		2	6	10	14	18	22	26	31	35	40	44	49	53	58	63	68	73	78	83	89	94	100	
63		-16	-3	+6	12	17	22	26	29	32	35	38	40	42	45	47	49	51	52	54	56	57	59	
		4	8	12	16	20	24	28	32	36	41	45	50	54	59	64	69	73	79	84	89	94	100	
64		-29	-9	+2	9	15	20	24	28	31	34	37	39	41	44	46	48	50	52	53	55	57	58	
		1	5	9	13	17	21	25	29	33	37	41	46	50	55	59	64	69	74	79	84	89	94	100
65		-42	-14	-2	+6	12	17	22	25	29	32	35	37	40	42	44	46	48	50	52	53	55	57	
		1	5	9	14	18	23	27	32	36	41	46	51	56	61	66	71	77	82	88	94	100		
66		-25	-7	+2	9	15	20	24	27	30	33	36	39	41	43	45	47	49	51	53	54	56	58	
		3	7	11	15	20	24	28	33	37	42	47	52	57	62	67	72	78	83	89	94	100		
67		-50	-15	-2	+6	12	17	22	26	29	32	35	37	40	42	44	46	48	50	52	54	56	58	
		1	5	9	13	17	21	25	30	34	39	43	48	53	57	62	67	73	78	83	89	94	100	
68		-27	-8	+2	9	15	20	24	27	30	33	36	39	41	43	46	48	50	52	54	56	57	59	
		2	6	10	14	18	22	26	31	35	40	44	49	53	58	63	68	73	78	83	89	94	100	
69		-16	-3	+6	12	17	22	26	29	32	35	38	40	42	45	47	49	51	52	54	56	57	59	
		4	8	12	16	20	24	28	32	36	41	45	50	54	59	64	69	73	79	84	89	94	100	
70		-29	-9	+2	9	15	20	24	28	31	34	37	39	41	44	46	48	50	52	53	55	57	58	
		1	5	9	13	17	21	25	29	33	37	41	46	50	55	59	64	69	74	79	84	89	94	100
71		-42	-14	-2	+6	12	17	22	25	29														





TA No. 454-0-1B  
10-63

U. S. DEPARTMENT OF COMMERCE  
WEATHER BUREAU



RELATIVE HUMIDITY  
and  
DEW POINT TABLE

Pressure 25 Inches of Mercury

For use at elevations between 3901 and 6100 feet above sea level  
(In Alaska use at elevations between 3601 and 5700 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.

USCOMM-WB-DC



# 3901-6100 ASL

## WET BULB TEMPERATURES

35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60																			
29	10	0	+8	13	18	22	26	29	32	34	37	39	41	44	46	49	51	52	53	54	55	56	57	58	59	60																		
26	29	10	14	18	22	26	30	33	35	39	44	49	53	58	63	68	73	78	83	89	94	100																						
18	-4	+4	+11	16	20	24	27	30	33	36	38	41	43	45	47	49	51	52	53	54	55	56	57	58	59	60																		
4	8	12	15	19	23	28	32	36	40	45	50	54	59	64	69	73	79	84	89	94	100																							
31	10	0	+7	13	18	22	26	29	32	35	37	40	42	44	46	48	50	51	53	55	56	57	58	59	60																			
19	-5	+4	+11	16	20	24	28	31	34	36	39	41	43	45	47	49	51	53	54	55	56	57	58	59	60																			
4	7	11	14	18	22	26	30	34	38	42	47	51	55	60	65	69	74	79	84	89	95	100																						
32	11	0	+8	13	18	22	26	29	32	35	38	40	42	44	46	48	50	52	54	55	56	57	58	59	60																			
2	5	9	12	16	19	23	27	31	35	39	43	47	52	56	61	65	70	75	79	84	90	95	100																					
61	3	-5	+4	11	16	21	24	28	31	34	37	39	41	43	46	48	49	51	53	55	56	58	59	61																				
33	-11	0	+8	14	19	23	26	30	33	35	38	40	43	45	47	49	51	52	54	56	57	59	61	62																				
1	5	8	11	15	18	22	26	29	33	37	41	45	49	53	57	62	66	71	75	80	85	90	95	100																				
63	-19	-5	+4	11	16	21	25	28	31	34	37	39	42	44	46	48	50	52	54	55	57	58	60	62	63																			
3	6	9	13	16	20	23	27	30	34	38	42	46	50	54	58	62	67	71	76	80	85	90	95	100																				
64	-34	-11	0	+8	14	19	23	27	30	33	36	38	41	43	45	47	49	51	53	55	56	58	60	61	63	64																		
4	8	11	14	17	21	24	28	31	35	39	43	46	50	54	58	63	67	72	76	81	85	90	95	100																				
19	-4	+5	11	17	21	25	29	32	35	37	40	42	44	47	49	50	52	54	56	57	59	61	62	64	65																			
3	6	9	12	15	19	22	25	29	32	36	40	43	47	51	55	59	63	68	72	76	81	86	90	95	100																			
66	33	10	+1	8	14	19	23	27	31	34	36	39	41	44	46	48	50	52	53	55	57	58	60	62	63	65																		
1	4	7	10	13	16	20	23	26	30	33	37	40	44	48	52	56	60	64	68	72	77	81	86	90	95	100																		
67	-19	-4	+5	12	17	22	26	29	32	35	38	40	43	45	47	49	51	53	55	56	58	60	61	63	64	66	67																	
3	6	8	11	15	18	21	24	27	31	34	38	41	45	49	52	56	60	64	68	73	77	81	86	90	95	100																		
68	-32	-10	+1	9	15	20	24	28	31	34	37	39	42	44	46	48	50	52	54	56	57	59	61	62	64	65	67	68																
4	7	10	13	16	19	22	25	28	32	35	39	42	46	49	53	57	59	60	64	68	73	77	82	86	91	95	100																	
69	-18	-3	+6	12	18	22	26	30	33	36	38	41	43	45	47	49	51	53	55	57	59	60	62	63	65	66	68	69																
3	5	8	11	14	17	20	23	26	29	33	36	39	43	46	50	54	57	61	65	69	73	78	82	86	91	95	100																	
70	-31	-9	+2	9	15	20	25	28	32	35	37	40	42	44	47	49	51	53	55	56	58	60	61	63	64	66	67	69	70															
4	7	10	12	15	18	21	24	27	30	33	37	40	43	47	51	54	58	62	66	70	74	78	82	86	91	95	100																	
71	-17	-3	+6	13	18	23	27	30	33	36	39	41	44	46	48	50	52	54	56	57	59	61	62	64	65	67	68	69	70															
1	4	7	10	13	16	19	22	25	28	31	34	38	41	44	48	51	55	58	62	66	70	74	78	82	87	91	95	100																
72	-29	-4	+6	10	16	21	25	29	32	35	38	41	43	45	47	49	51	53	55	57	59	60	62	63	65	66	68	69	71	72														
1	4	6	9	12	14	17	20	23	26	29	32	35	38	42	45	48	52	55	59	63	66	70	74	78	83	87	91	95	100															
73	-15	-2	+7	14	19	23	27	31	34	37	40	42	44	47	49	51	53	55	56	58	60	61	63	64	66	67	69	70	72	73														
1	3	5	8	10	13	16	18	21	24	27	30	33	36	39	42	46	49	52	56	59	63	67	71	75	79	83	87	91	96	100														
74	-26	-7	+4	11	17	22	26	30	33	36	39	41	44	46	48	50	52	54	56	58	59	61	62	64	65	67	68	69	71	72	73	74												
1	4	6	9	11	14	17	19	22	25	28	31	34	37	40	43	46	49	52	56	59	63	67	71	75	79	83	87	91	96	100														
75	-52	-14	0	+8	15	20	24	28	32	35	38	40	43	45	47	49	51	53	55	57	59	60	62	64	65	67	68	69	71	72	73	74	75											
2	4	6	9	11	13	16	19	22	25	28	31	34	37	40	43	46	49	52	56	59	63	67	71	75	79	83	87	91	96	100														
76	-24	-5	+5	12	18	22	27	30	33	36	39	41	43	45	47	49	51	53	55	56	58	60	62	63	65	66	68	69	71	72	73	74	75											
2	4	6	9	11	13	16	19	22	25	28	31	34	37	40	43	46	49	52	56	59	63	67	71	75	79	83	87	91	96	100														
77	-43	-12	+1	9	15	21	25	29	32	35	38	41	43	45	47	49	51	53	55	57	59	61	63	64	66	67	69	70	72	73	74	76	77											
3	5	7	10	12	14	17	19	22	25	28	31	34	37	40	43	46	49	52	56	59	63	67	71	75	79	83	87	91	96	100														
78	-21	-4	+6	13	19	23	27	31	34	37	40	43	45	47	49	51	53	55	57	59	61	62	64	65	67	68	70	71	73	74	75	77	78											
2	4	6	8	10	12	15	17	19	21	24	26	29	31	34	37	40	42	45	48	51	54	57	60	63	67	70	73	77	81	84	88	92	96	100										
79	-36	-10	+2	10	16	21	26	30	33	36	39	42	44	46	49	51	53	55	57	58	60	62	63	65	66	68	69	71	72	74	75	76	78	79										
1	3	5	7	9	12	14	16	19	21	24	26	29	32	35	37	40	43	46	49	52	56	59	62	66	69	71	72	74	75	76	78	79	80	81	82	83	84	85						
1	3	5	7	9	12	14	16	19	21	24	26	29	32	35	37	40	43	46	49	52	56	59	62	66	69	71	72	74	75	76	78	79	80	81	82	83	84	85						
80	-18	-2	+7	14	20	24	28	32	35	38	41	43	45	47	49	51	53	55	56	58	60	61	63	65	66	68	69	71	72	73	75	76	77	79	80	81	82	83	84	85				
1	3	5	7	9	11	13	15	17	20	22	25	27	30	32	35	38	41	44	47	50	53	56	59	63	66	69	73	77	80	84	88	92	96	100										
81	-31	-8	+4	11	17	22	27	30	34	37	40	42	45	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73	75	76	77	78	79	80	81	82	83	84	85				
1	3	5	7	9	11	14	16	18	21	23	25	28	31	34	37	40	43	46	49	52	56	59	63	66	70	73	77	80	84	88	92	96	100											
82	-57	-15	+1	+8	15	21	25	29	33	36	39	41	44	46	49	51	53	55	57	59	60	62	64	65	67	68	70	71	73	74	75	77	78	79	80	81	82	83	84	85				
2	4	6	8	10	12	15	17	19	21	24	26	29	31	34	37	40	42	45	48	51	54	57	60	63	67	70	73	77	81	84	88	92	96	100										
83	-26	-6	+5	13	19	23	28	31	35	38	41	43	45	47	49	51	53	55	56	58	60	61	63	65	66	68	69	71	72	74	75	76	78	79	80	81	82	83	84	85				
1	3	5	7	9	11	13	15	18	20	22	25	27	29	32	35	37	40	43	46	49	52	54	56	57	59	61	63	64	66	68	69	71	72	73	75	76	78	79	80	81	82	83	84	85
84	-49	-12	+1	10	16	22	26	30	34	37	40	42	45	47	49	51</																												

# WET BULB TEMPERATURES 3901-6100 ASL

	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90				
86	-37	-9	+3	11	18	23	27	31	34	38	40	43	46	48	50	52	54	56	58	60	62	63	65	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86			
87	-17	-2	-1	4	6	8	10	12	14	16	18	20	22	25	27	29	32	34	36	38	40	42	43	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	85	86
88	-29	-6	+5	13	19	24	28	32	35	38	41	44	46	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90							
89	-13	+1	10	17	22	27	31	34	37	40	43	46	48	50	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90								
90	-22	-3	+7	14	20	25	29	33	36	39	42	45	47	50	52	54	56	58	60	62	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90							
91	-40	-9	+4	12	18	23	28	32	35	38	41	44	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90							
92	-17	-1	+9	16	22	26	30	34	37	40	43	46	48	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90								
93	-29	-6	+6	14	20	25	29	33	36	39	42	45	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90							
94	-12	+2	11	18	23	28	32	35	38	41	44	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90								
95	-22	-3	+8	15	21	26	30	34	37	40	43	46	48	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90								
96	-39	-8	+4	13	19	24	29	33	36	40	42	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90						
97	-16	+0	+10	17	23	27	32	35	39	42	44	47	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	79	81	82	83	84	85	86	87	88	89	90								
98	-27	-4	+7	13	19	24	29	33	36	40	42	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90						
99	-54	+3	12	19	24	29	33	36	40	43	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
100	-19	-1	+9	17	22	27	32	35	39	42	45	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
101	-33	-6	+4	12	18	23	28	32	35	38	41	44	46	49	51	53	55	57	59	61	63	65	67	69	71	73	75	77	78	80	81	82	83	84	85	86	87	88	89	90						
102	-13	+2	10	16	21	26	30	34	37	40	43	46	48	51	53	55	57	59	61	63	65	67	69	71	73	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
103	-22	-4	+9	16	22	27	32	35	39	42	45	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
104	-39	-7	+5	14	20	26	30	34	38	41	44	47	49	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
105	-14	+2	11	18	24	29	33	37	40	43	46	49	51	53	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
106	-25	-3	+8	16	22	27	32	36	39	42	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
107	-47	-8	+5	14	20	26	30	34	38	41	44	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
108	-16	+1	11	18	24	29	33	37	40	44	46	49	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
109	-27	-3	+8	16	23	28	32	36	39	43	46	48	51	53	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
110	-58	-9	+5	14	21	26	31	35	38	42	45	48	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
111	-17	-1	+1	19	24	29	34	37	41	44	47	49	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
112	-29	-4	+9	16	22	27	32	35	39	42	45	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90							
113	-10	+5	14	21	26	30	34	38	41	44	47	49	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
114	-18	+1	11	19	25	30	34	38	41	44	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
115	-31	-4	+9	17	23	28	32	36	39	43	46	48	51	53	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
116	-10	+5	14	21	26	30	34	38	41	44	47	49	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
117	-18	+1	12	19	25	30	34	38	41	44	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
118	-31	-4	+9	17	24	29	33	37	41	44	47	50	52	54	56	58	60	62	64	66	68	70	72	74	75	77	78	80	81	82	83	84	85	86	87	88	89	90								
119	-9	+6	15	22	27	32	36	40	43	46	49	52	54	57	59	61	63	65	67	69	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90						

## DRY BULB TEMPERATURES

U. S. DEPARTMENT OF COMMERCE  
WEATHER BUREAU



RELATIVE HUMIDITY  
and  
DEW POINT TABLE

Pressure 23 Inches of Mercury

For use at elevations between 6101 and 8500 feet above sea level  
(In Alaska use at elevations between 5701 and 7900 feet above sea level)

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

HOW TO USE THE TABLE

Locate at the top of the column the reading corresponding to the wet bulb temperature. Locate at the left side of the table the reading corresponding to the dry bulb temperature. Follow down the column under the wet bulb temperature, and across from the dry bulb temperature; at the intersection of these two columns will be found the relative humidity (%) in black and the dew point (°F.) in red.





