PRELIMINARY EVALUATION OF BURNING PROBLEMS ON THE PARSNIP AND FINLAY PONDAGE AREA

by

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Background

The Parsnip and Finlay River drainages partially occupy a portion of the Rocky Mountain trench which will be flooded by the Portage Mountain dam. The trench which is oriented generally N.W. and S.E. is occupied by the Finlay River flowing from the south which joins the Parsnip River flowing from the north to form the Peace River which flows east through the mountains. Finlay Forks, the confluence of the north- and south-flowing rivers, is located about 150 miles NNW of Prince George. Portage Mountain, the site of the dam, is located 65 miles east of Finlay Forks.

Land clearing prior to flooding is being done only on a main navigation channel, auxiliary channels and industrial sites, and the aesthetically high value site at the damsite. The main navigation channel is about ½ mile wide and extends the full length of the flooded area; the auxiliary channels to the industrial sites are about ¼ mile wide.

Clearing is being done by three methods; logging in accessible merchantable stands, cabling, and tree crushing. A further proposal that the treated areas be burned to reduce the amount of material will be initiated in the summer of 1966. The burning program which will eventually involve a total of 40-50 thousand acres over four years will start in 1966 with about 3,500 acres of slash from 1965 in addition to the 1966 slash which is in a condition to burn.

Conditions

Fuels

Generally the fuels are of three species; spruce, lodgepole pine and black cottonwood, and may be encountered in three main arrangements depending on the method of clearing employed. All efforts will be aimed at avoiding pronounced variation in slash age because of the rigid time limitation allocated to the clearing program. Predominantly spruce slash which is not burned within one year of felling because of adverse weather will receive a low burning priority in the following season so as to maintain program stability by concentrating effort on the easily burned fresh spruce and lodgepole and old lodgepole slash.

In order of their readiness to burn, the species and arrangements encountered will probably be as follows:

1. Cabled lodgepole pine
2. Cabled spruce
3. Crushed lodgepole pine and logged spruce
4. Crushed spruce
5. Crushed black cottonwood
6. Cabled black cottonwood

Topography

The areas to be burned are generally valley bottom flat lands and present few topographical problems in containing the fires. A few isolated

stretches of line appear to transect benches but the occurrences are rare. However, these areas must be given patrol and suppression priority. On the ground, reconnaissance may dictate relocation of some guards to take advantage of natural breaks. The valley bottom location of these burns will definitely have a limiting factor on the length of the burning season because of the expected night recovery and the early onset of valley fog in the late summer. Minimum drying regimes will also have to be extended to allow fire spread in the absence of the slope effect. The mechanical effect of wind is nearly synonymous with the slope effect but must be used cautiously.

Weather and Weather Forecasts

The success of the entire burning program will hinge on the number of opportunities for burning. Unfortunately, a complete lack of long-term weather records for this area precludes even a rough survey of the expected number of burning days in this area. Since the objective of the burning is to substantially reduce the amount of debris, burning should be done after moderately long droughts. To accomplish the job an absolute minimum of five drying days will be required on even the most readily burned areas.

Because of the extensive length of line involved, winds will prove to be the most troublesome, not necessarily while the fires are burning, but during the smoulder period. Winds will be the prime factor in determining patrol frequency. The general summer flow pattern in the area is from the southwest; these macro winds are modified and substantially reduced in the trench to flow along the valley in a northward direction. The occurrence of high pressure cells either to the northwest or to the southeast would radically increase the velocity of the valley winds. The simultaneous occurrence of an inversion with a high to the southeast would result in a critical wind condition. Caution should be exercised during evening periods when burning is being done or has recently been done opposite one of the mouths of the numerous secondary drainages. The suspected regular occurrence of cold air drainage from the upper levels can have a pronounced effect on fire behaviour. This precaution should be especially regarded opposite drainages coming into the trench from the west when subsidence will have started while the sun is still shining on the western aspect.

Local thunderstorm activity during the proposed burning or patrol period should be closely regarded. In fact, burning should be delayed if storm cells are in the vicinity and patrol frequency should be increased where hangovers are within 300 feet of the guard.

Top priority for this program should be the purchase and establishment of at least three recording wind systems in the trench. One should be part of a Class I fire weather station at Finlay Forks, another in a location away from the influence of secondary drainages, and another opposite the mouth of one of the larger secondary east-flowing drainages. This type of instrument is available from Science Associates, Princeton, New Jersey, and is listed as No. 470 All-Purpose Wind Recording System and includes No. 406 Wind Speed Transmitter, No. 427A Wind Direction Transmitter and No. 471SW Spring-Drive Chart. The recorder is an 8-day clock and will require attendance every eight days to wind the chart. This unit should be purchased complete with mast, and the range of the recorder changed to make a full span of 50 miles per hour rather than the present 100 m.p.h. This modification

is available locally.

