Are Wildland-Urban Interface Fire Disasters Avoidable?

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Honorary Research Associate
Faculty of Forestry & Environmental Management
University of New Brunswick

KEYNOTE PRESENTATION:

New Brunswick Association of Fire Chiefs 32nd Annual Convention – Moncton, NB – May 23-25, 2009

Hosted by the SouthEast Fire Fighters Association

Background of Presenter

- Fought first wildland fire as a 15-year old
- Member of Interagency Hotshot Crew (Wyoming, USA), summers of 1972 & 1973
- Worked part-time for U.S. National Fire Danger Rating System Project, 1972-1974
- BSc, MSc and PhD degrees in forestry
- Employed by Canadian Forest Service since 1976, principally in fire behavior research
- Work experience across Canada and in Australia, New Zealand, Alaska and Portugal
- Consider myself a “student” of wildland fire

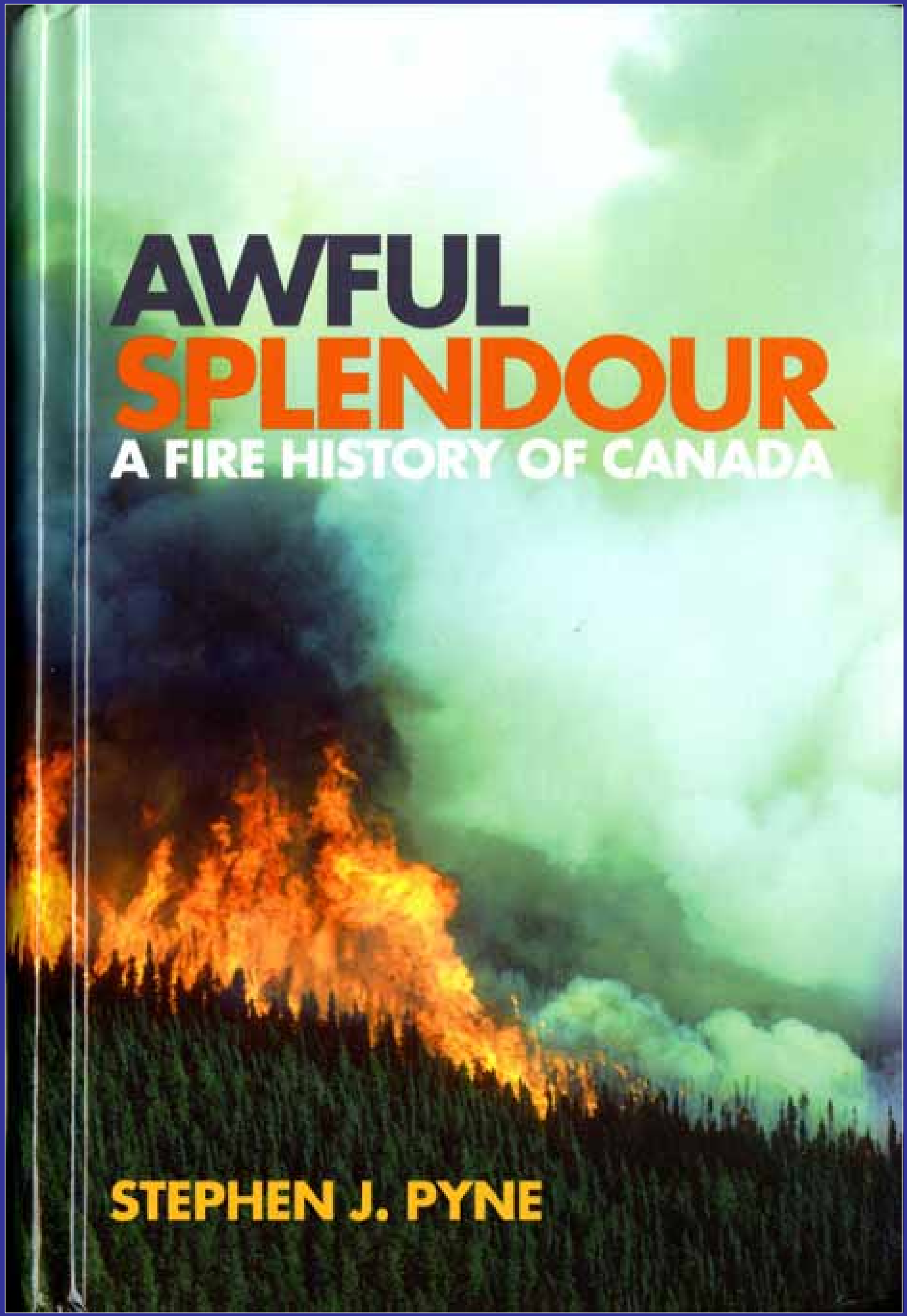
Previous Visits to Atlantic Canada, including New Brunswick