# 6101-8500 ASL

## WET BULB TEMPERATURES

46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85			
-23	-5	+5	12	17	22	26	30	33	36	39	42	44	46	48	50	52	54	56	58	60	61	63	64	66	68	69	70	72	73	74	75	76	77	78	79	80	81	82	83	84	85	
1	3	5	7	9	11	13	16	18	20	22	25	27	30	32	35	37	40	43	45	48	51	54	57	60	64	67	70	72	73	74	75	76	77	78	80	81						
-40	-11	+1	9	15	20	25	29	32	35	38	41	43	46	48	50	52	54	56	57	59	61	62	64	66	67	69	70	71	72	73	74	76	77	78	79	81	82					
1	2	4	6	8	10	12	14	16	19	21	23	25	28	30	33	35	38	41	43	46	49	52	55	58	61	64	67	71	74	77	78	81	85	88	92	96	100					
-19	-3	+6	13	19	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	60	62	64	65	67	68	70	71	73	74	75	77	78	79	80	82	83						
2	3	5	7	9	11	13	15	17	19	22	24	26	29	31	33	36	38	41	44	47	49	51	53	55	58	61	64	68	71	74	78	81	85	88	92	96	100					
-31	-8	+3	11	17	22	26	30	33	36	39	42	44	46	49	51	53	56	58	60	62	63	65	66	68	69	71	72	73	74	75	76	78	79	80	82	83	84					
1	3	4	6	8	10	12	14	16	18	20	22	25	27	29	32	34	37	39	42	44	47	49	52	53	56	59	62	65	68	71	74	78	81	85	89	92	96	100				
-15	-1	+8	14	20	24	28	32	35	38	41	43	46	48	50	52	54	56	58	59	61	63	64	66	68	69	70	72	73	75	76	77	79	80	81	83	84	85					
2	4	5	7	9	11	13	15	17	19	21	23	25	28	30	32	35	37	40	42	45	48	50	53	56	59	62	65	68	71	75	78	81	85	89	92	96	100					
86	-25	-6	+5	12	18	23	27	31	34	37	40	42	45	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73	74	76	77	78	80	81	82	84	85				
1	3	4	6	8	10	12	14	16	18	20	22	24	26	28	31	33	35	38	40	43	45	48	51	54	56	59	62	65	68	72	75	78	82	85	89	92	96	100				
87	-44	-12	+1	9	16	21	26	29	33	36	39	42	44	46	49	51	53	55	57	59	60	62	64	65	67	68	70	71	73	74	75	77	78	79	81	82	83	85				
2	4	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	36	38	41	43	46	48	51	54	57	60	63	66	69	72	75	78	82	85	89	92	96	100				
88	-20	-3	+7	14	19	24	28	32	35	38	41	43	46	48	50	52	54	56	58	60	62	63	65	66	68	69	71	72	74	75	77	78	79	81	82	83	84					
1	3	5	6	8	10	12	13	15	17	19	21	23	25	27	29	32	34	36	39	41	44	46	49	52	54	57	60	63	66	69	72	75	79	82	85	89	92	96	100			
89	-33	-8	+3	11	17	22	27	30	34	37	40	43	45	47	50	52	54	56	58	59	61	63	64	66	68	69	71	72	73	75	76	78	79	80	82	83	84					
1	2	4	5	7	9	11	12	14	16	18	20	22	24	26	28	30	32	35	37	39	42	44	47	49	52	54	57	60	63	66	69	72	76	79	82	86						
-15	-1	+8	15	21	25	29	33	36	39	42	44	47	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73	75	76	77	79	80	81	83	84							
2	3	5	6	8	10	11	13	15	17	19	21	22	25	27	29	31	33	35	38	40	42	45	47	50	52	55	58	61	64	67	70	73	76	79	80	81	83	84				
91	-25	-5	+5	13	19	24	28	32	35	38	41	43	46	48	50	52	54	56	58	60	62	64	65	67	68	70	71	73	74	76	77	78	80	81	82	84	85					
1	2	4	5	7	9	10	12	14	16	17	19	21	23	25	27	29	31	34	36	38	40	43	45	48	50	53	56	58	61	64	67	70	73	76	79	80	81	82	83	84	85	
92	-44	-12	+3	10	17	22	27	30	34	37	40	43	45	48	50	52	54	56	58	60	62	64	65	67	68	70	71	73	74	75	77	78	79	81	82	83						
2	4	5	7	9	11	13	15	17	19	21	23	25	27	29	31	33	36	38	41	43	46	48	51	54	57	60	63	66	69	72	75	78	82	85	89	92	96	100				
93	-18	-3	+8	15	20	25	29	33	36	39	42	44	47	49	51	53	55	57	59	61	63	64	66	68	69	71	72	74	75	76	77	79	80	81	82	83						
1	3	4	6	7	9	10	12	14	15	17	19	21	23	24	26	28	30	32	34	36	39	41	44	46	49	51	54	56	59	62	65	68	71	74	77	80	82	83				
94	-31	-7	+4	12	18	23	28	32	35	38	41	44	46	49	51	53	55	57	59	61	62	64	66	67	69	70	72	73	75	76	78	79	80	82	83							
1	2	3	5	6	8	9	11	13	14	16	18	20	21	23	25	27	29	31	33	35	37	39	41	44	46	49	51	54	57	60	63	66	69	72	76	79	82	86				
-13	+1	3	4	6	7	9	10	12	13	15	17	18	20	22	24	26	28	30	32	34	36	38	40	42	45	47	49	52	54	57	60	62	65	68	71	74	77	80	81	83		
96	-22	-3	+7	14	20	25	29	33	36	39	42	44	47	49	51	53	55	57	59	61	63	64	66	68	69	71	72	74	75	76	77	78	80	81	82	84						
1	2	4	5	6	8	9	11	12	14	16	17	19	21	23	24	26	28	30	32	34	36	38	40	43	45	47	49	51	54	56	59	62	65	68	71	74	77	80	82	83		
97	-38	-9	+4	12	18	23	28	32	35	38	41	44	46	49	51	53	55	57	59	61	63	64	66	68	69	71	72	74	75	77	78	79	81	82								
2	3	4	6	7	9	10	12	13	15	16	18	20	21	23	25	27	29	31	33	35	37	39	41	43	45	48	50	53	55	58	60	63	66	69	72	75	78	80	82	83		
98	-16	0	+9	16	22	26	30	34	37	40	43	46	48	50	53	55	57	59	61	62	64	66	67	69	71	72	74	75	76	77	79	80	81	83								
1	2	4	5	6	8	9	11	12	14	15	17	19	20	22	24	26	28	30	32	34	36	38	40	42	45	47	49	52	54	57	60	62	65	68	71	74	77	80	81	82		
99	-26	-5	+6	14	20	25	29	33	36	39	42	44	46	49	51	53	55	57	59	61	62	64	66	68	69	71	72	73	75	76	78	79	80	82								
1	2	3	4	6	7	9	10	11	13	14	16	18	19	21	23	24	26	28	30	32	34	36	38	40	42	44	46	49	51	54	57	60	63	66	69	72	76	79	82	86		
-47	-10	+3	11	18	23	28	32	35	39	42	44	47	49	51	54	56	58	60	61	63	65	67	68	70	71	73	74	76	77	79	80	81	83									
1	3	4	5	7	8	9	11	12	14	15	17	18	20	21	23	25	27	29	31	33	35	37	39	41	44	46	48	51	53	55	58	60	62	65	68	71	74	77	80	81	82	
101	-18	-1	+9	16	22	26	31	34	38	41	43	46	49	51	53	55	57	59	61	63	65	66	68	70	71	73	74	76	77	78	80	81	82									
1	2	3	5	6	7	9	10	11	13	14	16	17	19	20	22	24	25	27	29	31	33	35	37	39	41	43	45	47	50	52	55	57	60	63	65	68	71	74	77	80		
102	-29	-6	+6	14	20	25	29	33	37	40	43	45	48	50	53	55	57	59	61	62	64	66	68	69	71	72	74	75	77	78	80	81	82</									



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NATIONAL WEATHER SERVICE

DRY BULB TEMPERATURES

	-3	-2	-1	0	1	2	3	4	5
0	-31	-18	-10	-4					
1	-21	-10	-4	0	-3				
2	-11	-4	0	4	8	5			
3	-1	4	8	12	16	20	24		
4	7	11	15	19	23	27	31	35	
5	13	17	21	25	29	33	37	41	45

### RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 21 Inches of Mercury

For use at elevations between 8,501 and 11,000 feet above sea level.

(In Alaska, use at elevations between 7,901 and 10,000 feet above sea level.)

	6	7	8	9	10	
6	-58	-27	-15	-8	-2	3
7	-46	-24	-13	-6	0	4
8	-34	-21	-11	-4	1	5
9	-22	-13	-6	0	4	8
10	-10	-4	1	5	9	13

	11	12	13	14	15	
11	-49	-24	-13	-6	0	5
12	-37	-21	-11	-4	1	6
13	-25	-14	-7	-1	3	7
14	-13	-6	0	4	8	11
15	-1	4	8	12	16	20

#### HOW TO USE THE TABLE

Locate the wet bulb temperature in the headings which read horizontally from left to right at the top of the columns. Locate the dry bulb temperature in the columns which read vertically from top to bottom at the left side of the table. Follow down the column under the wet bulb temperature and across the line from the dry bulb temperature; at the intersection of the column and line will be found the relative humidity (%) in black, and the dew point (°F) in red.

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

	16	17	18	19	20			
16	-37	-19	-10	-3	2	7	11	14
17	-25	-13	-6	0	4	8	12	15
18	-13	-6	0	4	8	12	16	19
19	-1	4	8	12	16	20	24	27
20	7	11	15	19	23	27	31	35

	21	22	23	24	25						
21	-24	-14	-6	0	4	8	12	16	19	22	25
22	-12	-4	1	5	9	13	17	20	23	26	29
23	0	4	8	12	16	20	24	27	30	33	36
24	8	12	16	20	24	28	31	34	37	40	43
25	16	20	24	28	31	34	37	40	43	46	49

WET BULB TEMPERATURES

#### NOTE

This table was computed by use of the presently accepted psychrometric formulae. But at temperatures below 32°F the tables may and probably do depart significantly from physically-correct values. Vapor pressure over water, to which modern meteorological hygrometric tables are referred, is not known exactly at temperatures below the freezing point of water. The error is thought to be small near freezing and to grow to large proportions at very low temperatures. Furthermore the psychrometric equation itself is suspect at low temperatures. Because of (1) the difficulties of obtaining accurate wet and dry bulb readings at temperatures below 32°F, (2) the extreme sensitivity of tabular values to small differences in wet bulb depression at very low temperatures, and (3) other possible errors discussed above; the total error in psychrometrically derived dew points at 10°F and below may reach serious proportions.

	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
31	-38	-18	-8	-1	5	10	14	17	21	23	26	28	31	33	35	37	39
32	-28	-13	-5	2	7	11	15	19	22	25	27	29	31	32	34	35	37
33	-18	-7	1	6	11	15	19	22	25	27	29	31	32	34	35	37	38
34	-8	3	11	17	21	25	28	31	33	35	37	38	40	41	43	44	45
35	2	10	17	23	28	32	35	38	40	42	44	45	47	48	50	51	52

## 8501-11000 ASL

	36	37	38	39	40												
36	-39	-18	-7	0	4	11	15	18	22	25	27	30	32	34	36	38	40
37	-29	-13	-5	2	7	11	15	19	22	25	27	29	31	32	34	35	37
38	-19	-8	0	5	10	14	18	22	25	27	29	31	32	34	35	37	38
39	-9	2	10	16	21	25	28	31	33	35	37	38	40	41	43	44	45
40	1	9	16	22	27	31	34	37	40	42	44	45	47	48	50	51	52

	41	42	43	44	45												
41	-24	-14	-6	0	4	11	15	18	22	25	27	30	32	34	36	38	40
42	-12	-4	1	5	9	13	17	20	23	26	29	31	32	34	35	37	38
43	0	4	8	12	16	20	24	27	30	33	35	37	38	40	41	43	44
44	8	12	16	20	24	28	31	34	37	40	42	44	45	47	48	50	51
45	16	20	24	28	31	34	37	40	42	44	45	47	48	50	51	52	53

DRY BULB TEMPERATURES

	46	47	48	49	50																
46	-44	-18	-6	2	8	13	16	20	23	26	29	31	34	36	38	40	42	44	45	47	
47	-32	-11	2	7	11	15	19	22	25	27	29	31	32	34	35	37	38	40	41	43	44
48	-22	-1	6	11	15	19	22	25	27	29	31	32	34	35	37	38	40	41	43	44	45
49	-12	0	7	12	16	20	23	26	29	31	32	34	35	37	38	40	41	43	44	45	46
50	-2	6	13	18	23	27	31	34	37	40	42	44	45	47	48	50	51	52	53	54	55





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NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION  
NATIONAL WEATHER SERVICE

DRY BULB TEMPERATURES

-18	-17	-16	-15	-14	-13	-12	-11	-10
-17	-35	-22						
-16	-31	-33	-21					
-15	-41	-31	-20					
-14	-54	-30	-19					
-13		-49	-29	-18				
-12			-45	-26	-17			
-11				-41	-25	-16		
-10					-38	-23	-15	

# RELATIVE HUMIDITY and DEW POINT TABLE

Pressure 19 Inches of Mercury

For use at elevations between 11,001 and 13,500 feet above sea level.

(In Alaska, use at elevations between 10,001 and 12,500 feet above sea level.)

### HOW TO USE THE TABLE

Locate the wet bulb temperature in the headings which read horizontally from left to right at the top of the columns. Locate the dry bulb temperature in the columns which read vertically from top to bottom at the left side of the table. Follow down the column under the wet bulb temperature and across the line from the dry bulb temperature; at the intersection of the column and line will be found the relative humidity (%) in black, and the dew point (°F) in red.

### NOTE

This table was computed by use of the presently accepted psychrometric formulae. But at temperatures below 32°F the tables may and probably do depart significantly from physically-correct values. Vapor pressure over water, to which modern meteorological hygrometric tables are referred, is not known exactly at temperatures below the freezing point of water. The error is thought to be small near freezing and to grow to large proportions at very low temperatures. Furthermore the psychrometric equation itself is suspect at low temperatures. Because of (1) the difficulties of obtaining accurate wet and dry bulb readings at temperatures below 32°F, (2) the extreme sensitivity of tabular values to small differences in wet bulb depression at very low temperatures, and (3) other possible errors discussed above; the total error in psychrometrically derived dew points at 10°F and below may reach serious proportions.

Values in the body of the table are relative humidities (in percent) and dew points (in deg. Fahr.), with respect to water, for indicated values of wet and dry bulb temperatures in degrees Fahrenheit.

WET BULB TEMPERATURES

WET BULB TEMPERATURES										
6	7	8	9	10	11	12	13	14	15	
13	-49	-25	-14	-7	-1	3	7	11		
14	-39	-21	-12	-5	0	5	8	12		
15		-32	-18	-10	-3	2	6	10	13	
16	-58	-27	-15	-8	-2	3	7	11	14	
17		-43	-23	-12	-5	0	5	9	12	15
18			-34	-19	-10	-3	2	6	10	13
19				-20	-15	-8	-2	3	8	11
20					-10	-2	3	8	11	14
21						-5	0	5	9	13
22							5	10	14	18
23								10	15	20
24									15	21
25										22
26										23
27										24
28										25
29										26
30										27
31										28
32										29
33										30
34										31
35										32
36										33
37										34
38										35
39										36
40										37
41										38
42										39
43										40
44										41
45										42

11001-13500 ASL

DRY BULB TEMPERATURES

11001-13500 ASL

WET BULB TEMPERATURES

Table with columns 26-50 and rows 46-50. Values range from -28 to 50.

Table with columns 51-55 and rows 51-55. Values range from -28 to 55.

Table with columns 56-60 and rows 56-60. Values range from -28 to 60.

Table with columns 61-65 and rows 61-65. Values range from -28 to 65.

DRY BULB TEMPERATURES

Table with columns 66-70 and rows 66-70. Values range from -19 to 70.

Table with columns 71-75 and rows 71-75. Values range from -13 to 75.

Table with columns 76-80 and rows 76-80. Values range from -26 to 80.

Table with columns 81-85 and rows 81-85. Values range from -27 to 85.

Table with columns 86-90 and rows 86-90. Values range from -28 to 90.

Table with columns 91-95 and rows 91-95. Values range from -28 to 95.

WET BULB TEMPERATURES

Table with columns 41-80 and rows 76-80. Values range from -26 to 80.

Table with columns 81-120 and rows 81-85. Values range from -27 to 120.

Table with columns 121-160 and rows 86-90. Values range from -28 to 160.

Table with columns 161-200 and rows 91-95. Values range from -28 to 200.

Table with columns 201-240 and rows 96-100. Values range from -28 to 240.

Table with columns 241-280 and rows 101-105. Values range from -28 to 280.

Exposed- Less than 50% shading of surface fuels																						
Aspect	Slope	0800 to			1000 to			1200 to			1400 to			1600 to			1800 to					
		B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A			
N	0-30%	2	3	4	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	2	3	4
	31%+	3	4	4	1	2	2	1	1	2	1	1	2	1	2	2	2	2	2	3	4	4
E	0-30%	2	2	3	1	1	1	0	0	1	0	0	1	1	1	1	2	3	4	4	4	4
	31%+	1	2	2	0	0	1	0	0	1	1	1	2	2	3	4	4	4	5	6	6	6
S	0-30%	2	3	3	1	1	1	0	0	1	0	0	1	1	1	1	1	1	1	2	3	3
	31%+	2	3	3	1	1	2	0	1	1	0	1	1	1	1	1	2	2	2	3	3	3
W	0-30%	2	3	4	1	1	2	0	0	1	0	0	1	0	1	1	1	1	1	2	3	3
	31%+	4	5	6	2	3	4	1	1	2	0	0	1	0	0	1	1	1	1	2	2	2
Shaded- Greater than or equal to 50% shading of surface fuels																						
N	All	4	5	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	5	4	5	5
E	All	4	4	5	3	4	5	3	3	4	3	4	4	3	4	5	4	5	6	4	5	6
S	All	4	4	5	3	4	5	3	3	4	3	3	4	3	4	5	4	5	6	4	5	6
W	All	4	5	6	3	4	5	3	3	4	3	3	4	3	4	5	4	4	5	4	4	5

Dead Fuel Moisture Content Corrections  
May June July

Exposed- Less than 50% shading of surface fuels																						
Aspect	Slope	0800 to			1000 to			1200 to			1400 to			1600 to			1800 to					
		B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A			
N	0-30%	3	4	5	1	2	3	1	1	2	1	1	2	1	2	3	3	3	4	4	5	5
	31%+	3	4	5	3	3	4	2	3	4	2	3	4	3	3	4	3	3	4	3	4	5
E	0-30%	3	4	5	1	2	3	1	1	1	1	1	2	1	2	3	3	3	4	4	5	5
	31%+	3	3	4	1	1	1	1	1	1	1	2	3	3	4	5	4	5	6	4	5	6
S	0-30%	3	4	5	1	2	2	1	1	1	1	1	1	1	2	3	3	3	4	4	5	5
	31%+	3	4	5	1	2	2	0	1	1	0	1	1	1	2	2	2	3	4	4	5	5
W	0-30%	3	4	5	1	2	3	1	1	1	1	1	1	1	2	3	3	3	4	4	5	5
	31%+	4	5	6	3	4	5	1	2	3	1	1	1	1	1	1	3	3	4	4	5	6
Shaded- Greater than or equal to 50% shading of surface fuels																						
N	All	4	5	6	4	5	5	3	4	5	3	4	5	4	5	5	4	5	6	4	5	6
E	All	4	5	6	3	4	5	3	4	5	3	4	5	4	5	6	4	5	6	4	5	6
S	All	4	5	6	3	4	5	3	4	5	3	4	5	3	4	5	4	5	6	4	5	6
W	All	4	5	6	4	5	6	3	4	5	3	4	5	3	4	5	4	5	6	4	5	6

Dead Fuel Moisture Content Corrections  
Feb., March, April, Aug., Sept., Oct.