A weekly hygrothermograph with shelter, and a rain gauge at each location will provide minimum weather data. Rain gauges at the remote stations must be provided with a small amount of kerosene to prevent evaporation of water between the weekly measurement intervals. The humidity chart of the hygrothermograph will serve to establish rainfall periodicity. A recording rain gauge is recommended for the Finlay Forks station.

Further data on potentially dangerous weather regimes will be compiled by Mr. Jack Turner of the B. C. Forest Service, Protection Division. A fire weather forecasting service will probably be available from Mr. Al Jackson of the Department of Transport, Air Service Division, at the Vancouver Office. He may be contacted by phone for spot forecasts in most localities. Provision for input of weather data from the Finlay Forks station to Vancouver weather must be made if reliable forecasts are expected. The output from the Finlay Forks station should include at least the following weather parameters and should be transmitted before 0900 P.S.T. to enable the forecast to be returned early in the day.

1. Maximum previous day's temp.
2. Minimum previous day's humidity
3. Maximum average wind speed from 1200 to 1800 of previous day
4. Previous day's rainfall
5. Twenty-four hour precipitation from 0800 P.S.T. yesterday to 0800 P.S.T. today
6. Today's 0800 temperature
7. Today's 0800 humidity
8. Today's 0700-0800 average wind speed and direction

Return data when requested from the forecast office should include:

1. Today's min. relative humidity
2. Today's max. temperature
3. Today's afternoon maximum wind speed and direction
4. Tomorrow's max. wind speed and direction
5. Tomorrow's max. temperature
6. Probability of thunderstorm
7. Three-day outlook - plain language

Forecasts should be requested for all burning days and should extend for at least one day after the burn day. Communications must be established to allow early warning of the development of potentially dangerous wind situations. Previous consultation with Mr. Jackson should be made to establish required parameters and methods of communication.

Weather equipment required:	Total Cost
3 Hygrothermograph press	$ 450.00
3 Recording wind systems, battery operated	3,600.00

3 Instrument shelters	$ 240.00
2 Rain gauges, Met. type	30.00
1 Recording rain gauge	300.00

Requirements and General Operational Procedures

Personnel

A crew of at least twelve persons with one general foreman will be required to handle the 3,500 acre program during the coming season. With this type of task the personnel requirements can be exceedingly flexible, alternating between periods when three or four times this number could be used, to long periods during wet weather when there will be no personnel required. An effort should be made for the burning crew to be assigned other low-priority jobs so that their wages will not be charged wholly against burning; if this can't be done then other duties such as burn evaluation studies consisting of making pre- and post-burn fuel tallies to determine the effectiveness of the burns in reducing the amount of debris. These tasks could be performed during wet weather and also during dry weather when the crews could be located near potential trouble spots during hazardous post-burn periods. Rudimentary fire training in the use of hand tools, chain saws, and power pumps should be done immediately upon hiring. Because of the variable work hours required, provision for overtime pay should be made.

The twelve-man crew should be broken into 4 three-man squads with the equipment and capability of functioning as a three-man, air-lifted attack module. Personnel selected for this job should be alert, observant and be in good physical shape.

Personnel requirements:

1 Foreman
12 Crewmen - 4 to be selected as sub-foremen
Living accommodations for 13 men + 3 advisory staff
Fire training material

Ignition

Because of the general lack of access and the large areas involved, ignition will be done primarily from a helicopter using either a multiple or single point ignition napalm or chemical pyrotechnical device. Without seeing the ground, it seems that a combination of central ignition graduating to an area ignition pattern should be used; the mobility of the helicopter is especially adaptable to this technique. A line firing pattern burning into the wind would have greater impact on the area and would remove a greater portion of the fuel. However, this method entails a longer period when active fire is present, and with the large areas involved, the risk of an escape would be increased. The combined central and area technique will appreciably reduce the time involved in the actual burning, and the small sacrifice in the amount of material removed will be fair exchange for the reduced risk.