- **Apr. 1987** – CFS information sessions on the Canadian Forest Fire Danger Rating System (Fredericton, Shubenacadie, Charlottetown, Gander)
- **Nov. 1996** – CIFFC Advanced Wildland Fire Behavior Course (Fredericton)
- **Sep. 1998** – Atlantic Forest Fire Management Coordinating Committee Wildfire Behavior Documentation Session (Charlottetown)
- **Sep. 2000** – Forest Fire Science and Management Forum (Halifax)
- **Apr. 2002** – Canadian Forest Fire Behavior Prediction (FBP) System Fuel Typing Meeting with Atlantic Canada Fire/Forest Managers (Amherst)
- **Apr. 2002** – Northeastern Forest Fire Protection Commission Spring Fire Academy (Amherst)
- **Sep. 2003** – Canadian Forest Fire Behavior Prediction (FBP) System Fuel Typing Working Meeting (Shubenacadie)
- **Nov. 2008** – 60th Anniversary of the Shubenacadie Fire Control Centre

"Road Map" to Presentation

- Fire on the Canadian Landscape and New Brunswick Fire History
- History and Evolution of Forest Fire Protection in New Brunswick
- The Wildland-Urban Interface: Globally, Canada and in New Brunswick
- The Realities of Wildland Fire
- Wildland Fire Behavior 101
- Fire Behavior and the Connection to Fire Suppression
- The Concept of Fuels Management
- Some Recommendations, Suggestions and Other Take-home Messages

Fire on the Canadian Landscape and New Brunswick Fire History



Published in spring of 2007

“Fire is a defining element in Canadian land and life.

With few exceptions, Canada’s forests and prairies have evolved with fire.

Its peoples have exploited fire and sought to protect themselves from its excesses, and since Confederation, the country has devised various institutions to connect fire and society.”

Wildfire is a Threat to Human Safety and other Values-at-Risk

The signs were erected at each end of the fire path across the main road from Fredericton to Newcastle.

THE RESULT OF A CARELESS MOMENT

THE DEATH OF A FOREST

Wildland fire as "evil"

vs.

"Good servant but a bad master"

Multiple Roles of Fire as an Ecological Process:

- Fire influences the physical-chemical environment
- Fire controls plant species and communities
- Fire regulates dry-matter production and accumulation
- Fire determines wildlife habitat patterns and populations
- Fire influences insects, parasites, fungi, etc.
- Fire controls major ecosystem processes and characteristics