Exposed- Less than 50% shading of surface fuels																			
Aspect	Slope	0800 to			1000 to			1200 to			1400 to			1600 to			1800 to		
		B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N	0-30%	4	5	6	3	4	5	2	3	4	2	3	4	3	4	5	4	5	6
	31%+	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
E	0-30%	4	5	6	3	4	4	2	3	3	2	3	3	3	4	5	4	5	6
	31%+	4	5	6	2	3	4	2	2	3	3	4	4	4	5	6	4	5	6
S	0-30%	4	5	6	3	4	5	2	3	3	2	2	3	3	4	4	4	5	6
	31%+	4	5	6	2	3	3	1	1	2	1	1	2	2	3	3	4	5	6
W	0-30%	4	5	6	3	4	5	2	3	3	2	3	3	3	4	4	4	5	6
	31%+	4	5	6	4	5	6	3	4	4	2	2	3	2	3	4	4	5	6
Shaded- Greater than or equal to 50% shading of surface fuels																			
N	All	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
E	All	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
S	All	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6
W	All	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6	4	5	6

Dead Fuel Moisture Content Corrections  
Nov., Dec., Jan.

**Reference Fuel Moisture- Day Time 0800-1959**

Dry Bulb Temp. (F)	0-4%	5-9%	10-14%	15-19%	20-24%	25-29%	30-34%	39-39%	40-44%	45-49%	50-54%	55-59%	60-64%	65-69%	70-74%	75-79%	80-84%	85-89%	90-94%	95-99%	100%
10°-29°	1	2	2	3	4	5	5	6	7	8	8	8	9	9	10	11	12	12	13	13	14
30°-49°	1	2	2	3	4	5	5	6	7	7	7	8	9	9	10	10	11	12	13	13	13
50°-69°	1	2	2	3	4	5	5	6	6	7	7	8	8	9	9	10	11	12	12	12	13
70°-89°	1	1	2	2	3	4	5	5	6	7	7	8	8	8	9	10	10	11	12	12	13
90°-109°	1	1	2	2	3	4	5	5	6	7	7	8	8	8	9	10	10	11	12	12	13
109°+	1	1	2	2	3	4	4	5	6	7	7	8	8	8	9	10	10	11	12	12	12

Reference Fuel Moisture  
Night Time 2000-0759

Dry Bulb Temp. (F)	0-4%	5-9%	10-14%	15-19%	20-24%	25-29%	30-34%	39-39%	40-44%	45-49%	50-54%	55-59%	60-64%	65-69%	70-74%	75-79%	80-84%	85-89%	90-94%	95-99%	100%
10°-29°	1	2	4	5	5	6	7	8	9	10	11	12	12	14	15	17	19	22	25	25+	25+
30°-49°	1	2	3	4	5	6	7	8	9	9	11	11	12	13	14	16	18	21	24	25+	25+
50°-69°	1	2	3	4	5	6	6	8	8	9	10	11	11	12	14	16	17	20	23	25+	25+
70°-89°	1	2	3	4	4	5	6	7	8	9	10	10	11	12	13	15	17	20	26	25+	25+
90°-109°	1	2	3	3	4	5	6	7	8	9	9	10	10	11	13	14	16	19	22	25	25+
109°+	1	2	2	3	4	5	6	6	8	8	9	9	10	11	12	14	16	19	21	24	25+

Dead Fuel Moisture Corrections  
Night Time 2000-0759

Aspect	2000 to			2200 to			2400 to			0200 to			0400 to			0600 to		
	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A	B	L	A
N & E	9	1	1	13	1	2	16	2	2	17	1	1	18	1	1	16	2	1
S & W	9	0	1	14	0	1	16	0	2	17	0	1	18	0	0	9	0	1

**Probability of Ignition**

Shading %	Dry Bulb Temp. (F)	Fine Dead Fuel Moisture (%)															
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
Unshaded <50%	110+	100	100	80	70	60	60	50	40	40	30	30	20	20	20	20	10
	100-109	100	90	80	70	60	60	50	40	40	30	30	20	20	20	10	10
	90-99	100	90	80	70	60	50	40	40	30	30	30	20	20	20	10	10
	80-89	100	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10
	70-79	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
	60-69	90	80	70	60	50	50	40	30	30	20	20	20	20	10	10	10
	50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	40-49	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	30-39	80	70	60	50	50	40	30	30	20	20	20	10	10	10	10	10
Shaded >50%	110+	100	90	80	70	60	50	50	40	40	30	30	20	20	20	10	10
	100-109	100	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10
	90-99	100	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10
	80-89	100	80	70	60	60	50	40	40	30	30	20	20	20	10	10	10
	70-79	90	80	70	60	50	50	40	30	30	30	20	20	20	10	10	10
	60-69	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	50-59	90	80	70	60	50	40	40	30	30	20	20	20	10	10	10	10
	40-49	90	80	60	50	50	40	30	30	30	20	20	20	10	10	10	10
	30-39	80	80	60	50	50	40	30	30	20	20	20	10	10	10	10	10

FINE DEAD FUEL MOISTURE/PROBABILITY OF IGNITION  
WORKSHEET

INPUT

0	PP	PROJECTION POINT	_____	_____	_____
1	D	DAY TIME CALCULATION	<u>  D  </u>	<u>  D  </u>	<u>  D  </u>
2	DB	DRY BULB TEMP. °F	_____	_____	_____
3	WB	WET BULB TEMP. °F	_____	_____	_____
4	DP	DEW POINT, °F	_____	_____	_____
5	RH	RELATIVE HUMIDITY, %	_____	_____	_____
6	RFM	REFERENCE FUEL MOIST, % (TABLE 2)	_____	_____	_____
7	MO	MONTH	_____	_____	_____
8	SH	UNSHADED (U) SHADED (S)	<u>  U/S  </u>	<u>  U/S  </u>	<u>  U/S  </u>
9	T	TIME	_____	_____	_____
10	CH	ELEVATION CHANGE	<u>  B/L/A  </u>	<u>  B/L/A  </u>	<u>  B/L/A  </u>
		B = 1000' to 2000' below site			
		L = ±1000' of site location			
		A = 1000' to 2000' above site			
11	ASP	ASPECT, (N, E, S, W)	_____	_____	_____
12	SLP	SLOPE %	_____	_____	_____
13	FMC	FUEL MOIST CORRECT, % (TABLE 3, 4, OR 5)	_____	_____	_____

OUTPUT

1	IH-	FINE DEAD FUEL MOIST, % FDFM (line 6 + line 13)	_____	_____	_____
2	PIG	PROB OF IGNITION, % (TABLE 12)	_____	_____	_____



# Land Navigation & GPS Use



# Common Operations of the Vista GPS

## Marking a Waypoint

*Step 1-* Turn on the GPS and wait for it to tell you “Ready to Navigate”.

*Step 2-* Use the page button to get to the Main Menu page.

*Step 3-* Once you are at the Waypoint you want to mark, use the click stick to go to the Mark icon and press it.

*Step 4-* The next screen will name your Waypoint by name, location, distance, and bearing. To save it, just press OK.

## Going to a Waypoint

*Step 1-* Turn on the GPS and wait for it to tell you “Ready to Navigate”.

*Step 2-* Use the page button to get to the Main Menu page.

*Step 3-* Use the click stick to go to the Find icon and press it.

*Step 4-* Under the next menu, click on Waypoints and then choose either by name or by the nearest. Press the click stick.

*Step 5-* Select the Waypoint that you are trying go to and press the click stick.

*Step 6-* The next screen will show you the location, elevation, distance, and bearing of your intended Waypoint and press on the Goto button on the bottom. This will track your movements as you proceed to the Waypoint.

## Area Calculation

*Step 1-* Turn on the GPS and wait for it to tell you “Ready to Navigate”.

*Step 2-* Use the page button to get to the Main Menu page.

*Step 3-* Use the click stick to go to the Accessories icon and press it.

*Step 4-* Under the Accessories menu, use the click stick and go to the Area Calculation icon. Press the click stick.

*Step 5-* When you are ready to calculate an area, press start using the click stick and begin walking.

*Step 6-* When you have walked the entire area and are back at the beginning, press stop using the click stick.

*Step 7-* The GPS will then give you the area calculation and an option to save it.

## Changing Units- Position Format/Map Datum

*Step 1-* Turn on the GPS.

*Step 2-* Use the page button to get to the Main Menu page.

*Step 3-* Use the click stick to go to the Setup icon and press it.

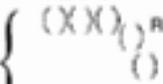
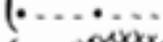
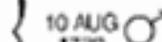
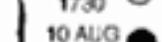
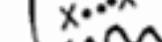
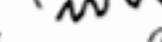
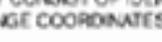
*Step 4-* In the Setup menu, use the click stick to go to the Units icon and press it.

*Step 5-* Under the Units menu, you will see both Position Format and Map Datum. If you need to change either of these, use the click stick until they are highlighted and press it.

*Step 6-* This will then give you a list of different formats and datums to choose. Highlight the new format and/or datum using the click stick and press it.

*Step 7-* The common Position Format that we use for ground units is **hddd°mm’ss.s”**. The Position Format for aircraft is **hddd°mm.mmm’**. The common Map Datum that we use is **NAD83**.

## Land Navigation/Map Use

SUGGESTED FOR PLACEMENT ON BASE MAP		SUGGESTED FOR PLACEMENT ON OVERLAYS	
<b>MINIMUM RECOMMENDED</b>			
BLACK	 RIDGE  HIGHLIGHTED GEOGRAPHIC OR MANMADE FEATURES	RED	 UNCONTROLLED FIRE EDGE  SPOT FIRE  HOT SPOT
BLACK	 COMPLETED DOZER LINE  COMPLETED LINE  LINE BREAK COMPLETED	ORANGE	 FIRE SPREAD PREDICTION
RED	 FIRE ORIGIN  HAZARD (IDENTIFY TYPE OF HAZARD, E.G., POWER LINES)	BLACK	 PLANNED FIRE LINE  PLANNED SECONDARY LINE  BRANCHES  DIVISIONS  SEGMENTS  WIND SPEED DIRECTION  PROPOSED DOZER LINE  FIRE BREAK (PLANNING OR INCOMPLETE)  STAGING AREA (IDENTIFY BY NAME)
BLUE	 INCIDENT COMMAND POST  INCIDENT BASE  CAMP (IDENTIFY BY NAME)	BLUE	 HELISPOT (LOCATION AND NUMBER)  HELIBASE  REPEATER/MOBILE RELAY  TELEPHONE  FIRE STATION  WATER SOURCE (IDENTIFY, E.G., POND, CISTERN, HYDRANT)  MOBILE WEATHER UNIT  IR DOWN LINK  FIRST AID STATION
OPTIONAL	 HELISPOT (LOCATION AND NUMBER)  HELIBASE  REPEATER/MOBILE RELAY  TELEPHONE  FIRE STATION  WATER SOURCE (IDENTIFY, E.G., POND, CISTERN, HYDRANT)  MOBILE WEATHER UNIT  IR DOWN LINK  FIRST AID STATION		
BLUE	 HELISPOT (LOCATION AND NUMBER)  HELIBASE  REPEATER/MOBILE RELAY  TELEPHONE  FIRE STATION  WATER SOURCE (IDENTIFY, E.G., POND, CISTERN, HYDRANT)  MOBILE WEATHER UNIT  IR DOWN LINK  FIRST AID STATION		
ALL OVERLAYS MUST CONTAIN REGISTRATION MARKS. THESE MAY CONSIST OF IDENTIFIED ROAD INTERSECTIONS, TOWNSHIP/RANGE COORDINATES, MAP CORNERS, ETC.			

### CONVERSION FACTORS FOR MAP SCALE

Representative Fraction	Inches/Mile	Inches/Chain	Feet/Inch
1:253,440	1/4	0.00312	21,120
1:126,720	1/2	0.00625	10,560
1: 63,680	1	0.0125	5,280
1: 31,680	2	0.025	2,640
1: 24,000	2 5/8 or	0.0328	2,000
1: 21,120	2.64	0.375	1,760
1: 15,840	3	0.05	1,320
1: 7,920	4	0.10	660
	8		

### FORMULA FOR AREA AND CIRCUMFERENCE OF A CIRCLE

Circle, Area =  $3.1416 \times \frac{\text{diameter squared}}{4}$   
 or  
 =  $3.1416 \times \text{radius squared}$

Circle, Circumference =  $3.1416 \times \text{diameter}$

**CONVERSION FACTORS**  
(continued)

**CONVERSION FACTORS**

Linear Measure		
— Chain	=	66 feet
	=	100 links
	=	20.1168 meters
— Foot	=	12 inches
	=	0.3048 meters
— Inch	=	2.54 centimeters
— Kilometer	=	0.62317 statute miles
	=	1,093.6 yards
	=	3,280.8 feet
— Link	=	0.66 feet
	=	7.92 inches
	=	0.2012 meters
— Meter	=	3.2808 feet
	=	39.37 inches
— Mile, statute	=	5,280 feet
	=	1,760 yards
	=	80 chains
	=	1.60934 kilometers
	=	0.8684 nautical miles
— Mile, nautical	=	6,080 feet
	=	2,026.7 yards
	=	92.12 chains
	=	1.8532 kilometers
	=	1.1515 statute miles
— Yard	=	3 feet
	=	36 inches
	=	0.9144 meters

Square (Area) Measure		
— Acre	=	43,560 square feet
	=	4,840 square yards
	=	10 square chains
	=	208.7 x 208.7 feet
	=	0.405 hectares
— Hectare	=	10,000 square meters
	=	2.4 acres
	=	328.1 x 328.1 feet
— Square foot	=	144 square inches
— Square mile	=	640 acres
— Township	=	36 square miles
	=	6 x 6 miles
— Square Yard	=	9 square feet
	=	1296 square inches
Cubic (Volume) Measure		
— Cubic foot	=	7,4805 gallons
	=	1728 cubic inches
	=	28.316 liters
— Cubic yard	=	27 cubic feet
	=	200.3 gallons
	=	764.53 liters
Liquid Measure		
— Cup	=	8 ounces
— Gallon	=	8.33717 pounds
	=	0.133680 cubic feet
	=	4 quarts
	=	128 ounces
	=	3.7853 liters
— Liter	=	0.264179 gallons
	=	1.567 quarts
	=	1.568 33.8144 ounces
— Pint	=	2 cups
	=	16 ounces
	=	0.47315 liters
— Quart	=	2 pints
	=	32 ounces
	=	0.9463 liters

A *representative fraction* is always written with the map distance as 1 (one). A representative fraction of 1/24,000 (1:24,000) means that one UNIT of measurement (inches, millimeters, feet, etc.) on the map is equal to 24,000 of the SAME UNITS on the ground. You CANNOT mix units in a representative fraction. If it is one INCH on the map, it is 24,000 INCHES on the ground.

EXAMPLE: R.F. is  $\frac{\text{map distance}}{\text{ground distance}} = \frac{1''}{24,000''}$  OR 1:24,000

If the map scale is not given, you can determine it as follows:

1. Locate two points on the map that you can also see on the ground.
2. Measure the distance between the points on the map.
3. Measure the distance between the points on the ground.
4. Divide the ground distance by the map distance, *in the same units*, and record the answer as "1: (answer)";

**Example:**

Map distance = 2 inches; Ground distance = 4,000 feet (48,000 inches)

$48,000 \div 2 = 24,000$ .

Record as 1 : 24,000.

The map scale is 1 : 24,000.

