

Fireline

Cliff Notes

2007

Compiled by: Chris O'Brien

MARK III PUMP INSTRUCTIONS¹

ENGINE LUBRICATION AND FUEL:

20:1 ratio – Thoroughly mix 60 oz. 2-cycle motor oil to each gallon of gas.

TO START PUMP:

1. Attach quick-connect fuel line to fuel can
2. Attach other end of fuel line to mark III pump fuel port
3. Open air vent on fuel can
4. Connect foot valve strainer to suction hose. Fill suction hose with water and connect pump intake side. Use spanner wrench to tighten the suction hose.
5. **Be sure foot valve is submerged** in water so it is not sucking air. If needed, place a shovel or bucket underneath foot valve where it rests. Check foot valve often and remove moss or debris that can collect on the foot valve. **Do not take the foot valve out of water while pump is running.**
6. Fill pump with water, then replace priming cap. Tighten firmly.
7. Connect discharge hose, nozzles, etc. to pump. Remember **hand tighten only** on the discharge side.
8. **SET UP!!!** From the discharge outlet connect a short piece (1 ½”) of hose to check and bleeder valve, then connect to 1 ½” gated wye. Connect hand primer to one side of gated wye, then connect the hose to the other side of the wye.
9. Prime pump with water
10. Close choke shutter if engine is cold.
11. Move throttle lever to START AND WARM UP position.
12. Give starter rope several quick, steady pulls.
13. Open choke slowly when engine starts. Allow engine to warm up 1-2 minutes before full throttle.

TO STOP PUMP:

1. Move throttle lever to STOP position.
2. Allow pump to run for approximately 1 minute with the throttle in the STOP position.
3. Press and hold the stop switch until engine has fully stopped.
4. To fully purge both the fuel line and the pump of remaining fuel, disconnect the quick-connect fuel line from the fuel can and allow the pump to run and empty itself of the remaining fuel in the line. This should only need to be done at the end of a shift or assignment.

IMPORTANT THINGS TO REMEMBER:

Do not run engine at full speed until properly warmed up! Do not run engine with pump disconnected! Do not run pump without water! Do not use suction hose without the foot valve strainer! Do not run pump at half speed! If less pressure is needed, adjust with bleeder valve!

FLOODING:

To clear a flooded engine close fuel supply valve, remove spark plug and rest it on top of cylinder head with ignition cable attached. Then with both the choke and throttle in the fully opened position, pull starter rope several times until excess fuel is exhausted. Before reinstalling spark plug, clean and dry.

AUTOMATIC CUTOFF SWITCH:

This device will stop the engine instantly and thereby eliminate over-speeding whenever the pump runs out of water or is improperly primed, etc. If the switch cuts out during normal operations, always find the cause before resetting. Some symptoms of this could be: not primed properly, air getting sucked through loose intake connection, foot valve clogged with debris, etc.

¹ Adapted from Lolo N.F. 2005 Needs to Know booklet.

MARK III TROUBLE-SHOOTING CHART²

A-Engine doesn't start

B-Starts momentarily then stops

C Runs irregularly or misses

D-Does not idle properly

E-Doesn't develop normal power

F-Overheats

G-Backfire

** Pump may need additional work, refer to owners manual

A	B	C	D	E	F	G	POSSIBLE CAUSE	REMEDY
X	X						Fuel supply tank empty	Refill tank
X	X						Fuel supply valve closed	Open valve
X	X						Air vent on fuel tank closed	Open air vent
X	X	X					Defective fuel supply hose	Replace
X	X	X					Dirty fuel strainer screen	Remove and clear or replace**
X	X	X					Leak in fuel supply system	Tighten or replace fittings
X	X	X	X	X	X		Carburetor mountings loose	Tighten mounting
X	X	X					Water or dirt in fuel system	Drain, flush thoroughly
X	X						Engine flooded	Close fuel, remove spark plug, open choke & throttle, pull until excess gas exhausted**
		X		X	X		Wrong gas in fuel mixture	Drain, flush thoroughly, replace**
				X	X		Wrong oil in fuel mixture	Drain, flush thoroughly, replace**
				X	X		Not enough oil in fuel mixture	Drain, flush thoroughly, replace**
x	X	X	X	X	X		To much oil in fuel mixture	Drain, flush thoroughly, replace**
		X		X			Air filter dirty	Remove, clean in gasoline
		X	X				Idle mixture screw is poorly adjusted	Close idle screw, then 1/2 turn counter-clockwise to reset
X		X	X	X	X	X	Spark plug fouled or defective	Clean or replace
X							No spark	Check stop switch or broken cable points**
X							Stop switch or cable shorted	Check switch and/or replace
X	X	X	X	X	X		Weak or intermittent spark	Check points, coil, and condenser**
X		X	X	X			Breaker points worn or dirty	Check, clean or replace
		X	X	X	X	X	Wrong type of spark plug	Plug must have 1/8 th gap
X						X	Defective condenser	Check or replace**
X		X	X	X	X	X	Ignition timing incorrect	Inspect points, clean or replace**
	X		X	X	X		Excessive carbon deposits	Clean or replace muffler
				X	X		Cooling system dirty	Clean fan housing
				X	X		Muffler blocked or dirt	Clean or replace muffler
				X	X		Main adjustment screw poorly adjusted	Close adjustment screw, then turn 1 1/2 turns counter clockwise to reset**