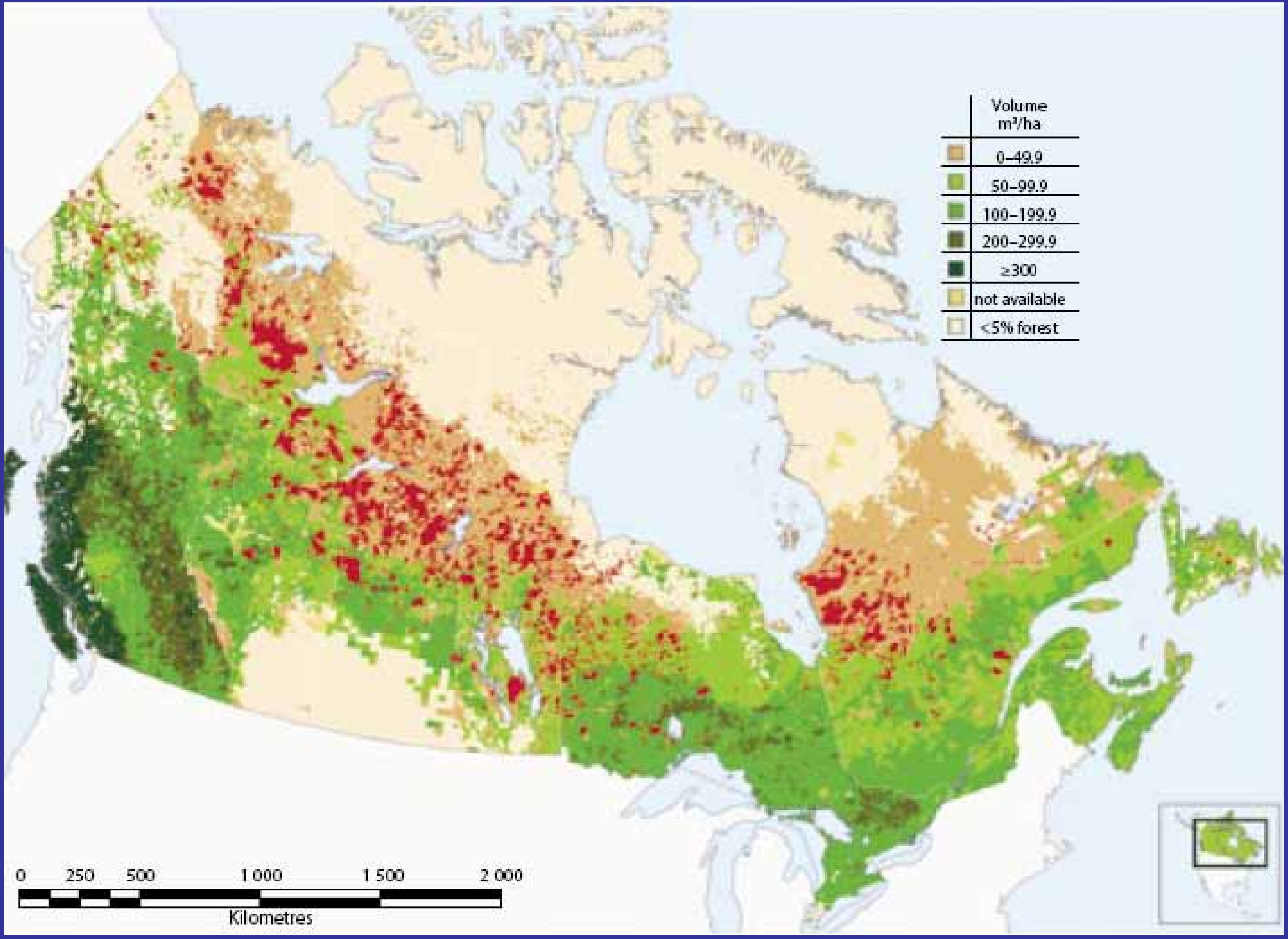
Basic National Fire Statistics

- 8600 fires have burned about 2.5 million hectares annually since 1980

- Lightning responsible for ~ 50% of the fires but about ~ 85% of the area burned (mainly June-July)

- Fire management expenditures have reached $500-600 million annually and are growing

Area Burned by Wildfires Greater Than 200 Hectares in Size, 1980-2001 (in red) in Relation to Timber Volume