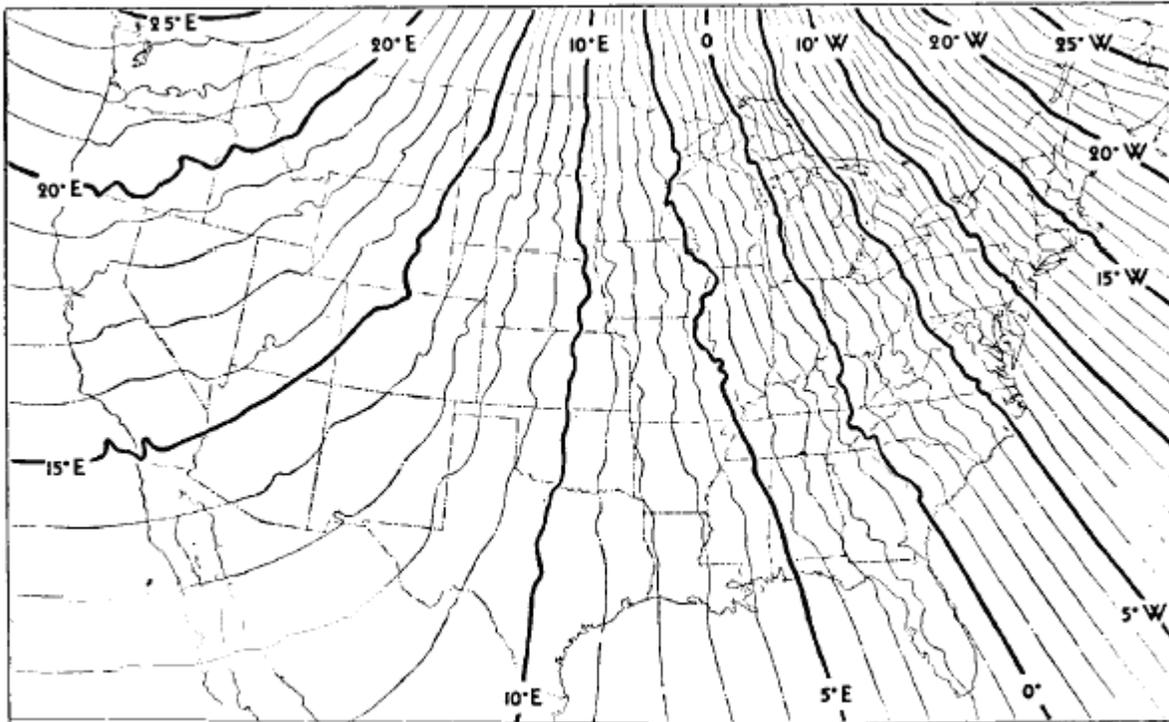
(the section lines are usually 1 mile)

Estimating slope is a simple mathematical process. The Formula is:

$$\text{PERCENT SLOPE} = \frac{\text{VD} \times 100}{\text{HD}} \quad \text{or} \quad \frac{\text{RISE} \times 100}{\text{RUN}}$$

## SECTIONS

6	5	4	3	2	1	
7	8	9	10	11	12	
18	17	16	15	14	13	
19	20	21	22	23	24	T5N
30	29	28	27	26	25	
31	32	33	34	35	36	
						R7W



**DECLINATION CHART OF THE UNITED STATES *circa 1955***

**The method of finding one's own position by sighting on two known landmarks is called Resection.**

1. The first step in resection is to locate two or more objects on the ground that can be identified on the map.
2. With the compass, measure an azimuth to each of the landmarks on the ground. (Example: 282, 380)
3. Convert these magnetic azimuths to true azimuths by adjusting for declination. (If east declination add; example  $282 + 150 = 297$  and  $380 + 150 = 530$ )
4. Convert to back azimuths. ( $297 - 180 = 117$  and  $530 - 180 = 350$ )
5. From the two known landmarks on the map, draw the lines of the back azimuths until the lines intersect.
6. The point where these two lines cross is your position.

**Township Lines** are the series of lines, 6 miles apart, which run east and west parallel to the Base Line. The area between the Base Line and the first Township Line on the south side is called Township 1 South. The area between the first and second Township lines on the south is Township 2 South, and so on. The numbering on the north side of the Base Line is the same. Range Lines are the series of lines, 6 miles apart, which run north and south parallel to the Principal Meridian. The areas between these lines are numbered much the same as the Township areas. The area between the Principal Meridian and the First line on the east side is Range 1 East. The area between the first and second lines on the east side is Range 2 East. The numbering on the west side of the Principal Meridian is the same. Proper descriptions of locations have the Township written first followed by the Range and Reference Point (T1N, R3E, Section 12, NE quarter).

Townships are subdivided into 36 parts, each one mile square (as near as may be), called Sections. The typical numbering system of the Township is started in the upper right-hand corner, moving across to the left, down and to the right, etc. If you remember that the upper right hand corner is always Number 1 and that the numbers move back and fourth to the bottom you will be able to locate section numbers as necessary. Each number identifies a section (square area) which is usually one square mile and contains 640 acres. Sections do not always contain 640 acres, nor are they always one square mile.

**Longitude and Latitude** - The earth's globe has a division system which identifies geographical positions precisely by reference to imaginary lines running pole to pole, and around the globe starting at and parallel to the equator. Longitude lines run true north to true south - North Pole to South Pole. The lines are based from:

The Prime Meridian which is 0 degree longitude, and which runs through Greenwich England. Beginning with the Prime Meridian, they are numbered both east and west for 180 degrees. Lines of longitude are not parallel; the closer they are to the poles, the smaller the distance between them. Principal Meridian Lines run in the same direction as the lines of longitude. Latitude lines circle the world parallel with the equator, running in an easterly and westerly direction. These lines are identified by their position either north or south of the equator. The equator is 0 degree latitude. The degrees of latitude increase as one proceeds from the equator toward either north or south poles where the latitude is 90 degrees. Some maps such as the U.S.G.S. Topography Map indicate longitude and latitude. Tick marks at the top or bottom of a map, numbered with degrees, minutes (') and seconds ("), indicate longitude. Similar tick marks at the sides indicate latitude. Cross-marks are noted where lines of latitude intersect with lines of longitude.

# CONVERTING LATITUDE LONGITUDE IN DEGREES DECIMAL MINUTES TO DEGREES MINUTES SECONDS

Latitude and Longitude may be shown in three different formats:

FORMAT	WHAT IT LOOKS LIKE	HOW YOU SAY IT (ETIQUITE)
A. Degrees Decimal Minutes (Aircraft)	48° 36.12' 114° 08.12'	"Four-eight degrees, three six point one two minutes."
B. Degrees Minutes Seconds (many maps)	48° 36' 12" 114° 08' 12"	"Four-eight degrees, three six minutes, and one two seconds."
C. Degrees Decimal Degree (seldom used)	48.3612° 114.0812°	"Four-eight point three six one two degrees."

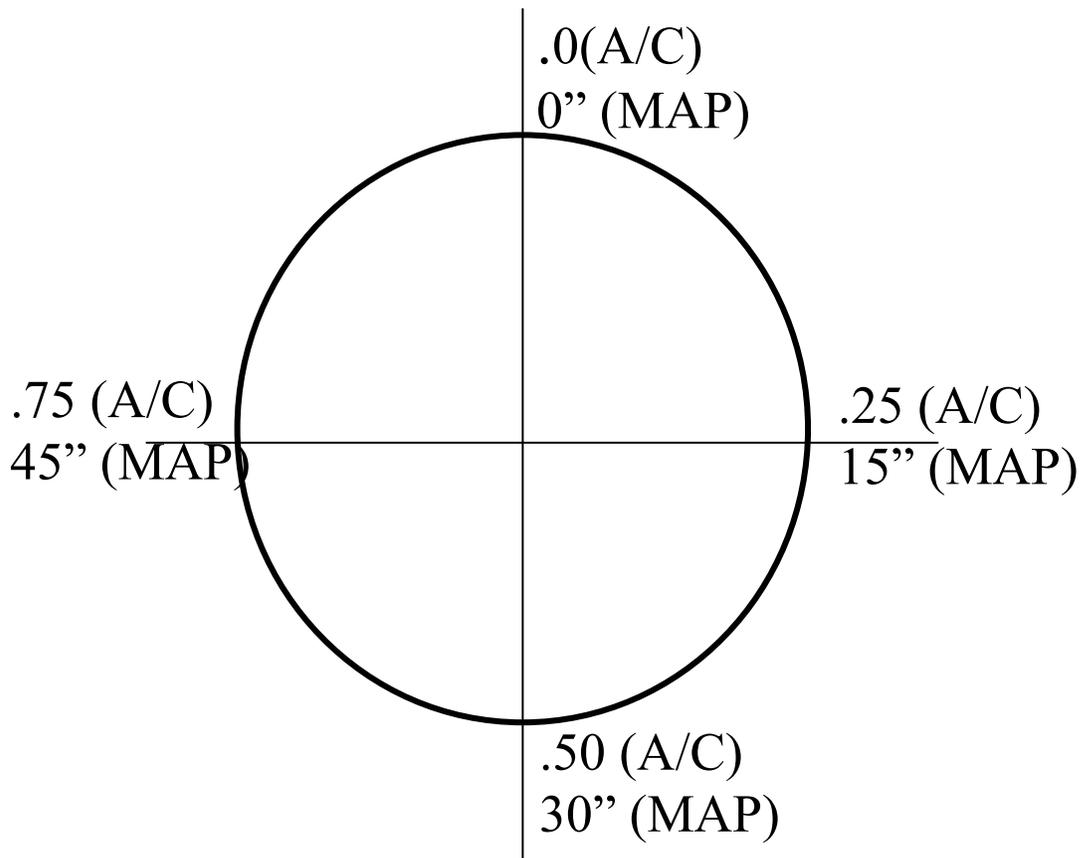
Most handheld GPS units can easily be set up to do any formats. If you do not have that option, do this:

To convert **Degrees Minutes Seconds** to **Degrees Decimal Minutes**, divide seconds by 60.

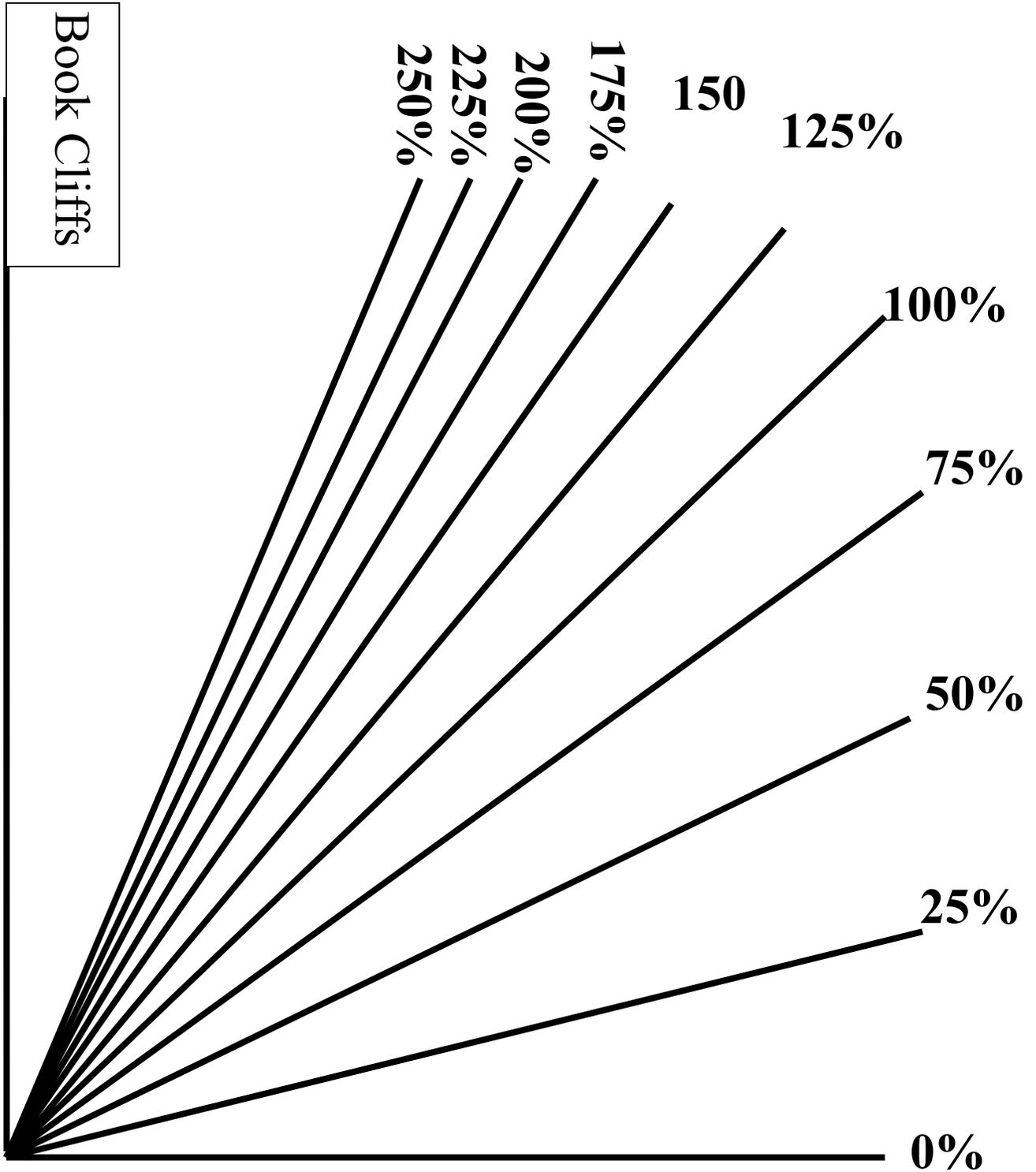
Example: 48° 20' 30" ⇒ (30" ÷ 60 = .5') ⇒ 48° 20.5'

To convert **Degrees Decimal Minutes** to **Degrees Minutes Seconds**, multiply hundredths (i.e. .12) by 60.

Example: 48° 20.5' ⇒ .5' x 60 = 30" ⇒ 48° 20' 30"



# Slope Percentage Table





# Fuels & Fire Behavior



# FIRE BEHAVIOR FUEL MODEL DESCRIPTIONS \*

## Grass Group

**Fuel Model 1** (1 foot deep) Fire spread is governed by the fine herbaceous fuels that have cured or are nearly cured. Fires are surface fires that move rapidly through cured grass and associated material. Very little shrub or timber is present, generally less than one-third of the area.

Grasslands and savanna are represented along with stubble, grass-tundra, and grass-shrub combinations that meet the above area constraint. Annual and perennial grasses are included in this fuel model.

**Fuel Model 2** (1 foot deep) Fire spread is primarily through the fine herbaceous fuels, either curing or dead. These are surface fires where the herbaceous material, besides litter and dead-down stemwood from the open shrub or timber overstory, contribute to the fire intensity. Open shrub land and pine stands or scrub oak stands that cover 1/3 to 2/3 of the area may generally fit this model, but may include clumps of fuels that generate higher intensities and may produce firebrands. Some pinyon-juniper may be in this model.

**Fuel Model 3** (2.5 feet deep) Fires in this fuel are the most intense of the grass group and display high rates of spread under the influence of wind. The fire may be driven into the upper heights of the grass stand by the wind and cross over standing water. Stands are tall, averaging about 3 feet, but considerable variation may occur. Approximately one-third or more of the stand is considered dead or cured and maintains the fire.

\* Anderson, Hal E.; Aid to Determining Fuel Models for Estimating Fire Behavior. Gen. Tech Report INT-122, 1982

## Shrub Group

**Fuel Model 4** (6 feet deep) Fire intensity and fast spreading fires involve the foliage and live and dead fine woody materials in the crowns of a nearly continuous secondary overstory. Examples are stands of mature shrub, 6 or more feet tall, such as California mixed chaparral, the high pocosins along the east coast, the pine barrens of New Jersey, or the closed jack pine stands of the north-central states. Besides flammable foliage, there is dead woody material in the stand that significantly contributes to the fire intensity. Height of stands qualifying for this model varies with local conditions. There may be also a deep litter layer that confounds suppression efforts.

**Fuel Model 5** (2 feet deep) Fire is generally carried in the surface fuels made up of litter cast by the shrubs and the grasses of forbes in the understory. Fires are generally not very intense as surface fuels loads are light, the shrubs are young with little dead material, and the foliage contains little volatile material. Shrubs are generally not tall, but nearly cover the entire area. Young, green stands with little or no deadwood such as laurel, vine maple, alder, or even chaparral, manzanita, or chamise are examples. As the shrub fuel moisture drops, consider using a Fuel Model 6.

**Fuel Model 6** (2.5 feet deep) Fires carry through the shrub layer where the foliage is more flammable than Fuel Model 5, but require moderate winds (>8 mi/h) at midflame height. Fire will drop to the ground at low wind speeds or openings in the stand. Shrubs are older, but not as tall as shrub types of Model 4, nor do they contain as much fuel as Model 4. A broad range of shrub conditions is covered by this model. Typical examples include intermediate stands of chamise, chaparral, oak brush, low pocosin, Alaskan spruce taiga, and shrub tundra. Cured hardwood slash can be considered. Pinyon-Juniper shrub lands may fit, but may over predict the rate of spread except at high winds; e.g., 20 mi/h at the 20-foot levels.

**Fuel Model 7** (2.5 feet deep) Fire burns through the surface and shrub strata equally. Fire can occur at higher dead fuel moisture contents due to the flammable nature of live foliage. Shrubs are generally 2 to 6 feet high. Examples are Palmetto-gallberry understory-pine overstory sites, low pocosins, and Alaska Black Spruce-shrub combinations.