² Adapted from Lolo N.F. Needs to Know booklet

WATER DELIVERY INFORMATION³

Gallons per minute (GPM) for nozzles

Forester: 3/16 tip: 10 gpm (50 psi nozzle pressure)
 3/8 tip: 30 gpm (50 psi nozzle pressure)

Variable Pattern: One inch: 20 gpm (100 psi nozzle pressure)
 1½ inch: 60 gpm (100 psi nozzle pressure)

Maximum efficient flow

One inch hose: 30 gpm
 1½ inch hose: 100 gpm

Useful Information

- Test for flow (gpm) by the time required to fill a Fedco, (example 5 gal. in 15 sec.=20 gpm)
- Maximum vertical height for drafting = 12 ft. (Mark 3)
- Loss of one foot draft per 1000 feet elevation
- Head pressure loss or gain: 5 psi per 10 feet elevation
- Friction loss chart per 100 feet of hose

Hose	20 gpm	30 gpm	40 gpm	50 gpm	60 gpm	70 gpm	80 gpm
¾"	15	50	100+				
1"	12	25	45	70	95	100+	
1 ½"	2	4	6	9	13	17	22

- Use check valve for pumping uphill to overcome back pressure at pump.
- Avoid use of hard suction for tandem pumping. Not designed to withstand positive pressures.
- Pump pressure = nozzle pressure + friction loss of hose lay + head pressure + appliance friction loss.
- A double hose lay will reduce friction loss by 1/4 of a single hose lay.
- Friction loss for gated wye: 5 psi
- Use of two suction hoses on intake will increase gallons per minute.
- Maximum *horizontal* distance-pumping
 Single Mark 3 pump, 1½" hose, 50 psi nozzle pressure
 10 gpm: 40,000 ft.
 20 gpm: 10,000 ft.
 30 gpm: 4,000 ft.
 60 gpm: 800 ft.
- Maximum *vertical* distance-pumping
 Single Mark 3 pump, 1½" hose, 50 psi nozzle pressure
 10 gpm: 400 ft. (Friction loss for hose not included)
 20 gpm: 400 ft.
 30 gpm: 350 ft.
 60 gpm: 200 ft.

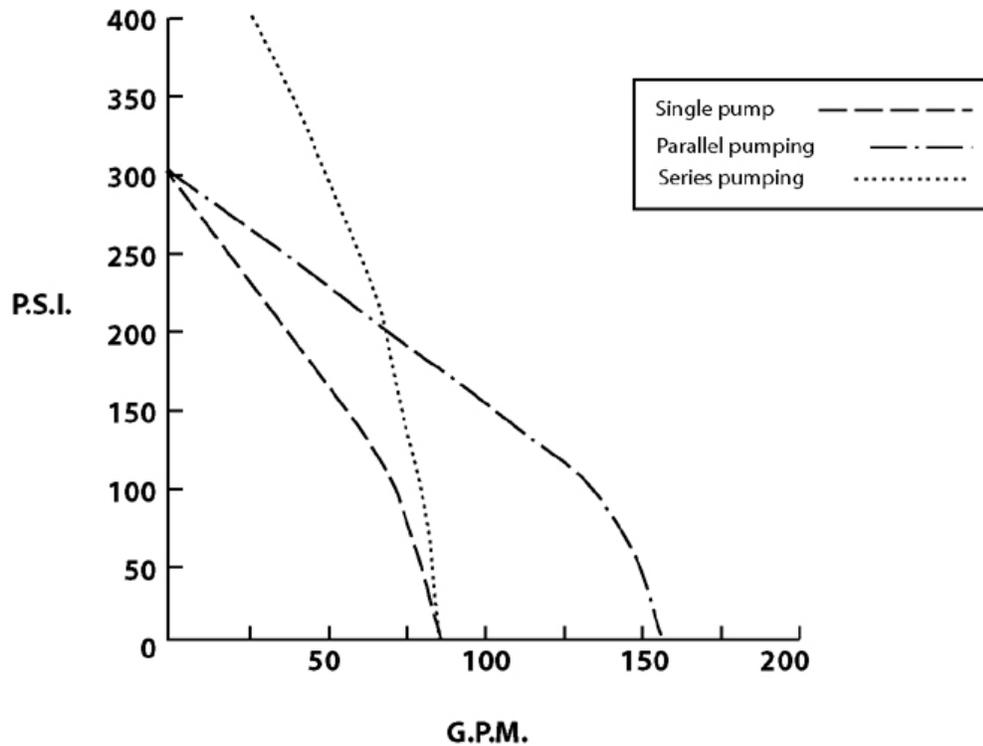
³ Adapted from 2006 Incident Response Pocket Guide.