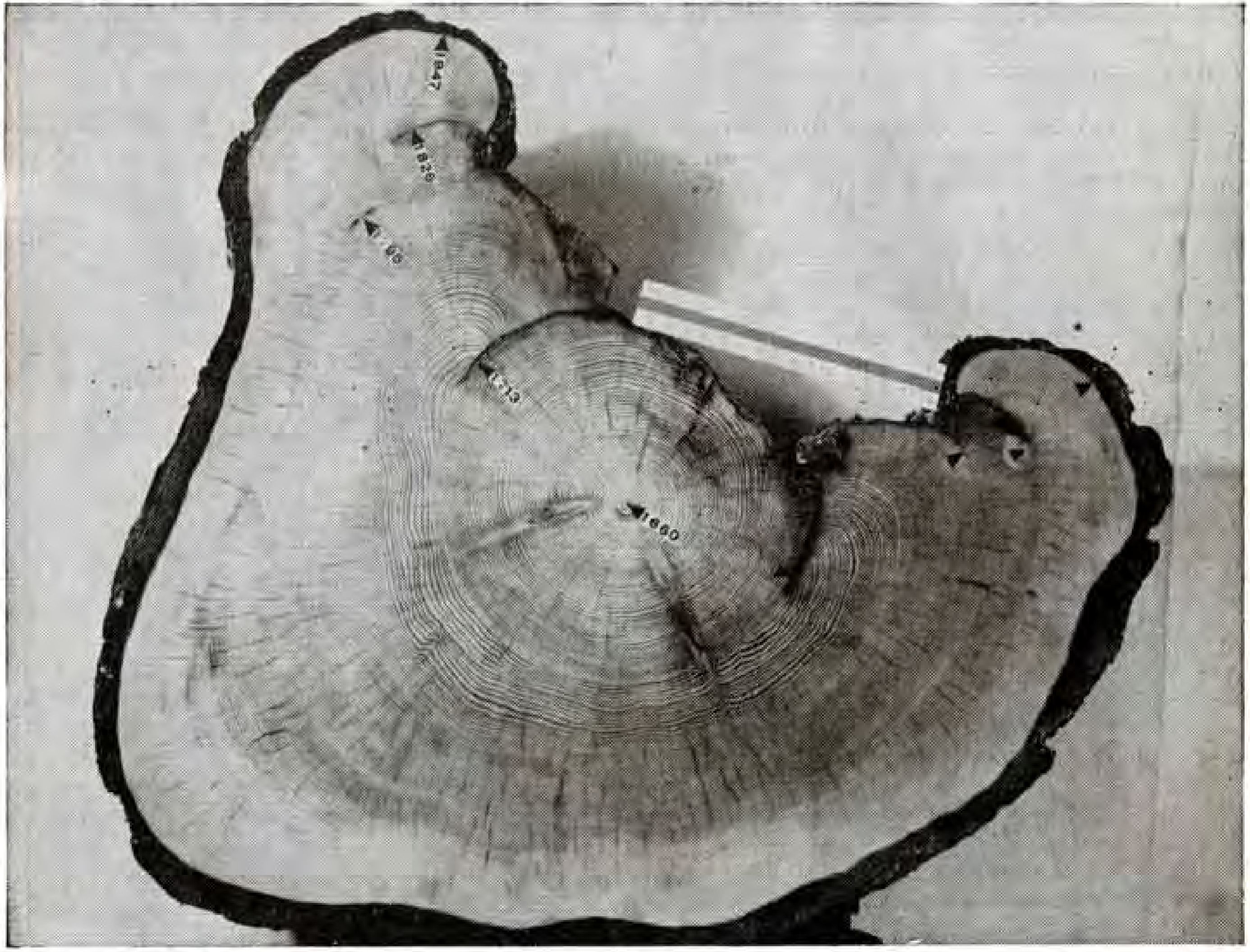
New Brunswick Fire History

Most Recent 10-yr Averages (1999-2008)

Average Number of Fires – 332.6
(lightning - 13%)

Average Area Burned – 558 hectares
(lightning - 13%)

Average Size – 1.7 hectare



Record of forest history in a tree. This Red Pine grew up after a forest fire a few years before 1660. It shows fire scars in the years 1713, 1795 and 1826. It was found on a ridge at the Head of the Southeast Upsalquitch in 1947. This is a photograph of a section about two feet above the ground

From 1948 annual report

Charcoal deposits in New Brunswick peat bogs and lake sediments attests to a long history of fire

Bog profile evidence of fire and vegetation dynamics since 3000 years BP in the Acadian Forest

Ross W. Wein, M. P. Burzynski,[1] B. A. Sreenivasa, and K. Tolonen[2]
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Received December 15, 1986

Wein, R. W., Burzynski, M. P., Sreenivasa, B. A., and Tolonen, K. 1987. Bog profile evidence of fire and vegetation dynamics since 3000 years BP in the Acadian Forest. Can. J. Bot. 65: 1180–1186.