## **Timber Litter Group**

**Fuel Model 8** (0.2 feet deep) Slow burning ground fires with low flame heights are generally the case, although an occasional “jackpot” of heavy fuel concentration may cause a flare up. Only under severe weather conditions do these fuels pose fire problems. Closed-canopy stands of short needle conifers or hardwoods that have leafed out support fire in the compact litter layer. This layer is mainly needles, leaves, and some twigs since little under growth is present in the stand. Representative conifer types are white pine, lodgepole pine, spruce, true firs, and larches.

**Fuel Model 9** (0.2 feet deep) Fires run through the surface litter faster than model 8 and have higher flame height. Both long-needle conifer and hardwood stands, especially the oak-hickory types, are typical. Fall fires in hardwoods are representative, but high winds will actually cause higher rates of spread than predicted because of spotting caused by rolling and blowing leaves. Closed stands of long-needle pine like Ponderosa, Jeffery, and Red pines or southern pine plantations are grouped in this model. Concentrations of dead-down woody material will contribute to possible torching out of trees, spotting, and crowning activity.

**Fuel Model 10** (1 foot deep) The fires burn in the surface and ground fuels with greater fire intensity than other timber litter models. Dead-down fuels include greater quantities of the 3-inch or larger limb wood resulting from over-maturity or natural events that create a large load of dead material on the forest floor. Crowning out, spotting, and torching of individual trees are more frequent in this fuel situation leading to potential fire control difficulties. Any forest type may be considered when heavy down materials are present, examples are insect or diseased stands, wind-thrown stands, over-mature situations with deadfall, and cured light thinning or partial-cut slash.

## Logging Slash Group

**Fuel Model 11\*** (1 foot deep) Fires are fairly active in the slash and herbaceous material intermixed with the slash. The spacing of the rather light fuel load, shading from overstory, or the aging of the fine fuels can contribute to limiting the fire potential. Light partial cuts or thinning operations in mixed conifer stands, hardwood stands, and southern pine harvests are considered. Clear-cut operations generally produce more slash than represented here. The <3 inch material load is less than 12 tons per acre. The >3 inch material is represented by not more than 10 pieces, 4 inch in diameter along a 50-foot transect.

**Fuel Model 12\*** (2.3 feet deep) Rapidly spreading fires with high intensities capable of generating firebrands can occur. When fire starts, it is generally sustained until a fuel break or change in fuels is encountered. The visual impression is dominated by slash and much of it is <3 inches in diameter. These fuels total less than 35 tons per acre and seem well distributed. Heavily thinned conifer stands, clear-cuts, and medium or heavy partial cuts are represented. The <3 inch material is represented by encountering 11 pieces, 6 inches in diameter, along a 50-foot transect.

\* When working in fuel model 11 or 12 with significant “red” needles attached to limbs, consider using the next heavier model. For example, Fuel Model 11 with “red” needles, use Fuel Model 12.

**Fuel Model 13** (3 feet deep) Fire is generally carried by a continuous layer of slash. Large quantities of >3 inch material are present. Fires are spread quickly through the fine fuels and intensity builds up as the large fuels start burning. Active flaming is sustained for long periods and a wide variety of firebrands can be generated. These contribute to spotting problems as the weather conditions become more severe. Clear-cut and heavy partial-cuts in mature and over-mature stands are depicted where the slash load is dominated by the >3 inch material. The total load may exceed 300 tons per acre, but the <3 inch fuel is generally only 10 percent of the total load. Situations where the slash still has “red” needles attached, but the total load is lighter like a Model 12, can be represented because of the earlier high intensity and faster rate of spread.

## Fuel Size Class

- 1 Hour Fuels - less than 1/4 inch**
- 10 Hour Fuels - 1/4 inch to 1 inch diameter**
- 100 Hour Fuels - 1 inch to 3 inch diameter**
- 1000 Hour Fuels - greater than 3 inch diameter**

## ***Dead Fuel Moisture***

Dead fuels consist of small to large diameter down and dead woody fuels (1-, 10-, 100-, and 1000-hr fuels), dead grasses and forbs and surface litter such as fallen leaves and needles. The categorization of duff and soil as dead fuels is also included in this guide, since they can influence mortality in prescribed fire and fire use applications. Small diameter dead fuels typically carry the fire and determine the rate of spread and intensity, so their moisture content is extremely important. The Estimation of one-hour fuels can be accomplished more accurately and effectively using Appendix A, Fire Behavior Field Reference Guide, 1992 of the Fireline Handbook (NFES 0065) than collection, transportation and measuring of a sample. Ten-hour fuel moisture at most NFDRS stations is calculated by a series of complex equations that use observed weather elements as inputs and provide a relative measure of drying. Some stations make use of electronic fuel moisture sensors, but fewer and fewer NFDRS stations employ the actual weighing of 10-hour fuel sticks. Calculated and electronically sensed data may not be accurate enough to use as an indicator of 10-hour fuel moisture for prescribed fire or fire use implementation. Many vital plant parts – rhizomes, roots, tubers – reside in duff; therefore, sampling the duff layer may be necessary. Since some of the Southwest Area has very little or no duff collecting and measuring soil samples may be the best way to evaluate the effects of fire below the surface. This may be necessary to protect the sprouting parts of some plant species that use the soil, instead of the duff layer.

## ***Live Fuel Moisture***

Live fuels consist of conifer needles, twigs and leaves of shrubs (evergreen and deciduous) and green (live) grasses and forbs. The basis of live fuel moisture causes some confusion among fire practitioners (i.e., how can fuel have more than 100% moisture?). The expression of moisture content in wildland fuels is in relation to dry weight, not just the proportion of water in the fuel. The dry material provides the heat to evaporate water so that the fuel will burn. The chart below details live moisture content:

### **Moisture Content %**

#### **Stage of Vegetative Development**

**300 Fresh foliage, annuals developing early in the growing cycle**

**200 Maturing foliage, still developing, with full turgor.**

**100 Mature foliage, new growth complete and comparable to older perennial foliage.**

**50 Entering dormancy, coloration starting, some leaves may have dropped from the stem. Also indicative of drought conditions.**

**>30 Completely cured.**

The changes in live fuel moisture content directly relates to the physiological activity of the vegetation. The differences caused by soil moisture, soil temperature, relative humidity and air temperature are identifiable. During seasons of deficient precipitation, there is less seasonal growth, and moisture levels are lower in other living material than during seasons of normal or above normal precipitation. If this moisture deficiency persists through the summer, live fuel moisture can drop at an increasing rate. Soil and air temperatures affect the time new growth starts and the level of moisture attained by the vegetation. In situations when soil moisture is not limiting, new growth will start earlier and often reach a higher level of moisture when the weather in late winter and spring is warm than when the weather is cold. Other factors that affect soil and air temperatures, such as slope, aspect, and elevation also affect the amount of new growth, the timing of growth, and the level of moisture in the living material. The moisture patterns of different plant species vary seasonally. Moisture variations also occur between plants of the same species in the same locale, and often in material taken from different heights and aspects on the same plant. Site quality also affects live fuel moisture; shrubs on good sites tend to produce a greater amount of new growth, have higher moisture levels, and decrease in moisture more slowly during the summer than shrubs on poor sites. Live plants may either suppress combustion or contribute to it, depending on their moisture content and flammability of chemical compounds contained in the plant.



**Payroll/Admin  
&  
Travel**



## 2015 Pay Period Calendar

January							
PP	S	M	T	W	T	F	S
<b>26</b>							
	4	EFT 5	6	7	8	9	10
<b>1</b>	11	12	13	14	15	16	17
	18	MLK Day	EFT 19	20	21	22	23
<b>2</b>	25	26	27	28	29	30	31

February							
PP	S	M	T	W	T	F	S
<b>2</b>							
	1	EFT 2	3	4	5	6	7
<b>3</b>	8	9	10	11	12	13	14
	15	President's Day	EFT 16	17	18	19	20
<b>4</b>	22	23	24	25	26	27	28

March							
PP	S	M	T	W	T	F	S
<b>4</b>							
	1	EFT 2	3	4	5	6	7
<b>5</b>	8	9	10	11	12	13	14
	15	EFT 16	17	18	19	20	21
<b>6</b>	22	23	24	25	26	27	28
	29	EFT 30	31				

April							
PP	S	M	T	W	T	F	S
<b>6</b>					1	2	3
<b>7</b>	5	6	7	8	9	10	11
	12	EFT 13	14	15	16	17	18
<b>8</b>	19	20	21	22	23	24	25
	26	EFT 27	28	29	30		

May							
PP	S	M	T	W	T	F	S
<b>8</b>						1	2
<b>9</b>	3	4	5	6	7	8	9
	10	EFT 11	12	13	14	15	16
<b>10</b>	17	18	19	20	21	22	23
	24	Memorial Day	EFT 25	26	27	28	29
<b>11</b>	31						

June							
PP	S	M	T	W	T	F	S
<b>11</b>							
		1	2	3	4	5	6
	7	EFT 8	9	10	11	12	13
<b>12</b>	14	15	16	17	18	19	20
	21	EFT 22	23	24	25	26	27
<b>13</b>	28	29	30				

July							
PP	S	M	T	W	T	F	S
<b>13</b>				1	2	3	4
	5	EFT 6	7	8	9	10	11
<b>14</b>	12	13	14	15	16	17	18
	19	EFT 20	21	22	23	24	25
<b>15</b>	26	27	28	29	30	31	

August							
PP	S	M	T	W	T	F	S
<b>15</b>							1
	2	EFT 3	4	5	6	7	8
<b>16</b>	9	10	11	12	13	14	15
	16	EFT 17	18	19	20	21	22
<b>17</b>	23	24	25	26	27	28	29
	30	EFT 31					

September							
PP	S	M	T	W	T	F	S
<b>17</b>				1	2	3	4
<b>18</b>	6	7	8	9	10	11	12
	13	EFT 14	15	16	17	18	19
<b>19</b>	20	21	22	23	24	25	26
	27	EFT 28	29	30			

October							
PP	S	M	T	W	T	F	S
<b>19</b>					1	2	3
<b>20</b>	4	5	6	7	8	9	10
	11	Columbus Day	EFT 12	13	14	15	16
<b>21</b>	18	19	20	21	22	23	24
	25	EFT 26	27	28	29	30	31

November							
PP	S	M	T	W	T	F	S
<b>21</b>							
<b>22</b>	1	2	3	4	5	6	7
	8	EFT 9	10	Veterans Day	12	13	14
<b>23</b>	15	16	17	18	19	20	21
	22	EFT 23	24	25	Thanksgiving	27	28
<b>24</b>	29	30					

December							
PP	S	M	T	W	T	F	S
<b>24</b>			1	2	3	4	5
	6	EFT 7	8	9	10	11	12
<b>25</b>	13	14	15	16	17	18	19
	20	EFT 21	22	23	24	25	26
<b>26</b>	27	28	29	30	31	Christmas Day	1
	3	EFT 4	5	6	7	8	9

 Electronic Fund Transfer

 Official Pay Day  Holiday

Produced by: HRIS SGS

SALARY TABLE 2015-RUS  
 INCORPORATING THE 1% GENERAL SCHEDULE INCREASE AND A LOCALITY PAYMENT OF 14.16%  
 FOR THE LOCALITY PAY AREA OF REST OF U.S.  
 TOTAL INCREASE: 1%  
 EFFECTIVE JANUARY 2015

*Hourly Basic (B) Rates by Grade and Step  
 Hourly Overtime (O) Rates by Grade and Step*

Grade	B/O	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
1	B	\$ 9.93	\$ 10.27	\$ 10.60	\$ 10.93	\$ 11.26	\$ 11.45	\$ 11.78	\$ 12.11	\$ 12.12	\$ 12.42
	O	14.90	15.41	15.90	16.40	16.89	17.18	17.67	18.17	18.18	18.63
2	B	11.17	11.44	11.80	12.12	12.25	12.62	12.98	13.34	13.70	14.06
	O	16.76	17.16	17.70	18.18	18.38	18.93	19.47	20.01	20.55	21.09
3	B	12.19	12.59	13.00	13.41	13.81	14.22	14.63	15.03	15.44	15.84
	O	18.29	18.89	19.50	20.12	20.72	21.33	21.95	22.55	23.16	23.76
4	B	13.68	14.14	14.59	15.05	15.51	15.96	16.42	16.87	17.33	17.79
	O	20.52	21.21	21.89	22.58	23.27	23.94	24.63	25.31	26.00	26.69
5	B	15.31	15.82	16.33	16.84	17.35	17.86	18.37	18.88	19.39	19.90
	O	22.97	23.73	24.50	25.26	26.03	26.79	27.56	28.32	29.09	29.85
6	B	17.06	17.63	18.20	18.77	19.34	19.91	20.48	21.04	21.61	22.18
	O	25.59	26.45	27.30	28.16	29.01	29.87	30.72	31.56	32.42	33.27
7	B	18.96	19.59	20.22	20.86	21.49	22.12	22.75	23.38	24.01	24.65
	O	28.44	29.39	30.33	31.29	32.24	33.18	34.13	35.07	36.02	36.98
8	B	21.00	21.70	22.40	23.10	23.80	24.50	25.20	25.90	26.60	27.30
	O	31.50	32.55	33.60	34.65	35.70	36.75	37.80	38.31	38.31	38.31
9	B	23.19	23.97	24.74	25.51	26.28	27.06	27.83	28.60	29.38	30.15
	O	34.79	35.96	37.11	38.27	38.31	38.31	38.31	38.31	38.31	38.31
10	B	25.54	26.39	27.24	28.09	28.94	29.80	30.65	31.50	32.35	33.20
	O	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31
11	B	28.06	29.00	29.93	30.87	31.80	32.74	33.67	34.61	35.54	36.48
	O	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31	38.31
12	B	33.63	34.75	35.88	37.00	38.12	39.24	40.36	41.48	42.60	43.73
	O	38.31	38.31	38.31	38.31	38.31	39.24	40.36	41.48	42.60	43.73
13	B	39.99	41.33	42.66	43.99	45.33	46.66	47.99	49.33	50.66	51.99
	O	39.99	41.33	42.66	43.99	45.33	46.66	47.99	49.33	50.66	51.99
14	B	47.26	48.84	50.41	51.99	53.56	55.14	56.71	58.29	59.86	61.44
	O	47.26	48.84	50.41	51.99	53.56	55.14	56.71	58.29	59.86	61.44
15	B	55.59	57.45	59.30	61.15	63.01	64.86	66.71	68.56	70.42	72.27
	O	55.59	57.45	59.30	61.15	63.01	64.86	66.71	68.56	70.42	72.27

Applicable locations are shown on the 2015 Locality Pay Area Definitions page: <http://www.opm.gov/policy-data-oversight/pay-leave/salaries-wages/2015/locality-pay-area-definitions/>

## Meals and Incidental Expenses ( M&IE) Breakdown

The following table shows the breakdown of continental breakfast/breakfast, lunch, and dinner components of the maximum daily reimbursement (per diem) rates for meals and incidental expenses while on travel. Refer to [Section 301-11.18 of the Federal Travel Regulation](#) for guidance on deducting these amounts from your per diem reimbursement claims for meals furnished to you by the government.

**NOTE: The first and last calendar day of travel is calculated at 75 percent.**

The M&IE rates differ by travel location. View the <a href="#">per diem rate</a> for your primary destination to determine which M&IE rates apply.						
M&IE Total	\$46	\$51	\$56	\$61	\$66	\$71
Continental Breakfast/ Breakfast	\$7	\$8	\$9	\$10	\$11	\$12
Lunch	\$11	\$12	\$13	\$15	\$16	\$18
Dinner	\$23	\$26	\$29	\$31	\$34	\$36
Incidentals	\$5	\$5	\$5	\$5	\$5	\$5
First & Last Day of Travel	\$34.50	\$38.25	\$42	\$45.75	\$49.50	\$53.25

**US Bank Contact INFO**  
**1-888-994-6722**

# **US Forest Service Travel Assistance**

## **ASC B&F Travel Branch**

### **Hours of Operation:**

**7:00 a.m. - 5:00 p.m. (MST)**

## **FS Travel Help Desk**

**877-372-7248, Option 3**

## **Other FS Travel Information**

**877-372-7248, Option 1**

## **Travel Management Center (TMC)**

**BCD - Travel - 800-877-6120**

## **Mailing Address:**

**US Forest Service**

**ASC- B&F Travel Branch**

**4000 Masthead Street NE**

**Mail Stop 202**

**Albuquerque, NM 87109**

# Medical & Evacuation



## Medivac

1. Assess Patient: If multiple patients are present **TRIAGE** and arrange transportation according to injuries.
2. Establish Chain of Command: Lead E.M.T., Superintendent. Who is going to accompany the patient to the hospital? Delegate a scribe, communications person, helispot manager, etc...
3. Communications: Use aircraft as comms platform, acquire comms with district A.S.A.P. Obtain info on medivac resources in route such as; E.T.A., size of helicopter and capacity.