WATER HANDLING EQUIPMENT NEEDS FOR 1 MILE OF HOSE LAY⁴

1 mile = 80 chains

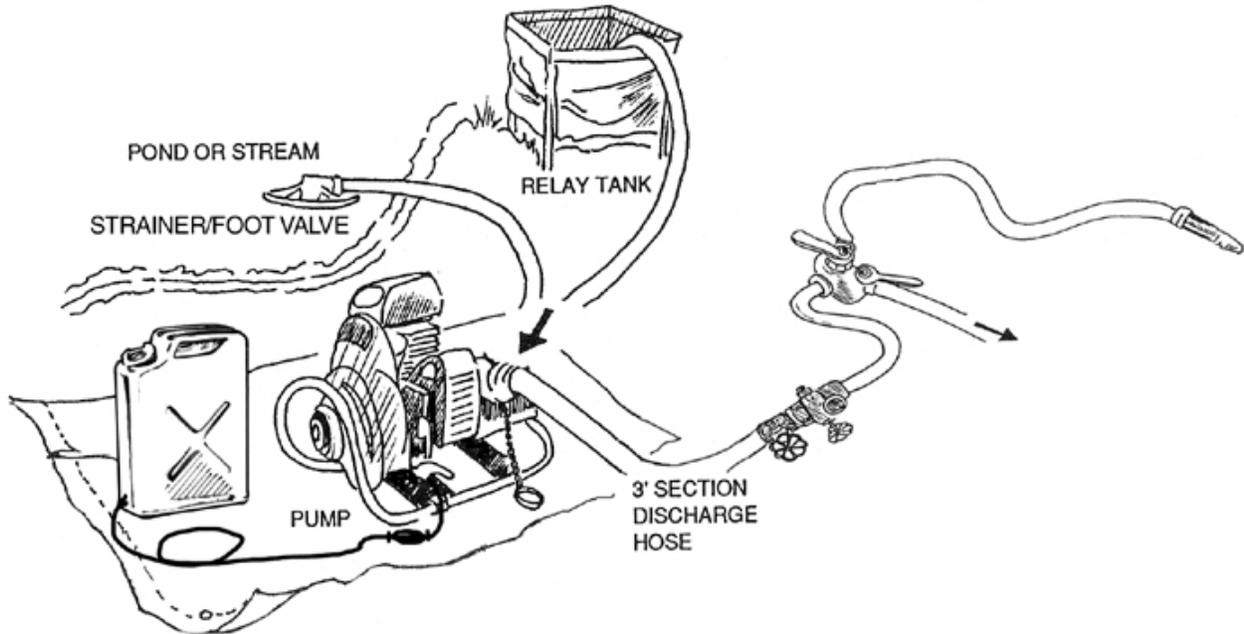
QUANTITY	ITEM DESCRIPTION	REMARKS
2	MARK III pump with kit	
20 gal	Pump gas	16:1 mix
53 rolls	1 ½" hose	
27 rolls	1" hose	
30	1 ½" gated wyes	
30	1 ½" to 1" reducers	
30	1" nozzles	Remember Forestor nozzles use less water
3	Hose clamps	
As needed	Mop up kits	
As needed	Wet water or foam	
As needed	Inline T's	
As needed	Port-a-tanks	
<i>60 rolls</i>	<i>¾" hose</i>	<i>See note below</i>
<i>30</i>	<i>1" gated wyes</i>	<i>See note below</i>
<i>30</i>	<i>1" to ¾" reducers</i>	<i>See note below</i>
<i>30</i>	<i>¾" nozzles</i>	<i>See note below</i>

**Consider subsisting ¾" hose for 1" to save on weight and water use. In some cases 1" hose can be substituted for 1 ½" hose.*



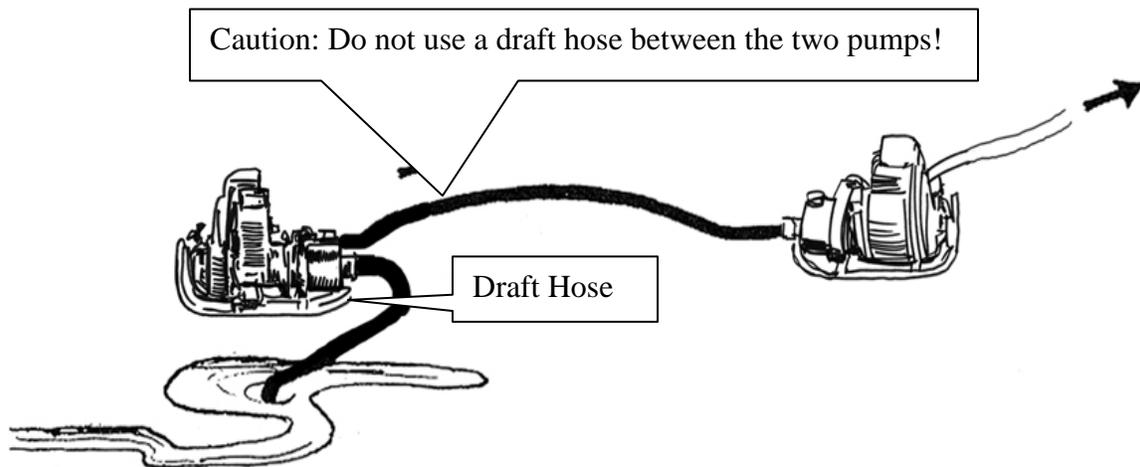
⁴ Adapted from Lolo N.F. Needs to Know booklet