There are several single point igniters on the market. One type

is a Fenner grenade with a pull-type igniter adapted for helicopter use; another is the use of a modified "Very" pistol with special cartridges. If single point igniters are used there should be as many devices purchased as acres involved. This ratio will make allowance for loss, damage by weather, and demonstration. The Fenner grenades are about 35 cents each and the Very pistol and flares cost about $25.00 for the pistol and 50 cents per cartridge. Of these two the Fenner grenade is the better device. A dispensing multiple ignition grenade is currently being developed with a good possibility of being ready for this season's work. Prices are not available, but only about one third the number will be required. Pre-set ignition techniques with fuses and/or detonators are not recommended because of the "lay" time involved and the risk of animal disruption to the "lay."

Area 3 will be wholly ignited from the helicopter although Areas 1 and 2 on the Parsnip drainage may well include some ground ignition, and provision for this eventuality should be made. For ground ignition the Panama drip torch has been found to be most suitable. This torch combines simplicity, safety, efficiency into a compact ignition unit easily handled and serviced by one man. These units cost about $31.00 Canadian funds. For the first year's program 12 of these units should suffice. In addition to these torches at least one mobilized ignition device should be purchased for rapid ignition of vehicle-traversable guards. One mobilized ignition device consists of a flexible tube connected to the exhaust pipe of a vehicle or tractor utilizing the exhaust pressure to draw kerosene or diesel fuel through a venturi and past a wick which ignites the fuel-air mixture. Flame lengths from 12 to 15 feet are capable with this device. This unit may also be used as a portable steam cleaner and herbicide sprayer. The cost is about $100.00 per unit. Another mobilized device available from Western Forest Fire Equipment consists of a small pump and wand device for pressurizing fuel from a drum; flame lengths up to 50 feet are claimed. This unit costs about $400.00 but would probably be more adaptable to this ignition job because of the greater flame length required.

Subject to revision according to local conditions at least a 5-day drying regime will be allowed prior to ignition. Ignition will proceed if maximum expected winds do not exceed 10 miles per hour for the day and 15 miles per hour for the next day. If used, fuel moisture indicator sticks should be less than 8 per cent moisture content or coastal fresh slash hazard tables shall be in excess of 12.

Prior reconnaissance of each unit will establish the need for suppression squads at assured trouble spots, and if required wetting down outside the line prior to ignition will be done. Apart from crews previously placed, a central depot for crews and equipment will be established for each burning unit. Radio communication between each 3-man module and the ignition reconnaissance helicopter will be maintained at all times. A helicopter having at least the capability of a Bell G3B will be required to provide efficient mobility of suppression forces and should be equipped with an electric release system.

Ignition Equipment Required:	Unit Price	Total Price
12 Panama drip torches	$ 30.00	$ 360.00
1 Mobilized ignition device	400.00	400.00
30 cases of 150 each Fenner grenades	40.00	1,200.00

Suppression and Patrol

Generally speaking, the control aspects are not difficult in this project; the complicating factors are the large extent of perimeter and the relative inaccessibility of the burning units.

Immediate suppression of any excursion will afford the least cost operation. The flexibility of four 3-man crews, each having their own attack capability with helicopter transportation, should adequately handle all but the most critical situation. In this event they will act as fire overhead. Each three-man crew should have the following equipment: 2 loaded B.C.F.S. hose packs, each pack containing 700 feet of unlined linen hose; 2 lightweight B.C.F.S. type aluminum nozzles, 2 siamese, one Gorman Rupp portable pump with kit, 2 pieces heavy gauge polyethylene sheeting at least 20 feet square, 2 shovels, 1 pulaski, 3 headlights, 1 day's rations, 1 Motorala handy talkie and 2 canvas bag trombone pumps. A chain saw should be readily accessible at all times.

For additional support there should be at least three monsoon buckets. This device consists of a 45-gallon drum equipped with a trap door slung beneath a helicopter. The bucket is filled by dipping into any water source of sufficient depth, helicoptered to the trouble spot and dropped either directly on the fire or into a temporary reservoir for use by a pump crew. The polyethylene sheets are used to line a ground depression to form the reservoir.

Air tankers for additional air attack capability will be available in the event of a major excursion from Prince George if not committed to other use.

The frequency of patrol will be based on the Federal Fire Danger Index with a frequency adjustment for wind and, most important, the number and proximity of hangover fires to the guards. During very critical periods personnel will be assigned lookout duty from local promontories to provide continuous surveillance of a burning unit. Other means of surveillance are opportunity flights, scheduled air patrols and ground transportation along traversable guards.