### **NO NAMES ON THE RADIO!!**

- ❖ Give patient report with the following information: Patients age, sex, mechanism of injury, chief complaint, vitals, IV established, allergies, and medications taken or given.
4. Paperwork: Delegate a scribe to fill out SOAP notes. Document! Document! Document!  
(Subjective info, Objective info, Assess the problem, Plan of treatment)
  5. Photograph: Accident site/mechanism of injury from different angles with written narrative of conditions.
  6. Notify: Home unit and dispatch of patient status. **Go with patient to hospital** to facilitate logistics I.E. hotel rooms, transportation, consent to treat etc.
  7. Debrief: All personnel involved in operation submit critique in writing to E.M.T. supervisor.

### **Medivac/Litter Use (Make the decision early)**

There should be one person in charge of the entire medivac/litter operation. The medic will determine head first or feet first travel for shock treatment and patient comfort.

The lead medic will be in charge of the patient and litter team; if possible a safety should be designated to oversee the entire operation.

There should be a few “scouts” used to route find the best, safest, and quickest route for the litter team. Flag it well and make it known.

### **How to carry the litter**

Position one rescuer at the head to serve as leader and to monitor head and neck stability.

Position the other rescuers along the sides of the litter, at least two to a side, trying to keep people of roughly equal height opposite each other.

Grab the litter through the appropriate hand-hold. Use whichever hand is appropriate to the direction you'll be walking.

Lift on the leader's call: "Lift on 3 - 1, 2, 3!"

Adjust each rescuer's lifting height as necessary to keep the injured person level.

Begin moving on the leader's call: "Move on 3 - 1, 2, 3!"

Walk for as long as you can before resting, following the leader's calls, commands and warnings at all times. Leader: be scanning ahead for obstacles and dangers, as well as monitoring the stability of the head and neck and issuing commands as necessary to keep the injured person level.

Stop when necessary (to monitor injuries, to re-secure knots, or to rest): notify the leader that you need to stop and follow the leader's calls: "Stop on 3 - 1, 2, 3!" and "Down on 3 - 1, 2, 3!"

Attend to any injuries that require monitoring.

Readjust the padding as necessary, especially under the buttocks and under the heels, since a spine-injured person will not sense a cutoff in circulation.

Repeat the above steps in order when you're ready to start again.

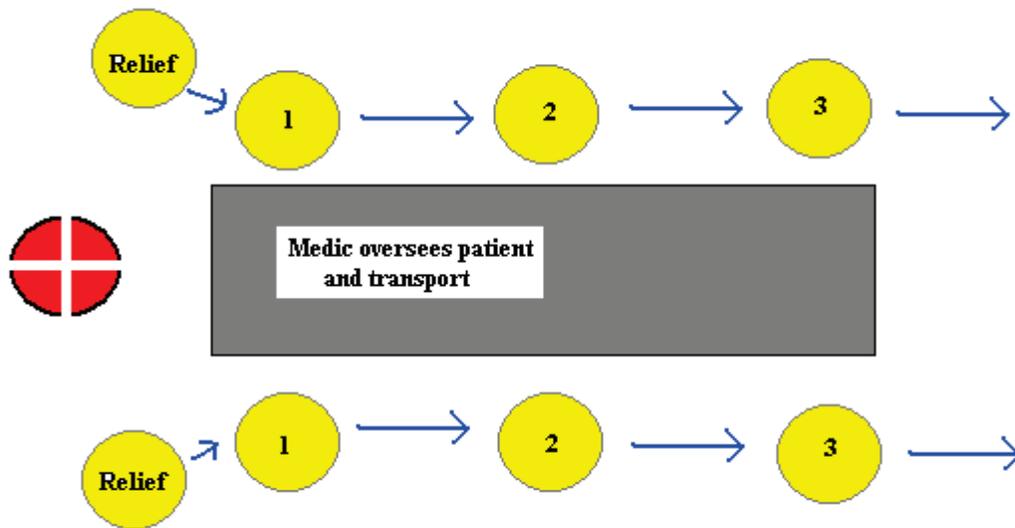
Consider the use of “litter slings” if multiple people are not immediately available or you need to cover long distances. Litter slings are attached to the litter and pass over the litter attendant’s shoulders to the outside hand which is held at arms length. The weight is distributed over the shoulders instead of the hand alone allowing you to travel much further and faster without relief. It also allows you to adjust the litter to treat for shock and patient comfort.

## How to pass the litter

One person is needed to coordinate litter passes. Litter passes are used to relieve personnel on the litter and should space far enough apart to allow continuous movement of the patient. A team of two people will be placed on the evacuation route, they will allow the litter to pass by them, they then step in behind the last person on the litter and grab their handle, once they have a good grip they will tap the person they are relieving on the back signaling to them to advance to the next position on the litter, **DO NOT LET GO UNTIL YOU GET THE TAP!!!**, that person will do the same for the next litter position until they are in front and have nobody to replace, they then advance to the end of the relay stations and get ready to start the process over. (Note the diagram below)

### Litter pass

Relief takes #1 spot, #1 moves to #2 spot, #2 moves to #3 spot, and #3 moves up the evac route to get back in the rotation.



When carrying the litter try to step opposite of the person in front of you. This will smooth out the ride for the patient.

# How to Load/Rig/Use the SKED litter

## HOW TO PLACE A PATIENT LOG ROLL METHOD



1. PLACE SKED® STRETCHER NEXT TO PATIENT. INSURE HEAD END OF STRETCHER IS ADJACENT TO HEAD OF PATIENT. PLACE CROSS STRAPS UNDER SKED®.



2. LOG ROLL PATIENT AND SLIDE SKED® AS FAR UNDER PATIENT AS POSSIBLE. GENTLY ROLL PATIENT DOWN ON TO SKED® STRETCHER.

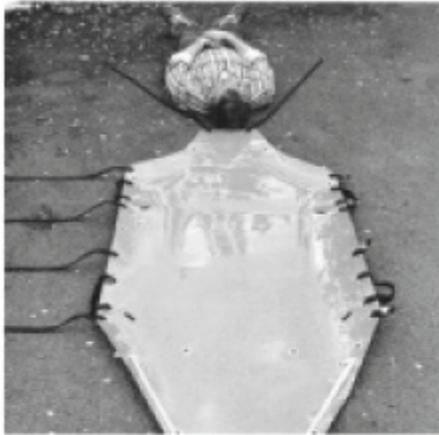


3. SLIDE PATIENT TO CENTER OF SKED® STRETCHER. BE SURE TO KEEP SPINAL COLUMN AS STRAIGHT AS POSSIBLE.



4. PULL STRAPS OUT FROM UNDER SKED® STRETCHER AND FASTEN TO BUCKLES. (SEE PG. 5)

## **ON THE SKED® STRETCHER: SLIDE METHOD**



1. POSITION FOOT END OF SKED® STRETCHER AT HEAD OF PATIENT.



2. HAVE ONE RESCUER STRADDLE SKED® AND SUPPORT PATIENTS HEAD, NECK, AND SHOULDERS.



3. GRASP FOOT STRAPS OF SKED® STRETCHER AND SLIDE SKED® UNDER PATIENT.



4. CENTER PATIENT ON SKED® STRETCHER AND FASTEN STRAPS TO BUCKLES (SEE PG 5).

The centralization of the USDA Forest Service Workers' Compensation Program function was completed in March 2008. The ASC-HRM Workers' Compensation Section (WC) is the initial point of contact for processing and managing work related injury/illness claims. This includes all Forest Service employees, whether injured during project work or on an incident.

No other personnel or sub-units in the agency shall:

- Maintain compensation files
- Contact DOL-OWCP
- Issue form CA-16 for medical treatment (except for qualified incident finance personnel on an incident)
- Counsel employees regarding DOL-OWCP procedures

Direction in the Interagency Incident Business Management Handbook (IIBMH) for treatment of injured workers while at the site of an incident grants qualified incident finance personnel authority to authorize medical care. Once the employee leaves the incident site, WC is the point of contact for case management.

It is the responsibility of the injured employee's supervisor to complete their portion of the CA-1 or CA-2 and ensure WC receives the form within two days of receipt from the employee. Any delay by the supervisor will affect the injured employee's timely claim adjudication by DOL-OWCP. FS Workers' Compensation case managers will work with the supervisor to return the employee to work as applicable.

Initial process for filing a claim is as follows:

- An employee that sustains a work-related injury and wants to file a claim with DOL-OWCP reports the incident to their supervisor and initiates their claim by completing the appropriate form (CA-1/CA-2) in the Safety and Occupational Health (SOH) incident reporting and Workers' Compensation (WC) case management eSafety system, accessed through My connectHR.
- Supervisor completes their portion of the claim form (CA-1/CA-2) in eSafety, faxing the signed copy to ASC-HRM WC at 866-339-8583 within two days of receipt from the employee filing the claim. The original is provided to the injured employee for their records.
- If the injured employee's supervisor is not available to complete and submit their portion of the CA-1/CA-2 within two days of receipt from the employee, the employee or personnel acting on their behalf may contact ASC-HRM Workers' Compensation to change the supervisor's name in eSafety to a supervisor/manager who is available to complete and submit the form within the established timeline.
- WC Case Managers will create a CRM case for each WC claim submitted. The CRM case will be in the employee's name to enable following the status of their WC claim utilizing My connectHR; then HR Help; then Self Service or by calling the Contact Center at 877-372-7248, press "2" for HRM, and reference the CRM case number.
- The WC Section reviews, finalizes, and submits forms to DOL-OWCP within the required ten working days.

Process for issuance of CA-16, Authorization for Examination and/or Treatment is as follows:

- Injured employee should seek medical treatment when necessary and immediately notifies their supervisor.
- Employee may be treated at any hospital emergency room as they are required to provide treatment even without advance guarantee of payment.
- When seeking medical treatment from an Urgent Care, clinic, or a privately owned medical facility, ensure the medical provider accepts *Federal Workers' Compensation* through the Department of Labor; otherwise the injured employee will be responsible for all costs associated with medical treatment.
- During business hours, requests for medical authorization and/or treatment shall be made through the ASC-HRM Contact Center by calling 877-372-7248, press "2" for HRM. Be sure to advise the Contact Center representative you have a request for authorization for medical treatment and you need to be transferred to the WC Section.
- During non-business hours, in accordance with the Code of Federal Regulations, 20 CFR§10.300(b), on-site personnel representing the Agency are deemed to have the authority to provide verbal authorization for examination and/or treatment for a work-related injury and do not need to wait for verbal authorization by ASC-HRM (see Decision Tree for guidance **prior** to giving verbal authorization).
- Supervisor/representative who provides verbal authorization for medical treatment (see Decision Tree for guidance **prior** to giving verbal authorization) has up to 48 hours or the next business day to contact ASC-HRM for a CA-16 to be issued to the medical provider.

We strive to provide improvements in our service to injured workers and to ensure we are providing high quality, consistent service. Calls to the WC section shall be made through the Contact Center at 877-372-7248, press "2" for HRM, or visit the ASC-HRM WC webpages for additional information.

The following standards will be used when any firefighter sustains burn injuries, regardless of agency jurisdiction:

- After on-site medical response, initial medical stabilization, and evaluation are completed; the agency administrator or designee having jurisdiction for the incident and/or firefighter representative (e.g. Crew Boss, Medical Unit Leader, Compensations for Injury Specialist, etc.) should coordinate with the attending physician to ensure that a firefighter whose injuries meet any of the following burn injury criteria is immediately referred to the nearest regional burn center. It is imperative that action is expeditious, as burn injuries are often difficult to evaluate and may take 72 hours to manifest themselves. These criteria are based upon American Burn Association criteria as warranting immediate referral to an accredited burn center.
- The decision to refer the firefighter to a regional burn center is made directly by the attending physician or may be requested of the physician by the agency administrator or designee having jurisdiction and/or firefighter representative.
- The agency administrator or designee for the incident will coordinate with the employee's home unit to identify a Workers Compensation liaison to assist the injured employee with workers compensation claims and procedures.
- Workers Compensation benefits may be denied in the event that the attending physician **does not agree** to refer the firefighter to a regional burn center. During these rare events, close consultation must occur between the attending physician, the firefighter, the agency administrator or designee and/or firefighter representative, and the firefighter's physician to assure that the best possible care for the burn injuries is provided.

## **NATIONAL WILDFIRE COORDINATING GROUP**

**National Interagency Fire Center**

**3833 S. Development Avenue**

**Boise, Idaho 83705**

NWCG#012-2008

Standards for Burn Injuries Page 2 of 2

### **Burn Injury Criteria**

- Partial thickness burns (second degree) involving greater than 5% Total Body Surface Area (TBSA).
- Burns (second degree) involving the face, hands, feet, genitalia, perineum, or major joints.
- Third-degree burns of any size are present.
- Electrical burns, including lightning injury are present.
- Inhalation injury is suspected.
- Burns are accompanied by traumatic injury (such as fractures).
- Individuals are unable to immediately return to full duty.
- When there is any doubt as to the severity of the burn injury, the recommended action should be to facilitate the immediate referral and transport of the firefighter to the nearest burn center.



# Communications



# King Radio Programming Instructions

1. Select the group you want to program. Press (#) and the desired group number. Press (ENT).
2. Bridge the gap between the rear upper and lower contacts of the accessory jack with a metal connector, then hold the (FCN) key. (Approx. 3 sec.).
3. At the "ID" display, enter the 6 - digit password (000000) and press (ENT).
4. At the "CH 00" display, press the channel number to program and press (ENT).
5. The display will change to the desired channel.
6. Press the (FCN) key and the Receive (Rx) freq. Will be displayed. To skip press (FCN). To change press (CLR), input the new Rx frequency, then press (ENT).
7. Now the Rx code guard will be displayed. Remember, as a rule we input tone frequencies on the TxCG. To skip press (FCN).
8. The Transmit (Tx) freq. is displayed. To skip press (FCN). To change press (CLR), enter new Tx freq., and press (ENT).
9. Now the Tx code guard will be displayed. To skip press (FCN). To change press (CLR), enter the new TxCG and press (ENT).
10. Now the channel label will be displayed, press (FCN).
11. You are now back at the entry point, "PRG" will appear in the upper left of the display. Review changes by pressing (FCN) repeatedly.
12. To enter a new channel to program, go back to step four.
13. When changes are complete, turn radio off and then on again to use new frequency information.

## **How to tell if your radio is Narrowband**

- When checking the King EPH, it is very important to check to see if you get the word PASS when you put the password in for programming.
- If you get the word PASS, hit "enter" and then enter channel number with key pad, and hit "enter" again. You should now see the "N" next to the channel number (if programmed in the narrowband mode) and you can change it from narrowband to wideband by pressing the # key on the keypad.
- If you do not see the word PASS, then you will have to program the radio by using a computer or cloning and will not be able to tell whether it is narrowband or wideband unless you upload the radio program to a computer and look at it there.

## Cloning Instructions:

Select group, turn master off

Select group, turn clone off

Attach clone cable to master (with master switch)

Turn master on

Set master in program mode (master switch + FCN)

Password \_\_\_\_\_

Connect clone cable to clone radio

Turn on clone radio

Press \* on master "PROG" will flash

Press FCN on master to download clone

If successful, "PROG" will flash otherwise "FAIL" will flash

## 00 Functions:

000 Sec - adding numbers will cause delay on keying radio

2.0 Sec. - when called 2 second when in scan mode

1 - 1 2 3 4 5      Priority scan

2 - 1 2 3 4 5      Scan Priority

To start or stop flash, press #

3 - 1 2 3 4 5      Alpha Numeric

FCN      Light off

FCN      Group 1

Tones:

- Input tones on Tx only unless otherwise specified
- @ 000.0 put in corresponding channel for tone by group

## Intra-Crew Communications Study Interagency Hotshot Crews

### FINAL PLAN:

National Hotshot Intra-Crew - 163.7125 MHz NTIA

Primary IA & Incident - P-1 167.1375 MHz NTIA  
P-2 168.6125 MHz NTIA  
P-3 173.6250 MHz NTIA

Additional frequencies can be made available upon arrival at incident by request only. This all depends on the size of complex, crews assigned, and frequency availability.

### Guidelines:

There is one (1) designated nationwide Hotshot Intra-crew frequency. 3 additional intra-crew frequencies are available and can be activated by IHC's at will whenever necessary.

### **The following requirements are with no exceptions:**

- Narrowband Operation.
- All communications involving tactical operation and coordination are to be conducted on the assigned Division Tactical.
- Tone/NAC on RX and TX on all frequencies at all times.
- When Demobed, Hotshot crews will be required to return to National IHC frequency. All others to be removed.
- No use of any other frequencies authorized unless assigned by NIFC
- Use in mobiles not authorized.
- Sharing of frequencies will be considered for all IA & incident assignments and implemented when possible. In most cases, the use of discrete frequencies should be reserved for Crews within ½ mile of one another.
- Maintain radio discipline at all times. This is a requirement for effective and efficient communications.
- Incidents in close proximity to one another, that are exceptionally large, or that have become complex will be assigned additional frequencies on a case-by-case basis.
- Utilize lowest transmit power setting possible without compromising safety.
- An intra-crew hotline is established to help mitigate and resolve problems.
- The National IHC Intra-crew and Primary IA & Incident frequencies will be available all year.