MK III Pump Set Up Options⁵



Single Pump Set Up

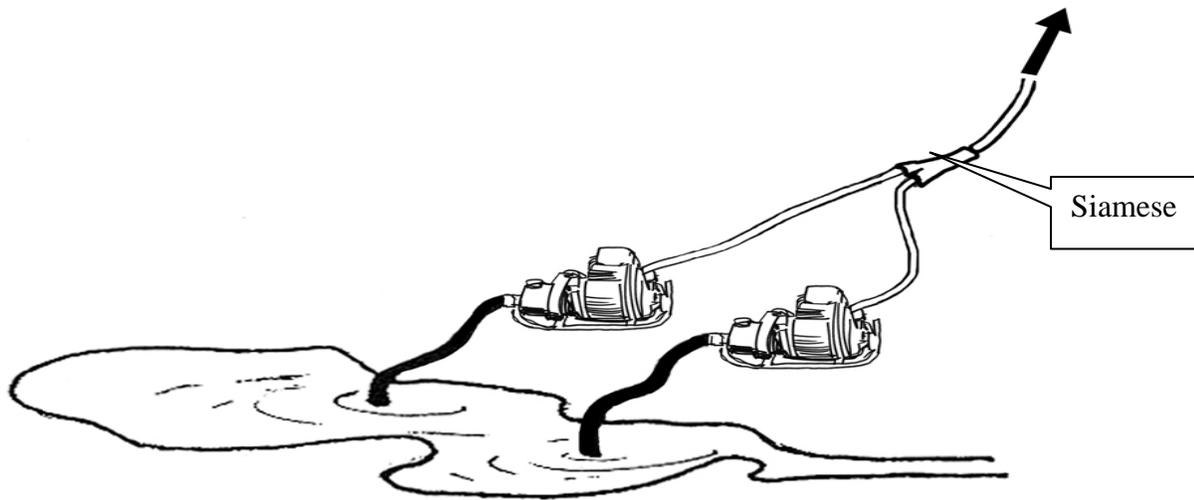
Advantages	Disadvantages
Usually adequate for flat ground	



Pumping Series

Advantages	Disadvantages
Requires one pump operator	Does not increase the amount of water being pumped
Allows pumping to higher elevations	

⁵ Adapted from S-211 workbook.



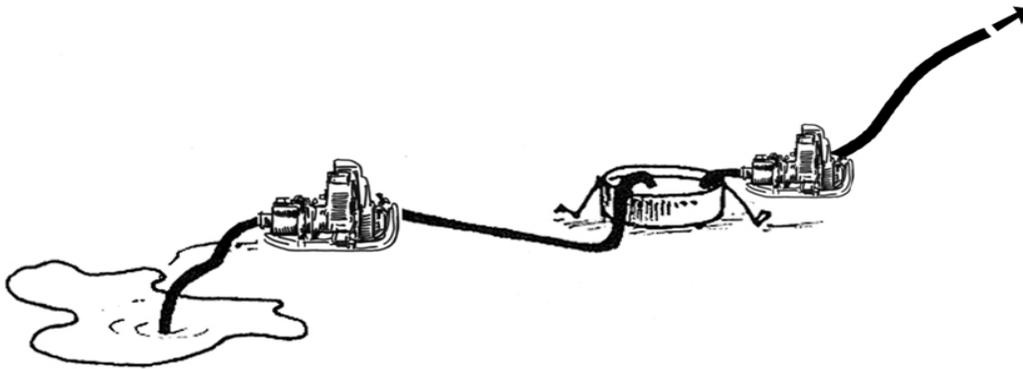
Parallel Pumping

Advantages	Disadvantages
Requires one pump operator	Does not increase the amount of water pressure available
Increases the amount of water pumped	