An attempt has been made to characterize fire prehistory and its effect on Acadian Forest vegetation by microscopic examination of charred particles and pollen preserved over the last 3000 years in bogs near Marcelville and Fredericton, New Brunswick, Canada. A background accumulation rate of about 0.15 $mm^2 \cdot g$ dry $weight^{-1} \cdot year^{-1}$ of charred particles was found in each sample, indicating a constant rain of distant-source, small particles. Proximity of the source fire to the site of particle deposition was estimated with the aid of two charred particle transport studies conducted during prescribed burns. Charred particles of 44 400 μm^2 and larger were found up to 1 km from the source, with a wind speed of 20 km/h. Smaller particles remained in the air column for much longer and are of less use for determining local fires. Analysis determined periods of province-wide fires and subsequent forest composition changes. The greatest of these occurred at about 2200, 1750, 1550, and 400 years BP. Temporal patterns of charred particle peaks were similar in the two bogs and support data from Nova Scotia and Maine. Fires seem to have accompanied the establishment of the present-day forest type in the period around 1450 years BP.

Wein, R. W., Burzynski, M. P., Sreenivasa, B. A., et Tolonen, K. 1987. Bog profile evidence of fire and vegetation dynamics since 3000 years BP in the Acadian Forest. Can. J. Bot. 65 : 1180–1186.

À l'aide d'examen microscopique de particules carbonisées et de pollen préservés durant les 3000 dernières années dans des marécages près de Marcelville et Frédéricton au Nouveau-Brunswick, Canada, nous avons tenté de déterminer les caractéristiques des incendies de la préhistoire et leur effet sur la végétation forestière acadienne. Un taux d'accumulation d'environ 0.15 $mm^2 \cdot g$ de poids $sec^{-1} \cdot an^{-1}$ de particules carbonisées a été noté pour chaque échantillon, ce qui indique une pluie constante de petites particules de source éloignée. La distance qui sépare la source d'incendie du site de dépot de particules a été estimée à l'aide de deux études de transport de particules carbonisées, faites au cours d'incendies prescrits. Des particules carbonisées de 44 400 μm^2 et plus ont été trouvées jusqu'à 1 km de la source, le vent soufflant à une vitesse de 20 km/h. Des particules plus petites sont restées dans la colonne d'air bien plus longtemps et s'avèrent moins utiles pour déterminer les feux locaux. Des analyses ont permis de déterminer les périodes d'incendies à la grandeur de la province et les changements subséquents dans la composition forestière. Les plus importants de ceux-là ont eu lieu aux alentours de 2200, 1750, 1550 et 400 ans Av.P. Les modèles chronologiques des poussées de particules carbonisées étaient semblables pour les deux marécages et appuient les données provenant de la Nouvelle-Écosse et du Maine. Des incendies semblent avoir accompagne l'établissement du type de forêt contemporain au cours de la période ca. 1450 ans Av.P.

[Traduit par la revue]

Introduction

In the past decade, fire as an ecological agent has received increasing attention not only because fire continues to damage increasingly valuable resources, but also because scientists studying ecosystem functioning have realized the importance of fire in maintaining the diversity of forests on many landscapes. More fire studies have been conducted in drier, continental climate regions than in the more moist, maritime climate regions such as the Acadian Forest, which covers most of the Maritime Provinces and part of the State of Maine. Some of the methods commonly used in determining fire frequency are not feasible in the Acadian Forest. Most eastern tree species will not survive a fire that is intense enough to cause scarring; because of many decades of intensive harvesting, the fire record is confounded with the harvest record. No extensive photographic collection or synthesis of early written records has yet been produced that gives sufficient details. Prior to the turn of the century only scattered accounts of fires have been found in the historical literature (e.g., Hay 1900; Ganong 1902, 1906; Lorimer 1977). Recent estimates of fire rotation for New Brunswick, Nova Scotia, Maine, and New Hampshire have been developed from forest fire suppression records (Wein and Moore 1977, 1979; Fahey and Reiners 1981). Using lake sediments, palynological investigations have been made of forest development (Davis 1967; Hadden 1975; Mott 1975), and fire frequencies have been determined for areas within the Maritimes and New England from examination of lake sediments (Green 1976, 1981; Anderson 1979; Anderson *et al.* 1986).