CREW	CG(PL)	DCS	NAC DEC/HEX
SANTA FE	162.2	165	1622/\$656
SIERRA	162.2	624	2527/\$9DF

# Santa Fe Hotshots

## Group 25 Channel Name Indicators

### Channels

1. TAC\_1
2. TAC\_2
3. TAC\_3
4. TAC\_4
5. TAC\_5
6. TAC\_6
7. CMD\_1
8. CMD\_2
9. CMD\_3
10. A/G\_1
11. A/G\_2
12. MUT-AID
13. CREW
14. IHC\_P1
15. IHC\_P2
16. IHC\_P3

# Santa Fe Hotshots

## BK Radio CH-00 Programming Settings

Screen 01 - P000000

Screen 02 - 0000000

Screen 03 - 090 Sec

Screen 04 - 2.0 Sec

Screen 05 - PR1 On (Can enter channel here)

Screen 06 - PR2 On

Screen 07 - 3 flashing

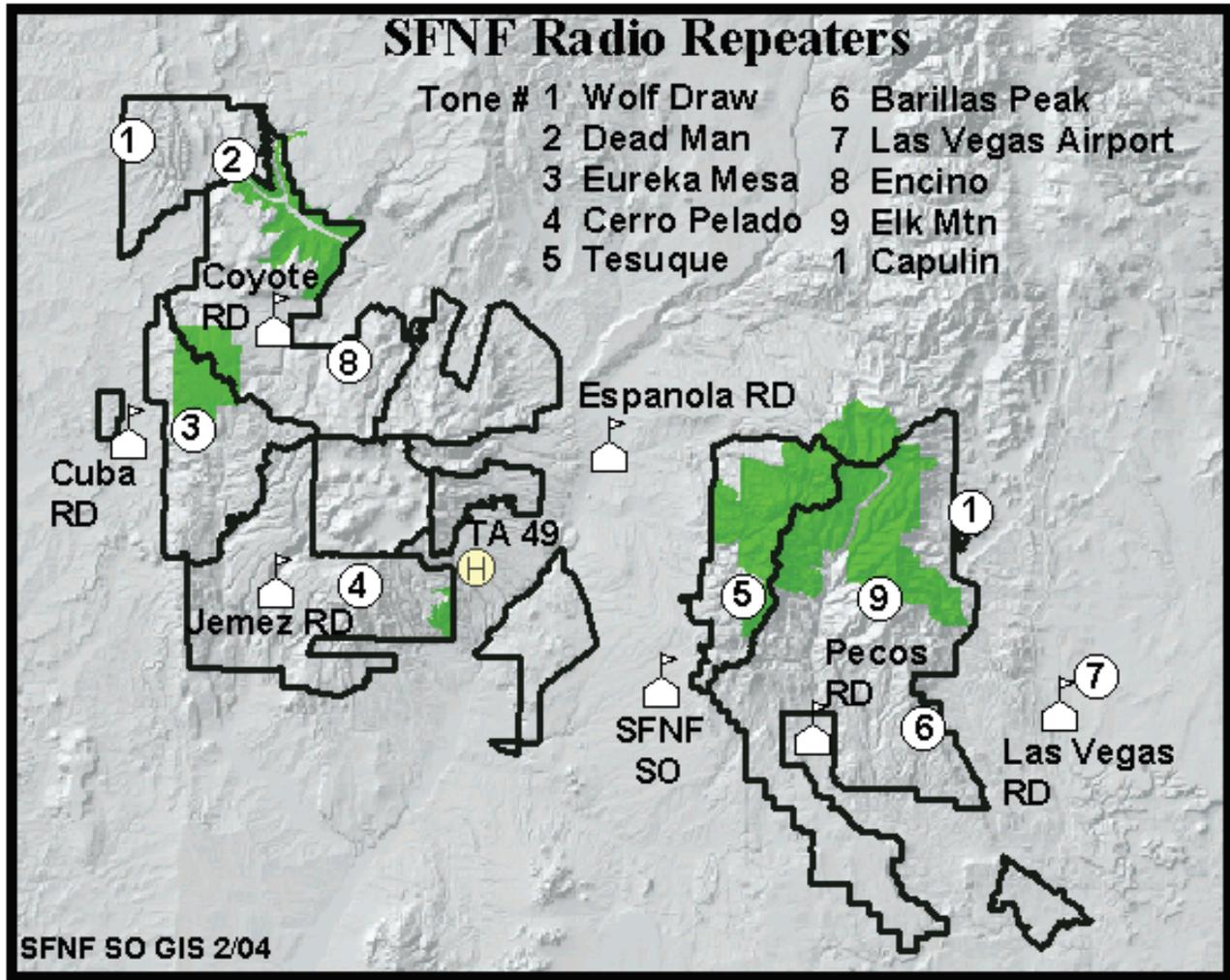
Screen 08 - 1,3,5 flashing

Screen 09 - 3,4,5 flashing

Screen 10 - 3 Sec On

Screen 11 - Group Label

# SANTA FE NATIONAL FOREST REPEATER MAP



# Some Useful Terminology

## **Active Crown Fire**

1 A fire in which a solid flame develops in the crowns of trees, but the surface and crown phases advance as a linked unit dependent on each other.

## **Area Ignition**

1 Ignition of several individual fires throughout an area, either simultaneously or in rapid succession, and so spaced that they add to and influence the main body of the fire to produce a hot, fast-spreading fire condition. Also called simultaneous ignition.

## **Azimuth**

1 Horizontal angle or bearing of a point measured clockwise from true (astronomic) north.

## **Azimuth Circle**

1 A circle graduated in 360 degrees in a clockwise direction from true (astronomic) north.

## **Back Azimuth**

1 Angle or bearing 180 degrees opposite of azimuth.

## **Backburn**

1 Used in some localities to specify fire set to spread against the wind in prescribed burning.

## **Backfire**

1 A fire set along the inner edge of a fireline to consume the fuel in the path of a wildfire or change the direction of force of the fire's convection column.

## **Backfiring**

1 A tactic associated with indirect attack, intentionally setting fire to fuels inside the control line to slow, knock down, or contain a rapidly spreading fire. Backfiring provides a wide defense perimeter and may be further employed to change the force of the convection column. Backfiring makes possible a strategy of locating control lines at places where the fire can be fought on the firefighter's terms. Except for rare circumstance meeting specified criteria, backfiring is executed on a command decision made through line channels of authority.

## **Backing Fire**

1 Fire spreading, or ignited to spread, into (against) the wind or downslope. A fire spreading on level ground in the absence of wind is a backing fire. 2 That portion of the fire with slower rates of fire spread and lower intensity normally moving into the wind and/or down slope. Also called: heel fire.

## **Blackline**

1 Preburning of fuels adjacent to a control line before igniting a prescribed burn. Blacklining is usually done in heavy fuels adjacent to a control line during periods of low fire danger to reduce heat on holding crews and lessen chances for spotting across control line. In fire suppression, a blackline denotes a condition where there is no unburned material between the fireline and the fire edge.

## **Bone Pile**

1 A mop up term. To "bone yard" a fire means to systematically work the entire area, scraping embers off remaining fuel, feeling for heat with the hands, and piling unburned materials in areas cleared to mineral soil. 2 An area cleared to mineral soil for piling unburned fuels.

## **Burn Out**

1 Setting fire inside a control line to consume fuel between the edge of the fire and the control line.

*Backfire see also:*

## **Cardinal Directions**

1 North, south, east, west; used for giving directions and information from the ground or air in describing the fire (e.g., the west flank or east flank, not right flank or left flank).

## **Carrier Fuels**

1 The fuels that support the flaming front of the moving fire.

## **Check Line**

1 A temporary fireline constructed at right angles to the control line and used to hold a backfire in check as a means of regulating the heat or intensity of the backfire.

## **Cold Trailing**

1 A method of controlling a partly dead fire edge by carefully inspecting and feeling with the hand for heat to detect any fire, digging out every live spot, and trenching any live edge.

## **Conflagration**

1 A raging, destructive fire. Often used to connote such a fire with a moving front as distinguished from a fire storm.

## **Confinement**

1 The strategy employed in appropriate management responses where a fire perimeter is managed by a combination of direct and indirect actions and use of natural topographic features, fuel, and weather factors.

**Containment** 1 The status of a wildfire suppression action signifying that a control line has been completed around the fire, and any associated spot fires, which can reasonably be expected to stop the fire's spread.

2 The act of controlling hazardous spilled or leaking materials.

**Controlled**

1 The completion of control line around a fire, any spot fires therefrom, and any interior islands to be saved; burned out any unburned area adjacent to the fire side of the control lines; and cool down all hot spots that are immediate threats to the control line, until the lines can reasonably be expected to hold under the foreseeable conditions.

**Convection Column**

1 The rising column of gases, smoke, fly ash, particulates, and other debris produced by a fire. The column has a strong vertical component indicating that buoyant forces override the ambient surface wind.

**Coyote Tactics**

1 A progressive line construction duty involving self-sufficient crews which build fire line until the end of the operational period, remain at or near the point while off duty, and begin building fireline the next operational period where they left off.

**Cup Trench**

1 A fireline trench on the downhill side of fire burning on steep slopes that is supposed to be built deep enough to catch rolling firebrands that could otherwise start fire below the fireline. A high berm on the outermost downhill side of the trench helps the cup trench catch material. Also called gutter trench.

**Eddy**

1 A circular-like flow of a fluid (such as air or water) drawing its energy from a flow of much larger scale, and brought about by pressure irregularities as in the downwind (lee) side of a solid obstacle. For example, wind conditions may be erratic and may eddy on the downwind side of large rock outcroppings, buildings, etc.

**Exposure**

1 Property that may be endangered by a fire burning in another structure or by a wildfire.

2 Direction in which a slope faces, usually with respect to cardinal directions.

3 The general surroundings of a site with special reference to its openness to winds.

**Fine Fuel Moisture**

1 The probable moisture content of fast-drying fuels which have a timelag constant of 1 hour or less; such as, grass, leaves, ferns, tree moss, pine needles, and small twigs (0-1/4").

**Fine Fuels**

1 Fast-drying dead or live fuels, generally characterized by a comparatively high surface area-to-volume ratio, which are less than 1/4-inch in diameter and have a timelag of one hour or less. These fuels (grass, leaves, needles, etc.) ignite readily and are consumed rapidly by fire when dry.

**Fire Regime**

1 Description of the patterns of fire occurrences, frequency, size, severity, and sometimes vegetation and fire effects as well, in a given area or ecosystem. A fire regime is a generalization based on fire histories at individual sites. Fire regimes can often be described as cycles because some parts of the histories usually get repeated, and the repetitions can be counted and measured, such as fire return interval.

**Flank Fire**

1 A firing technique consisting of treating an area with lines of fire set into the wind which burn outward at right angles to the wind.

**Foehn Wind**

1 A warm, dry and strong general wind that flows down into the valleys when stable, high pressure air is forced across and then down the lee slopes of a mountain range. The descending air is warmed and dried due to adiabatic compression producing critical fire weather conditions. Locally called by various names such as Santa Ana winds, Devil winds, North winds, Mono winds, etc.

**Geographic Area Coordination Center (GACC)**

1 The physical location of an interagency, regional operation center for the effective coordination, mobilization and demobilization of emergency management resources. Listings of geographic coordination centers and their respective geographic coordinating areas can be found within the National Interagency Mobilization Guide, Chapter 50.

**Head Fire**

1 A fire spreading or set to spread with the wind.

**Span of Control**

1 The supervisory ratio of from three-to-seven individuals, with five-to-one being established as optimum.

**Spot Fire**

1 Fire ignited outside the perimeter of the main fire by a firebrand.

**Spotting**

1 Behavior of a fire producing sparks or embers that are carried by the wind and which start new fires beyond the zone of direct ignition by the main fire.

**Wildland Fire Implementation Plan (WFIP)**

1 A progressively developed assessment and operational management plan that documents the analysis and describes the appropriate management response for a wildland fire.

**Wildland Fire Situation Analysis (WFSa)**

1 A decision-making process that evaluates alternative wildfire suppression strategies against selected environmental, social, political, and economic criteria, and provides a record of those decisions.

# Glossary of Fire Behavior & Fire Weather Terms

**Adjective Rating (R)** - A public information component of the NFDRS specific to the rating of fire danger. Adjective ratings are: low(L), moderate(M), high(H), very high(VH) and extreme(E).

**Aerial Fuels** - All live and dead vegetation located in the forest canopy or above the surface fuels, including tree branches and crowns, snags, moss and high brush.

**Appropriate Management Response (AMR)** - Specific actions taken in response to a wildland fire to implement protection and fire use objectives. Formerly known as the appropriate suppression response which consisted of the confine, contain, and control tactical strategies. (NWCG terminology adopted 06/12/97)

**Aspect** - The direction a slope faces the sun. Expressed in cardinal direction. Same as exposure.

**Available Fuel** - The portion of the total fuel that actually burns.

**Backfire** - A fire set along the fire side of a control line or barrier to consume the fuel in the path of an advancing wildfire or to change the direction of force of the fire's convection column. Note: Doing this on a small scale and with closer control, in order to consume patches of unburned fuel and aid in control line construction is distinguished as burning out.

**Backing Fire** - A slowly advancing fire which is burning into or against the wind or downslope. See head fire.

**Burning Index (BI)** - A measure of fire intensity. BI combines the Spread Component and Energy Release Component to relate to the contribution of fire behavior to the effort of containing a fire. BI has no units, but in general it is 10 times the flame length of a fire.

**Burning Period** - That part of each 24-hour period when fires will spread most rapidly. Most commonly 10:00 am to 4:00 pm.

**Canopy** - The stratum containing the crowns of the tallest vegetation present, (living or dead) usually above 20 feet.

**Chain** - A non-metric measure of distance common to land surveying, forestry and fire management. One chain equals 66 feet.

**Class of Fire (as to size of wildland fires)** - Class A = 0.25 acres or less, Class B = 0.25-<10 acres, Class C = 10-<100 acres, Class D = 100-<300 acres and Class E = 300+ acres.

**Confine a Fire** - To restrict the fire within determined boundaries established either prior to the fire or during the fire.

**Contain a Fire** - To take suppression action, as needed, which can be reasonably be expected to check the fire's spread under prevailing conditions

**Control a Fire** - To complete a control line around a fire, any spot fires therefrom, and any interior islands of unburned fuel to be saved; burn out any unburned area adjacent to the fire side of the control lines; and cool down any hotspots that are immediate threats to the control line, until the lines can reasonably be expected to hold under foreseeable conditions.

**Control Line (Fire Line)** - An inclusive term for all constructed or natural fire barriers and treated fire edge used to control a fire.

**Convection Column** - The thermally produced, ascending column of gases, smoke, and debris produced by a fire.

**Creeping Fire** - Fire burning with a low flame and spreading slowly.

**Crown Fire** - A fire that advances from the top to top of trees or shrubs more or less independently of the surface fire. Sometimes crown fires are classed as either dependent or independent, to distinguish the degree of independence from the surface fire's influence. See crown out.

**Danger Index** - A relative number indicating the severity of wildfire danger as determined from burning conditions and other variable factors of fire danger.

**Drift Smoke** - Smoke that has drifted from its point of origin and has lost any original billow form.

**Drought Index** - A number representing net effect of evaporation, transpiration and precipitation in producing cumulative moisture depletion in deep duff or upper soil layers. See Keetch-Byram & Palmer Drought Indices.

**Dry Lightning Storm** - A lightning storm with negligible precipitation reaching the ground.

**Duff** - The partially decomposed organic material of the forest floor beneath the litter or freshly fallen twigs, needles and leaves. See litter.

**Effective Wind Speed** - The mid-flame wind speed adjusted for the upslope effect on fire spread.

**Equilibrium Moisture Content (EMC)** - The level at which dead fuels neither gain nor lose moisture with time, under specific constant temperature and humidity. The vapor pressure in the air is equal to the vapor pressure in the fuel. A fuel particle, at EMC, will have no net exchange of moisture with its' environment.

**Energy Release Component (ERC)** - Based upon the estimated potential available energy released per unit area in the flaming zone of a fire. It is dependent upon the same fuel characteristics as the spread component (SC). The day to day variations of the ERC are caused by changes in the moisture contents of the various fuel classes, including the 1000 hour time lag class. ERC is derived from predictions of the rate of heat release per unit area during flaming combustion and the duration of the burning. Expressed in BTU's per square foot.

**Escaped Fire** - A fire which has exceeded initial attack capabilities.

**Extreme Fire Behavior** - Implies a level of wildfire behavior characteristics that ordinarily precludes methods of direct attack. One or more of the following is usually involved: High rates of spread; prolific spotting and or crowning; presence of fire whirls; a strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment, behaving erratically and sometimes dangerously.

**Fine Fuels** - Fuels such as grass, needles, fern, tree moss, some slash types & leaves which ignite readily and are consumed rapidly when dry. Also called flash fuels.