Siamese

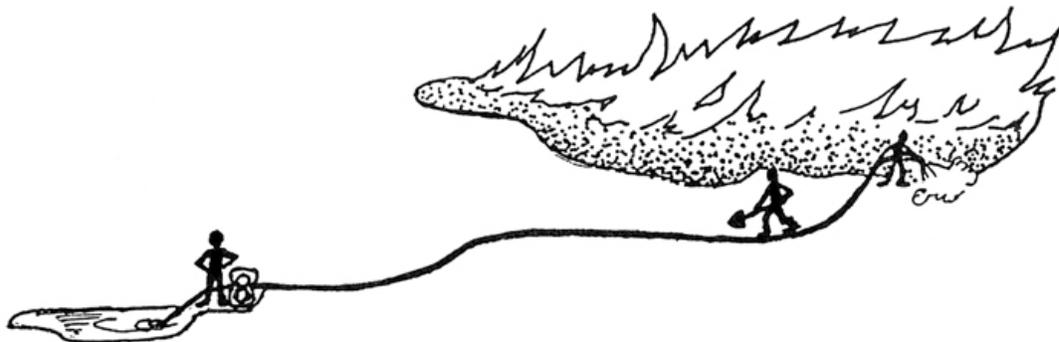
This fitting is required in parallel pumping in order to join the two pumps into one hose. Note that the threads of a siamese are the opposite of a gated wye. One double male fitting and two double female fittings can be used on a gated wye to improvise a siamese.



Staged Pumping

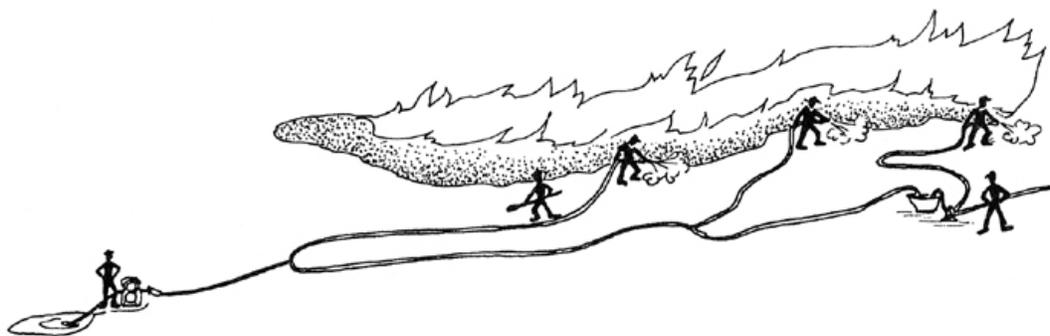
Advantages	Disadvantages
You can pump as high as you want, provided you have enough pumps and pump operators	Requires multiple pump operators
	Requires a fold-a-tank or other type of water tank

HOSE LAYS⁶



Simple Hose Lay

Advantages	Disadvantages
Quick to set up	Difficult to expand without shutting off pump
Does not require a lot of equipment	
Good on a small fires or hotspot	