We turned our attention to fire evidence in bogs because these studies are less common and because in ecosystems where fire frequencies might be needed, suitable lake sediments may not be available. A most important advantage in studying boggy sediments as opposed to lake sediments is that the bog sediments are less subject to mixing and redeposition. The climate of New Brunswick has been favourable to paludification (bog formation) (Korpijaakko and Radforth 1972); about 100 000 ha of the Province of New Brunswick are covered with peatlands (Gemmell and Keys 1979). There have been numerous reports of macroscopic layers of charred particles in the peat deposits of northern countries (e.g., Pyavchenko 1958; Heinselman 1963; Nichols 1967; Tolonen 1967). At Point Escuminac, New Brunswick, charred layers up to 2 cm thick have been observed, presumably the result of on-bog fires that may have even consumed part of the paleo record. Most fire information thus far obtained from the examination of bog sediments, with the exception of Mehringer *et al.* (1977), has been by-products of other studies (Tolonen 1983).

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DISCUSSION

Palynological Study of Lake Sediment Profiles from Southwestern New Brunswick: Discussion

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AND
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Accepted for publication 19 June 1975

Mott (1975) is to be congratulated on his paper for two reasons: for adding materially to the sparse literature on Quaternary palynology in the Maritimes, and for documenting so clearly some of the problems of the radiocarbon dating of calcareous materials. It is the second of these points on which this discussion centers.

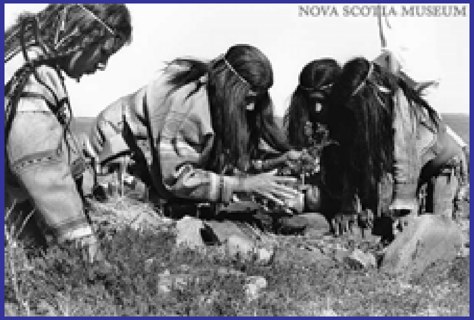
The old carbonate effect, whereby old carbon is incorporated into the organic and inorganic carbon cycle on limestone terrain and gives rise to spurious radiocarbon ages, has been described by Deevey *et al.* (1954), and by Broecker and Walton (1959), as well as in several more recent papers by various authors, (e.g. Ollson 1974). Although this hazard has been known since the early years of radiocarbon dating, its effects have seldom been documented from stratigraphic sequences, and have commonly been disregarded by those using radiocarbon dates. A stratigraphic succession of dates showing a roughly constant hard-water error of 1700 years has been documented by Shotton (1972).

Mott clearly shows the fallacy of using a sediment surface sample age (or the *Ambrosia* pollen horizon in order to avoid recent bomb fallout effects) as a constant correction factor for old carbonate error in a lake bottom sediment core. Ogden (1965*a,b*) and Davis (1969) questioned the application of such constant corrections to the sediment column, but few workers seem to have been troubled by the assumptions involved. One such assumption which troubles us is that the chemical environment has remained constant throughout the history of small lakes. It would seem most likely that major chemical changes have taken place during the 12 000 or more years since deglaciation, and some of these have been documented (Kemp 1969; Mackereth 1966). Newly-deglaciated terrain would be unweathered; in areas of carbonate bedrock, the exposed surface would tend to yield carbonate-rich sediments. As soil formation progressed contemporaneously with vegetational succession, the supply of carbonate-rich sediments would tend to lessen. It follows that small lakes would tend to have carbonate carbon-rich sediments in their early stages, followed by organic carbon accumulation in later stages. Such a sequence is common in bogs and small lakes in southwestern Ontario, where peat and/or gyttja often overlie a layer of marl or marl-like sediment formed during an early lake stage. Carbon analyses carried out on Louise Lake sediments (Fig. 1), for example, show highest carbonate carbon and lowest organic carbon percentages throughout the period preceding the rise in spruce pollen. With the invasion of spruce-dominated vegetation, there is a noticeable decline in carbonate carbon and a corresponding sharp rise in organic carbon. Subsequently, carbonate carbon decreases slightly upward to a minimum while organic carbon increases to maximum percentages in mid-postglacial time. The resultant effect of such trends should be greater incorporation of old carbon in the early stages of lake development, and lesser in later stages. The effect on radiocarbon dates would be to yield apparent ages more in error at the base of the sequence than at the top. Replotting of Mott's dates to show the amount of error versus depth shows just such a relationship (Fig. 2, 3*a*).