**Fine Fuel Moisture** - The probable moisture content of fast-drying fuels which have a time lag constant of one hour or less; such as, grass, leaves, ferns, tree moss, draped needles, and small twigs.

**Fire Behavior** - The manner in which a fire reacts to the variables of fuel, weather and topography.

**Fire Behavior Forecast** - Fire behavior predictions prepared for each operational period by a Fire Behavior Analyst (FBAN) to meet planning needs of fire management personnel. The forecast interprets fire calculations made, describes expected fire behavior by areas of the incident, with special emphasis on personnel safety, and identifies hazards due to the fire for ground and aerial activities.

**Fire Behavior Prediction System (FBPS)** - A fire behavior prediction system developed to make site specific fire behavior predictions utilizing fuels, weather and topographic inputs. The FBPS operates on site and time specific data to evaluate fire behavior as it changes with time and from point to point.

**Firebrand** - Any source of heat, natural or manmade, capable of igniting wildland fuels. Flaming or glowing fuel particles that can be carried naturally by wind, convection currents, or by gravity into unburned fuels.

**Fire Danger Rating** - A fire management system that integrates the effects of selected fire danger factors into one or more qualitative or numerical indices of current protection needs. See fire danger.

**Fire Effects** - The physical, biological and ecological impact of fire on the environment.

**Fire Intensity** - The rate of heat release for an entire fire at a specific point in time. See fireline intensity.

**Fireline Intensity** - The rate of heat energy released during combustion per unit length of fire front. It is usually expressed in BTUs/second/foot.

**Fire Load Index (FLI)** - A rating of the maximum effort required to contain all probable fires occurring within a rating area during the rating period. It is the cumulative index of the NFDRS. It is designed to combine the projections of fire occurrence and behavior into a single number that can be related to the total fire suppression job. The meaning of FLI has been left to the user. By itself, it does not tell the user much about the nature of the fire management problem. One needs to examine the individual components and indices that are the basis for the FLI. It ranges over a scale of 1-100 and has no units.

**Fire Management Plan** - A strategic plan that defines a program to manage wildland and prescribed fires and documents the Fire Management Program in the approved land use plan. The plan is supplemented by operational procedures such as preparedness plans, preplanned dispatch plans, prescribed fire plans and prevention plans. (NWCG terminology adopted 06/12/97)

**Fire Weather Forecast** - A weather prediction specially prepared for use in fire management activities.

**Fire Weather Station** - A meteorological sampling station specifically equipped to measure weather and fuel elements which have an important effect on fire management activities.

**Firewhirl** - A spinning, moving column of ascending air rising from a vortex and carrying aloft smoke, debris and flames. These range in size from a foot or two in diameter to small tornadoes in size and intensity.

**Flame Height** - The average height of flames as measured on a vertical axis. It may be less than flame length if the flames are angled.

**Flame Length** - The distance measured from the tip of the flame to the middle of the flaming zone at the base of the fire. It is measured on a slant when the flames are tilted due to the effects of wind and/or slope.

**Flaming Front** - The zone of a moving fire within which the combustion is primarily flaming. Behind this flaming zone, combustion is primarily glowing. Light fuels typically have a shallow, flaming front, whereas heavy fuels have a deeper front.

**Fuelbreak** - A wide strip or block of land on which the native vegetation has been permanently modified so that fires burning into it may be more readily suppressed. May or may not have firelines constructed in it prior to a fire occurrence.

**Fuel Loading** - The weight of fuels in a given area, usually expressed in tons per acre. Fuel loading may be referenced to fuel size or timelag categories; and may include surface fuels or total fuels.

**Fuel Moisture Content (FMC)** - The quantity of moisture in fuel expressed as a percentage of the weight when thoroughly dried at 212F.

**Fuel Moisture Sticks** - A specifically prepared set of sticks of known dry weight continuously exposed to the weather and periodically weighed to determine the changes in moisture content as an indication of moisture changes in wildland fuels. Typically representative of the 10 hour timelag fuel size.

**Fuel Type** - An identifiable association of fuel elements of distinctive species, form, size, arrangement or other characteristics that will cause a predictable rate of fire spread and intensity under specific weather and topographic conditions. Also referred to as fuel model.

**Ground Fire** - Fire that consumes the organic material beneath the surface litter.

**Ground Fuels** - All combustible fuels lying beneath the ground surface including deep duff, roots, rotten buried logs, peat and other woody debris.

**Haines Index** - A national fire-weather index based on the stability and moisture content of the lower atmosphere and their direct relationship to the growth of large fires. The index is from 1-6 with 1 being the lowest potential for large fire growth while 6 is the highest large fire growth potential.

**Hazard** - A fuel complex defined by kind, arrangement, volume, condition, and location that forms a special threat of ignition or suppression difficulty.

**Hazard Reduction** - Any treatment of a hazard that reduces the threat of ignition and spread of fire.

**Head Fire** - A fire spreading or set to spread with the wind or up slope.

**Head of Fire** - The most rapidly spreading portion of a fire's perimeter, usually to the leeward or up slope.

**Heat Per Unit Area** - The heat released by a square foot of fuel while the flaming zone of the fire is in that area. Expressed as BTUs/sq.ft.

**Heat Transfer** - The transfer or exchange of heat energy by radiation, conduction or convection.

**Heavy Fuels** - Fuels of large diameter such as snags, logs and large limb wood which ignite and are consumed more slowly than fine or flash fuels. Also called coarse fuels. See fine & flash fuels.

**Horizontal Continuity** - The extent or horizontal distribution of fuels at various levels or planes.

**Human Caused Risk (HCR)** - The number relating to the expected number of person caused fires that a rating area will be exposed to during the rating period. It is based on the historical fire occurrences in relation to weekday vs. weekend person caused fires.

**Ignition** - The initiation of combustion.

**Ignition Component (IC)** - Related to the probability of a firebrand producing a fire that will require suppression action. It is mainly a function of the 1 hour time lag (fine fuels) fuel moisture content and the temperature of the receptive fine fuels. IC has no units. A percentage of probability from 1-100.

**Ignition Temperature** - The lowest temperature of a substance at which sustained combustion can be initiated. Also called kindling point.

**Islands** - Patches of unburned fuel inside the fire's perimeter.

**Keetch-Byram Drought Index (KBDI)** - A number between 0-800 representing the amount of moisture in the top 8 inches of soil. Zero is saturated, 800 is maximum drought stress. It is calculated from recent precipitation measurements in relation to the average annual precipitation. It is important to note that the KBDI is customized for each geographic area and that often the scale shows less of a range in variation.

**Ladder Fuels** - Fuels which provide vertical continuity between strata. Fire is able to carry from surface fuels by convection into the crowns with relative ease.

**Lightning Activity Level (LAL)** - A numerical rating from the lowest of 1 to the highest of 6, keyed to the start of thunderstorms and the frequency and character of cloud-to-ground lightning forecasted or observed on a rating area during a rating period.

**Lightning Risk (LR)** - Number relating to the expected number of cloud to ground lightning strikes capable of igniting fires that a rating area will be exposed to during the rating period.

**Litter** - The uppermost layer of loose debris composed of freshly fallen or slightly decomposed organic materials such as dead sticks, branches, twigs, and leaves or needles.

**Long-range Spotting** - Firebrands which are carried high into the convection column and then fall out downwind beyond the main fire, starting new fires. Such spotting can easily occur 1/4 mile or more from the firebrands' source.

**Management Ignited Fire** - See prescribed burning. (Obsolete terminology)

**Maximum Manageable Area (MMA)** - The area of a prescribed fire where the fire is managed as part of the burn plan prescription parameters and constraints. A prescribed fire is managed within the MMA and all prudent and practical actions are taken by the prescribed fire team to maintain the fire within this predetermined area. If the prescribed fire breaches this perimeter line, the fire is declared a wildfire and the appropriate management response is initiated. This action usually consists of rapid and aggressive suppression tactics. (NWCG terminology adopted 06/12/97) Replaces the obsolete terminology of Maximum Allowable Perimeter (MAP).

**Midflame Winds** - The wind speed that affects a surface fire and is used in the mathematical fire behavior prediction models. It is usually less than the standard 20 foot wind speed.

**Moisture of Extinction** - The fuel moisture content at which the fire will not spread or spreads only sporadically and in an unpredictable manner.

**NFDRS (National Fire Danger Rating System)** - A multiple index system developed to provide information about current and predicted fire danger conditions.

**Palmer Drought Index** - A drought index commonly used in agriculture which defines seven different levels of drought classification. Less commonly used in fire management because it cannot be readily customized to specific locales.

**Plume Dominated Fire** - A fire where the energy produced by the fire in conjunction with forces such as atmospheric instability has created convective forces which dominate the surrounding environment. Such fires are extremely unpredictable, spread in various directions simultaneously, and exhibit extreme fire behavior. These fires are extremely dangerous and are often large in size. The formation of plume dominated fires is often directly related to high Haines indices.

**Pockets** - Deep indentations of unburned fuel along the fire's perimeter. Normally, fireline will be constructed across pockets and they are then burned out.

**Preparedness** - Activities that lead to a safe, efficient and cost effective fire management program in support of land and resource management objectives through appropriate planning and coordination. (NWCG terminology adopted 06/12/97)

**Prescription** - Measurable criteria which guide selection of appropriate management response and actions. Prescription criteria may include safety, economic, public health, environmental, geographic, administrative, social or legal considerations. (NWCG terminology adopted 06/12/97)

**Prescribed Burning or Prescribed Fire** - Controlled application of fire to wildland fuels in either their natural or modified state, under specified environmental conditions which allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and spread required to attain planned and approved resource management objectives. Also called controlled burning or formerly referred to as management ignited prescribed fire. A written, approved prescribed fire plan must exist and, requirements of the National Environmental Policy Act must be met, prior to ignition. (NWCG terminology adopted 06/12/97)

**Prescribed Natural Fire (PNF)** - A naturally occurring fire which is managed under prescribed conditions and allowed to "run its course" without endangering public safety or significant resource losses. (Obsolete terminology)

**Probability of Ignition (PI)** - The rating of the probability that a firebrand (glowing or flaming) will cause a fire, providing it lands on receptive fuels. It is calculated from air temperature, fuel shading, and fuel moisture. Portrayed on a 1-100% scale. See Ignition Component.

**Rate of Spread (ROS)** - The relative activity of a fire in extending its horizontal dimensions over time. Expressed as a rate of increase of the total perimeter of the fire, as a rate of forward spread of the fire front, or as a rate of increase in area, depending upon the intended use of the information. Usually it represents the forward spread and is expressed in chains per hour or meters per hour for a specific period in the fire's history.

**Reburn** - 1. Subsequent burning of an area in which fire has previously burned but has left flammable fuel that ignites when burning conditions are more favorable. 2. An area that has reburned.

**Red Flag Warning** - A term used by fire-weather forecasters to call attention to weather of particular importance to fire behavior. The purpose is to call attention of forecast users to special conditions of limited duration that may result in extreme burning conditions. May also bring attention to rapid changes in weather conditions which may increase the fire danger more rapidly than standard fire danger rating indices.

**Relative Humidity (RH)** - The ratio of the amount of moisture in a given volume of atmosphere to the amount that volume would contain if it were saturated. The ratio of the actual vapor pressure to the saturated vapor pressure.

**Remote Automated Weather Station (RAWS)** - A special remote fire weather observation station which takes timed measurements of the various weather factors used to calculate fire danger and behavior. These stations usually transmit data via satellite telemetry to the National Interagency Fire Center for distribution to fire managers nation-wide.

**Resistance to Control** - The relative difficulty of constructing and holding a fireline as affected by resistance to line construction and by fire behavior. Also called difficulty of control.

**Risk** - 1) The chance of fire starting as determined by the presence and activity of causative agents. 2) A causative agent. 3) A number related to the potential number of firebrands to which a given area will be exposed during the rating day.

**Running Fire** - Behavior of a fire spreading rapidly with a well-defined head.

**Scorch Height** - Average heights of foliage browning caused by a fire. Also referred to as scorch line.

**Short-range Spotting** - Firebrands, flaming sparks, or embers are carried by surface winds, starting new fires beyond the zone of direct ignition by the main fire. The range of such spotting is usually less than 1/4 mile. See Long-range Spotting.

**Slash** - Debris left after logging, pruning, thinning or brush cutting. Includes logs, chunks, bark, branches, stumps, and broken understory trees or brush.

**Smoke Management Forecast** - A forecast issued daily during specific periods advising fire managers of atmospheric conditions with special emphasis on elements which will affect the dispersal of pollutants from a fire.

**Smoldering fire** - Behavior of a fire burning without flame and spreading very slowly.

**Spot Fire** - Fire ignited outside the perimeter of the main fire by flying sparks or embers.

**Spotting** - Behavior of a fire producing sparks or embers that are carried by the wind or convection column and ignite new fires beyond the zone of direct ignition by the main fire.

**Spot Weather Forecast** - A special weather forecast issued to fit the time, topography and weather of a specific fire. Requires specific on-site weather observations and measurements.

**Spread Component (SC)** - A rating of the forward rate of spread of a head fire.

**Staffing Level (SL)** - A public information component of the NFDRS relating to the level of fire management staffing. Staffing levels are from 1-5 with 1 being the lowest and 5 the highest.

**State of the Weather (W)** - A brief description of current weather that expresses the amount of cloud cover, kind of precipitation, and/or restrictions to visibility being observed at a weather observation site.

**Surface Fire** - Fire that burns surface litter, other loose debris and small vegetation.

**Surface Fuels** - All materials lying on, or immediately above, the ground, including needles or leaves, duff, grass, small dead wood, downed logs, stumps, large limbs, low brush and reproduction.

**Surface Wind** - The wind measured 20 feet above the average top of the vegetation. Often a combination of local and general winds. Referred to as "20 Foot winds".

**Thermal Belt** - An area of a mountainous slope that typically experiences the least variation in diurnal temperatures, has the highest average temperature, and thus, the lowest average relative humidity.

**Timelag** - An indication of the rate a dead fuel gains or loses moisture due to changes in its environment. The time necessary for a fuel particle to gain or lose approximately 63% of the difference between its initial moisture content and its equilibrium moisture content. Fuels are usually grouped into 1-hr; 10-hr; 100-hr; and 1000hr timelag categories.

**Torching** - Fire burning principally as a surface fire that intermittently ignites the crowns of trees or shrubs as it advances.

**Wildland Fire Situation Analysis** - A decision-making process that evaluates alternative management strategies against selected safety, environmental, social, economical, political and resource management objectives as selection criteria. Formerly called the escaped fire situation analysis (EFSA). (NWCG terminology adopted 06/12/97)

**WIMS (Weather Information Management System)** - A computerized system for the collection and evaluation of weather data from fire weather stations for use in the calculation of NFDRS indices.

**Wind Driven Fire** - A fire in which the local and/or topographic winds have the overriding control on the rate of spread and growth of a fire. The power of the wind is greater than the power of the fire.

**Zone Weather Forecast** - A portion of the general weather forecast issued on a regular basis during the normal fire season specifically to fit the requirements of fire management needs. These zones and or areas are a combination of administrative and climatological areas.

### **Interpreting Fire Weather Station Observations & Forecasts**

#### **Interpreting Display Observations W = State of The Weather**

- 0 = Clear
- 1 = Scattered Clouds (1/10 - 5/10)
- 2 = Broken Clouds (6/10 - 9/10)
- 3 = Overcast (More than 9/10)
- 4 = Foggy
- 5 = Drizzling
- 6 = Raining
- 7 = Snowing or Sleet
- 8 = Showering
- 9 = Thunderstorm

**DRY TMP** = Dry Bulb Temperature (F) **RH** = Relative Humidity (%) **ML** = Morning Lightning Activity Level (From midnight to observation time)(1-6 Scale) **HC** = Human Caused Risk (1-6 Scale) **WIND DIRECTION** = Cardinal Direction **WIND SPEED** = Miles Per Hour (MPH) **10 HR** = 10 Hour Time Lag Fuel Moisture (%) **MAX TEMP** = Maximum Temperature (F) **MIN TEMP** = Minimum Temperature (F) **MAX RH** = Maximum Relative Humidity (%) **MIN RH** = Minimum Relative Humidity (%) **DUR** = Duration of Rain (Hours) **AMT** = Amount of Rain (Inches) **YL** = Yesterday's Lightning Activity Level (1-6 Scale) **FHC** = Forecasted human Caused Risk (1-6 Scale)

#### **Interpreting Fire Danger Indices**

**7MSGC** = 78 or 88 System, Fuel Model, Slope Class, Grass Type, Climate Class **WS** = Predicted Wind Speed **WDY** = Woody Fuel Moisture **HRB** = Herbaceous Fuel Moisture **1H** = 1 Hour Fuel Moisture **10** = 10 Hour Fuel Moisture **HU** = 100 Hour Fuel Moisture **TH** = 1000 Hour Fuel Moisture **IC** = Ignition Component **SC** = Spread Component **EC** = Energy Release Component **BI** = Burning Index **FL** = Fire Load Index **SL** = Staffing Level **R** = Adjective Fire Danger Rating **KBDI** = Keetch-Byram Drought Index