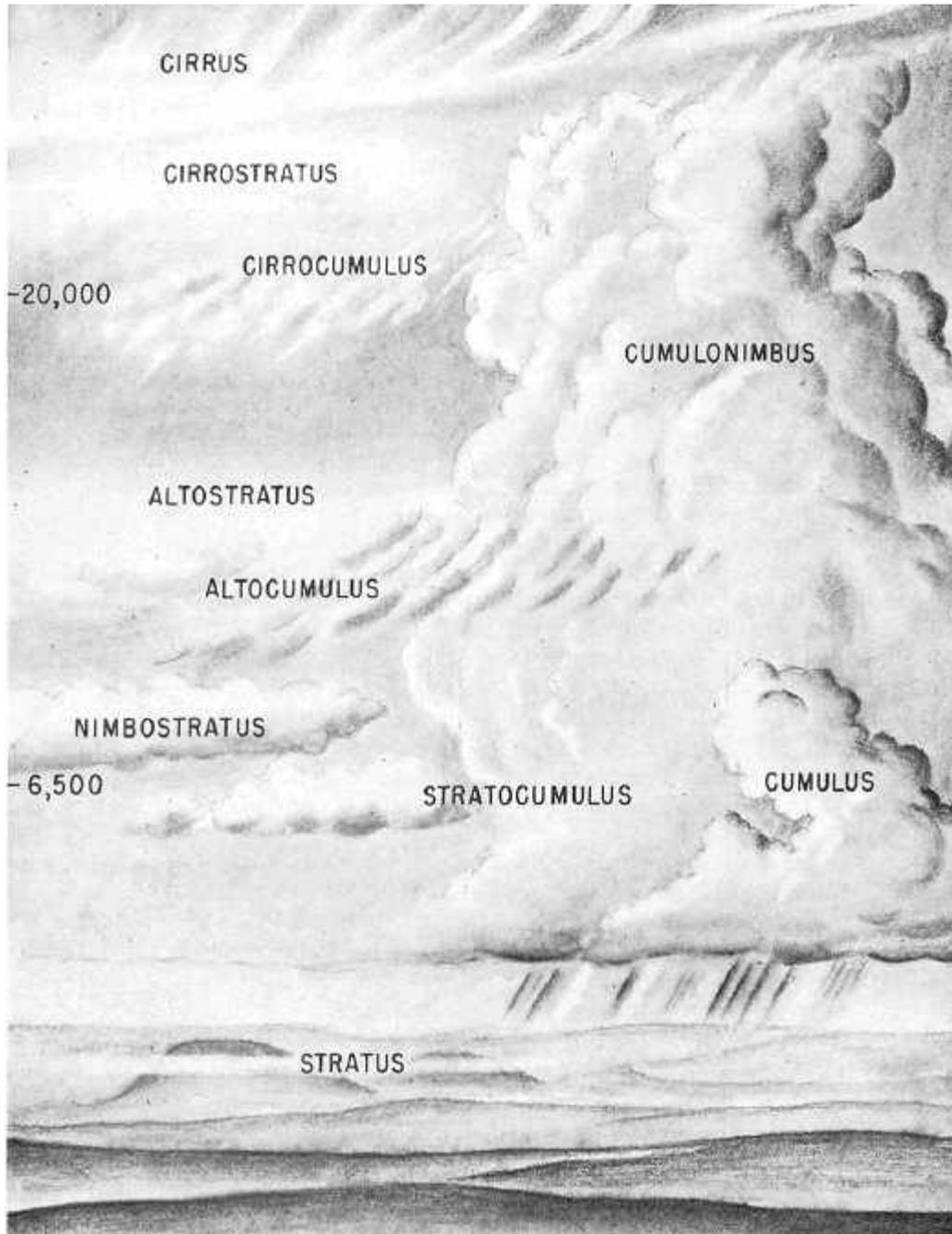
Progressive Hose Lay

Advantages	Disadvantages
Easy to expand	Requires a lot of equipment
Great tools to fight fires with higher flame lengths	
Most effective when hose packs are set up in advance	

⁶ Adapted from S-211 workbook.

WEATHER

Cloud Chart⁷



⁷ Taken from S-190 workbook

ATMOSPHERIC STABILITY⁸

Type	Indication	Dangers
Stable Air	Stratus clouds Limited rise of smoke columns Poor visibility Fog layers Steady winds	A small fire can become a large intense fire when replaced by unstable air.
Unstable Air	Clouds grow vertically Cumulus type clouds Gusty winds Good visibility Dust devils and fire whirls	Rapidly spreading fires
Inversions	Smoke and warm gases rise only until their temperature equals that of the surrounding air.	Decreased air quality and poor visibility. When the inversion lifts fire behavior will change abruptly.
Thermal Belts	Occurs mid-slope in mountainous terrain. A belt of warm weather is created by nighttime inversion	Fire behavior in the mid-slope is active through the night.
Subsidence	Stable air condition that is associated with foehn winds and increased fire behavior. Large scale sinking of air associated with a high pressure system.	As subsidence occurs, expect the weather to become hotter and drier.
Dust Devils and Fire Whirls	Most common indicator of unstable air. Fire whirls often occur in heavy fuels and on the lee side of ridges.	Wind speeds in fire whirls can exceed 20 mph. Can contribute to spotting and slopovers.

⁸ Adapted from S-190 workbook.

WINDS⁹

Type	Indication	Dangers
Cold Front	Southeasterly to south westerly winds ahead of the front. Westerly to north westerly winds behind the front.	Abrupt wind changes. Ahead of the front strong southerly winds will drive fire to north or northeast. After the front, winds will shift west or northwest. Relative humidity will drop within 24 hrs. of passage
Foehn Winds	Typically on lee side of mountain ranges. Commonly called: Chinook Santa Ana Mono wind North wind East wind	Relative humidity will drop with onset of foehn wind. Can last for days. Wind can reach speed of 40-60 mph.
Thunderstorms	Tall building cumulus cloud: Anvil shape Virga Ice crystals (dark top)	Downdraft wind that spreads in all directions. Wind velocities of 25-35 mph. Surface winds will be strongest in the direction the thunderstorm is moving.
Sea Breezes	Day time breeze Air from the sea moves onto land	Wind speed can reach 10 to 20 mph. Can affect spread rate and direction of fire and smoke.
Land Breezes	Night time breeze Air from the land moves off to the sea	Wind speed is between 3 and 10 mph. Can effect spread rate and direction of a fire and the smoke.
Upslope Winds	Day time wind Warm air rises from valley floor to mountaintop	Maximum upslope wind occurs mid-afternoon. Beware of rapid spread and extreme fire behavior slopes.
Downslope Wind	Night Cooler air from mountain-top sinks to valley floor.	Maximum downslope wind occurs after midnight. Beware of fire changing direction
Valley Winds	Similar behavior to slope winds	Up valley winds start after upslope winds and can reach speeds of 10 to 15 mph by the afternoon. Down valley winds begin a few hours after dark and can reach speeds of 5 to 10 mph

⁹ Adapted from S-190 workbook.