The duration of hangovers will largely determine the size of the patrol job. In areas of predominantly sound lodgepole pine, hangovers may be expected to last a maximum of one week in the absence of precipitation. If there are large volumes of rotten material then hangovers can well last the entire summer. Care in the preparation of guards will avoid most of the hangovers that occur along the guard. Fuel concentrations on both sides of the guard should be minimized by a brush blade to move all fuel away from the guard location. A second machine with a blade then scalps a single-blade width to mineral soil on the outside edge of the cleared zone. If only one machine is used the berm should be moved to the outside of the guard where it is inaccessible to fire rather than to the inside where fire can readily become established and maintained in the mixture of fuel, duff and dirt.

Equipment requirements for suppression and patrol: Approx. Total

4 portable Gorman Rupp pumps	$2,000.00
5 Motorala handy talkies	2,500.00

2	dozen Pulaskis	$ 120.00
1	Slip-on tanker unit	500.00
2	dozen Lady shovels	120.00
2	dozen Headlamps	100.00
10	Canvas bag trombone pumps	80.00
2	rolls Polyethylene	--
3	Monsoon buckets	400.00
5,000	ft. of 2½" Unlined hose	5,000.00
2	dozen Nozzles	60.00
2	dozen siamese	120.00
2	Chain saws	300.00

Location and Particulars of Areas

The following brief summary of each of the three general locations where 1966 burning is proposed serves to point out locations, general conditions and specific control problems on each area. To reference the terms, the broad definition of locality is an "area", while "burning unit" or "unit" refers to individual burning opportunities within the area. The units are provisionally designated along natural fire guards or where topographic advantage for guard location can be realized. Each burning unit is an individual prescription problem that will be attacked either singly or in multiples but never in fractions.

Area No. 1 - Parsnip River Pondage

Area 1, Appendix 1, is about 1½ miles long and lies southwest of Tutu Lake between Block 1 and 2 of X89052. The western third of this area along the river is predominantly cottonwood, the remaining two thirds is immature spruce and lodgepole pine. The tree crusher was used exclusively on this area. There is no all-weather access and guards have yet to be built. The southeast corner of this area dissects a slope, and without extreme caution in locating this guard some containment problems could develop. Drivable guards along the east side of this area will be established as soon as machinery is able to operate. The main river channel of the Parsnip forms the other three boundaries of the area. This area of about 510 acres will be a single burning unit.

Area No. 2 - Parsnip River Pondage

This area, Appendix 2, totals about 1,600 acres and extends for about six miles of shoreline on the east side of the main river between Blocks 4 and 8 of X89052. Two large drainages, the Nation River from the west and Cut Thumb Creek from the east, intersect the main trench about four miles from the area's southern extent. Fifteen foot guards have been built and roads extend to portions of the area. The cover type on this area was predominantly lodgepole pine and spruce. The tree crusher was used exclusively in the clearing operation on this area.

Area 2 has been divided along logical control lines into three burning units of 430, 680 and 500 acres for units 1, 2 and 3 respectively. Apart from the extensive east boundary, only the locality at the mouth of Cut Thumb Creek presents a potential control problem. In this locality a large extension of the burning area extends along both sides of Cut Thumb

Creek making an awkward dog leg which extends the length of control line into the bottom of a natural advective chimney. Another factor that emphasizes the escape potential of this locality is the confluence of the Nation drainage directly to the west probably causing an increased and highly variable wind field compared to the rest of the trench. This locality will receive number one patrol priority for Area 2.

Area No. 3 - Finlay River Pondage

The third area of about 1,900 acres, Appendix 3, extends along about eight miles of river. The southern extent is marked by the confluence of Shovel Creek with the Finlay and the northern end by a series of oxbow bends north of Factor Ross Creek. The main camp for the 1965 clearing operations is located near the midpoint of the area.

This area has been divided into five burning units of 460, 430, 480, 300 and 230 acres from 1 to 5 respectively separated by either main river and guard intersection or by wide flood channels. The main river forms the west guard of the entire area. Units 1, 4 and 5 also utilize flood channels as eastern guards. About 30-40 per cent of the area is cottonwood, while the remaining higher eastern portions are mature spruce. Control problems are anticipated on Unit 2 and 3. A portion of the east boundary of 3 is guarded by a 15-foot cot guard against mature timber and will not arouse concern unless an extended drought occurs. This unit will receive patrol priority 2 on this area. The east boundary of Unit 2 will received patrol priority 1. The old burn along about a mile of the east boundary is a potentially high rate of spread fuel complex. The sharp angle of the channel at this point also increases the escape potential because the guard is at right angle to the expected S.W. macro wind and about 45 degrees to the S.E. valley winds.