SPIKE CAMP ORDERS FOR ONE CREW¹⁰

Food Items

Quantity	Item Description
20	Dinners
20	Breakfasts
40	Lunches
8	Cubies
	Fresh fruit
4 cases	MREs (emergency)

Camp Items

Quantity	Item Description
4	Hand soap
8 rolls	Toilet paper
4	Wash bins
	First aid supplies
1 roll	Plastic (or tarp)
1000'	P-cord
1 box	Garbage bags
20	Sleeping bags

Line Items

Quantity	Item Description
	Batteries (radio <i>and</i> headlamp)
	Chainsaw gas
	Bar oil
	Saw parts/ files
	Flat files
	Extra hand tools

¹⁰ Adapted from Lolo N.F. 2005 Needs to Know booklet

CHAINSAW TROUBLESHOOTING AND FUEL MIXTURES¹¹

Chainsaw Troubleshooting Chart

Chain does not turn:	Chainsaw does not start:
Chain brake engaged Chain tension too tight Burred drive links Pinched bar groove Chain off sprocket Bar sprocket nose frozen Adequate bar/chain lubricant Debris in bar groove or sprocket	Ignition switch off Incorrect fuel mixture Choke on or saw is flooded Dirty air filter Plug wire broken or off spark plug Dirty or incorrect spark plug Exhaust screen plugged
Cutting crookedly:	Slow cutting:
Low rakers on one side Cutter filed differently Damage to raker on one side of the chain Uneven bar rails	Chain on backwards Dull chain Raker too high Clutch slipping Bar groove too wide

Carburetor Adjustments

To start, turn both jets to the right (clockwise) until they are snug

Make/model	Counterclockwise turns
Stihl 036, 044, 046,064	1 full turn for both high and low jets
Stihl 460	¾ turn for the high jet and ¼ for the low jet

Fuel Mixture Ratio

Fuel (gal.)	20-1	25-1	40-1	50-1
1	6 oz.	5 oz.	3 oz.	2.5 oz.
2	12 oz.	10 oz.	6 oz.	5 oz.
3	20 oz.	15 oz.	10 oz.	8 oz.
4	26 oz.	20 oz.	13 oz.	10 oz.
5	32 oz.	26 oz.	16 oz.	13 oz.

Fuel Ratio by Tool

Tool	Ratio	Tool	Ratio
Drip torch	1 gas : 3 diesel	Mark III	20: 1
Chainsaw	50: 1	Shindowa	30: 1
Mini-Striker	Straight gas		

¹¹ Adapted from Lolo N.F. 2005 Needs to Know booklet

RADIO PROGRAMMING

Programming radio	Cloning radio
<ol style="list-style-type: none"> 1. Hold master switch and FCN for 3 sec. 2. Screen should say ----- id 3. Type 000000 and press ENT 4. Screen should say CH 00 5. Type the channel number you wish to program and press FCN 6. Screen should list the present Rx frequency. 7. Press CLR 8. Screen should say 00. 9. Type desired frequency press ENT 10. Screen should list 00 for code guard. 11. Type desired code guard press ENT 12. Screen should now list old Tx frequency. 13. Repeat process from step 7. 14. Radio should be programmed. 	<p>With master radio.</p> <ol style="list-style-type: none"> 1. Hold master switch and FCN for 3 sec. 2. Screen should say ----- id 3. Type 000000 and press ENT 4. Screen should say CH 00 <p>Attach the cable to slave radio and turn it on.</p> <ol style="list-style-type: none"> 5. Press * on master radio 6. Screen will flash "PROG" 7. Press FCN 8. If successful master radio will flash "PROG" 9. Turn off slave radio. Radio should be programmed. 10. If unsuccessful master radio will flash "fail" and beep.

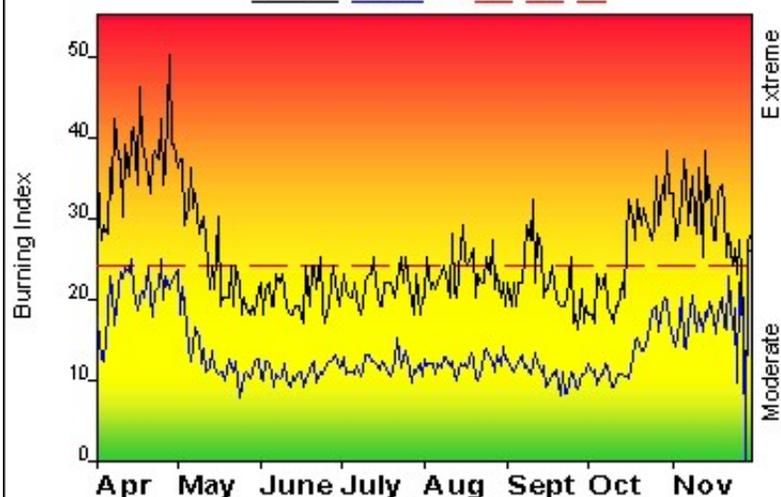
Office Phone Numbers

Name/Address	Phone/Pager	FAX
WMNF Supervisor Office	603-528-8746	603-528-8783
Androscoggin Ranger District	603-466-2713	603-466-2856
Rochester Ranger District	802-767-4261	802-767-4777
Saco Ranger District	603-447-5448	603-447-8405
GMNF Supervisor Office	802-747-6737	802-767-6766
Ammonoosuc Office	603-869-2626	603-869-5844
Manchester Ranger District	802-362-2307	802-362-1251
Finger Lakes National Forest	607-546-4470	607-546-4470
Pemigewasset Ranger District	603-536-1513	603-536-5147
Maine Forest Service	207-287-2791	207-287-8422
New Hampshire DRED	603-271-2214	

Remarks	Frequency	Tone	Assignment
Ground	Rx 171.525 Tx 171.575		FS GROUND
Washington	Rx 171.525 Tx 170.575	167.9	Forest Net Dispatch Repeat
Middle sister	Rx 171.525 Tx 170.575	146.2	Forest Net Dispatch Repeat
Wildcat	Rx 171.525 Tx 170.575	123	Forest Net Dispatch Repeat
Moosilaukee Milan	Rx 171.525 Tx 170.575	131.8	Forest Net Dispatch Repeat
Loon W Royce	Rx 171.525 Tx 170.575	136.5	Forest Net Dispatch Repeat
Tecumseh	Rx 171.525 Tx 170.575	110.9	Forest Net Dispatch Repeat
Pleasant	Rx 171.525 Tx 170.575	103.5	Forest Net Dispatch Repeat
Hitchcock	Rx 171.525 Tx 170.575	170.575	Forest Net Dispatch Repeat
Gorham PD	Rx 155.085 Tx 158.595		
Coos sheriff	Rx 155.925 Tx 155.925		
NH. Fish & Game	Rx 159.465 Tx 159.465	131.8	
NH Fish & Game RPT	Rx 151.340 Tx 159.345	141.3	
NH Forest/ Fire	Rx 159.225 Tx 159.225		
NE Fire Compact	Rx 159.285 TX 159.285		Tactical
Maine Fire Frequency	Rx: 154.310 Tx: 154.310		

FIRE DANGER -- White Mountain National Forest

Maximum, Average, and 90th Percentile



Fire Danger Area:

- ◆ White Mountain NF
- ◆ Oxford County, Maine
- ◆ Carroll, Grafton, Coos, NH

Fire Danger Interpretation:



- EXTREME** -- Use extreme caution
- (Caution)** -- Watch for change
- Moderate** -- Lower Potential, but always be aware

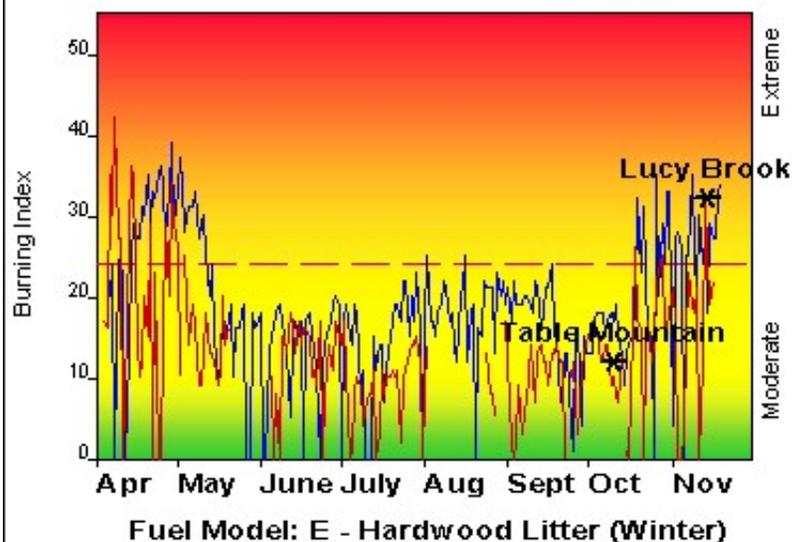
Maximum -- Highest Burning Index by day for 1984 - 2004

Average -- shows peak fire season

90th Percentile -- Only 10% of the days from 1984 - 2004 had an Burning Index above 24

Local Thresholds - Watch out: Combinations of any of these factors can greatly increase fire behavior:
 20' Wind Speed over 15 mph, RH less than 35%,
 Temperature over 80, 1000-Hour Fuel Moisture less than 18

Years to Remember: 2001 1992



Remember what Fire Danger tells you:

- ✓ Burning Index gives day-to-day fluctuations calculated from 2 pm temperature, humidity, wind, daily temperature & rh ranges, and precip duration.
- ✓ Wind is part of BI calculation.
- ✓ Watch local conditions and variations across the landscape -- Fuel, Weather, Topography.
- ✓ Listen to weather forecasts -- especially WIND.

Past Experience:

Most Spring and Fall fires burn in grass or leaves.
 Most Summer fires burn in conifer stands in the duff layer.
 Thermal Belt conditions can allow fires to burn actively at night.

Historic Fires:

- 1903: 85,000 acres in the White Mountains including four fires over 10,000 acres.
- 1947: 220,000 acres in Bar Harbor and York County, Maine fires (October 23)
- 1957: 13,000 acres in Sanford, Maine (May 8)
- 1984: 106 acres in Bartlett, NH (Table Mountain, October 16)
- 2004: 139 acres in Bartlett, NH (Lucy Brook, November 14)