Pyne (2007) on New Brunswick Fire History

“The usual colonizing fires popped up …”.

“… fire-littering of the Mi’kmaq”.



“As cutting quickened, however, so did burning. Nature’s economy adjusted to an exchange of fuel for flame; even as New Brunswick exported timber, it effectively imported fire. A felling binge was followed by a flaming bust.”

Miramichi Fire - October 7, 1825

Canada
DEPARTMENT OF RESOURCES AND DEVELOPMENT
FORESTRY BRANCH

FOREST RESEARCH DIVISION
FOREST FIRE RESEARCH NOTE
No. 15

FOREST FIRES IN NEW BRUNSWICK
1938-1946

by

H. W. BEALL and C. J. LOWE

OTTAWA
1950

Fire history and rotations in the New Brunswick Acadian Forest

ROSS W. WEIN AND JANICE M. MOORE
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Received September 21, 1976
Accepted January 26, 1977

WEIN, R. W., and J. M. MOORE. 1977. Fire history and rotations in the New Brunswick Acadian Forest. Can. J. For. Res. **7**: 285–294.

From an analysis of fire records in New Brunswick for the period of 1920–1975, the fire history and rotation patterns are presented. Mean and median annual burns have been 12 000 ha (0.15% of the province) and 2500 ha (0.03% of the province), respectively, but the fire rotations have been widely different for different vegetation types. The most extensively burned vegetation type of red spruce – hemlock – pine has had a fire rotation period of 230 years. Hardwood and high-elevation conifer vegetation types have had fire rotation periods of over 1000 years.

WEIN, R. W., et J. M. MOORE. 1977. Fire history and rotations in the New Brunswick Acadian Forest. Can. J. For. Res. **7**: 285–294.

A partir d'une analyse des dossiers sur les incendies forestiers au Nouveau-Brunswick pour la période 1920–1975, on a reconstitué l'histoire des feux et analysé leur périodicité. La superficie moyenne annuelle d'un incendie a été de 12 000 ha (0.15% de la province) et la médiane annuelle de 2500 ha (0.03% de la province). La période de révolution (temps requis pour que l'équivalent de 100% de l'aire soit brûlé) a toutefois varié beaucoup avec les types de végétation. Le type de végétation le plus couramment brûlé, la forêt d'épinette rouge – pruche – pin blanc, a eu une période de révolution de 230 ans. Les feuillus et les types de végétation de conifères de haute élévation ont eu des périodes de révolution de plus de 1000 ans.

[Traduit par le journal]

Introduction

Traditionally, fire control in forested areas has received strong financial support to prevent loss of inventory and human life. More recently it has been found, at least in some ecosystems, that control of fire over a long period of time leads to fuel accumulation and more destructive fires. Attempts are being made to simulate natural fire rotations in some of the western North American national parks by permitting fires, ignited by lightning, to burn and to be extinguished naturally. This, of course, does not include the probable influence of indigenous North Americans who played a role in shaping these ecosystems.

The use of fire as a silvicultural tool is also becoming more important economically and questions about long-term consequences of this activity are being raised. Researchers are well aware that the results of prescribed burning may be quite different in different ecosystems because ecosystems have evolved under varying fire regimes. It is important to know both the prehistory of fire (in thousands of years), which assists in the understanding of the evolution of the ecosystem, and also the history of fire to determine if industrial man has changed the significance of fire.

Detailed historical reference and analysis of fire records are available for Maine (Coolidge 1963) and many general summaries are available for the New England States (e.g. Little 1974), but in the Maritime Provinces only short-term summaries are readily available (Beall and Lowe 1950; Morrison 1938). The most useful summary of areas burned was based on aerial photographs taken in 1944–1945 (Province of New Brunswick 1958). The purpose of the present paper is to synthesize the historical role of fire and to determine the period of fire rotations in different vegetation types of the province of New Brunswick.

Area Description

The forest of the Maritime Provinces and the New England States is a transition zone between the boreal forest to the north and the hardwood forest to the south, thus including

Wein and Moore (1977)
Annual Forest Fire Statistics – 1920 to 1975

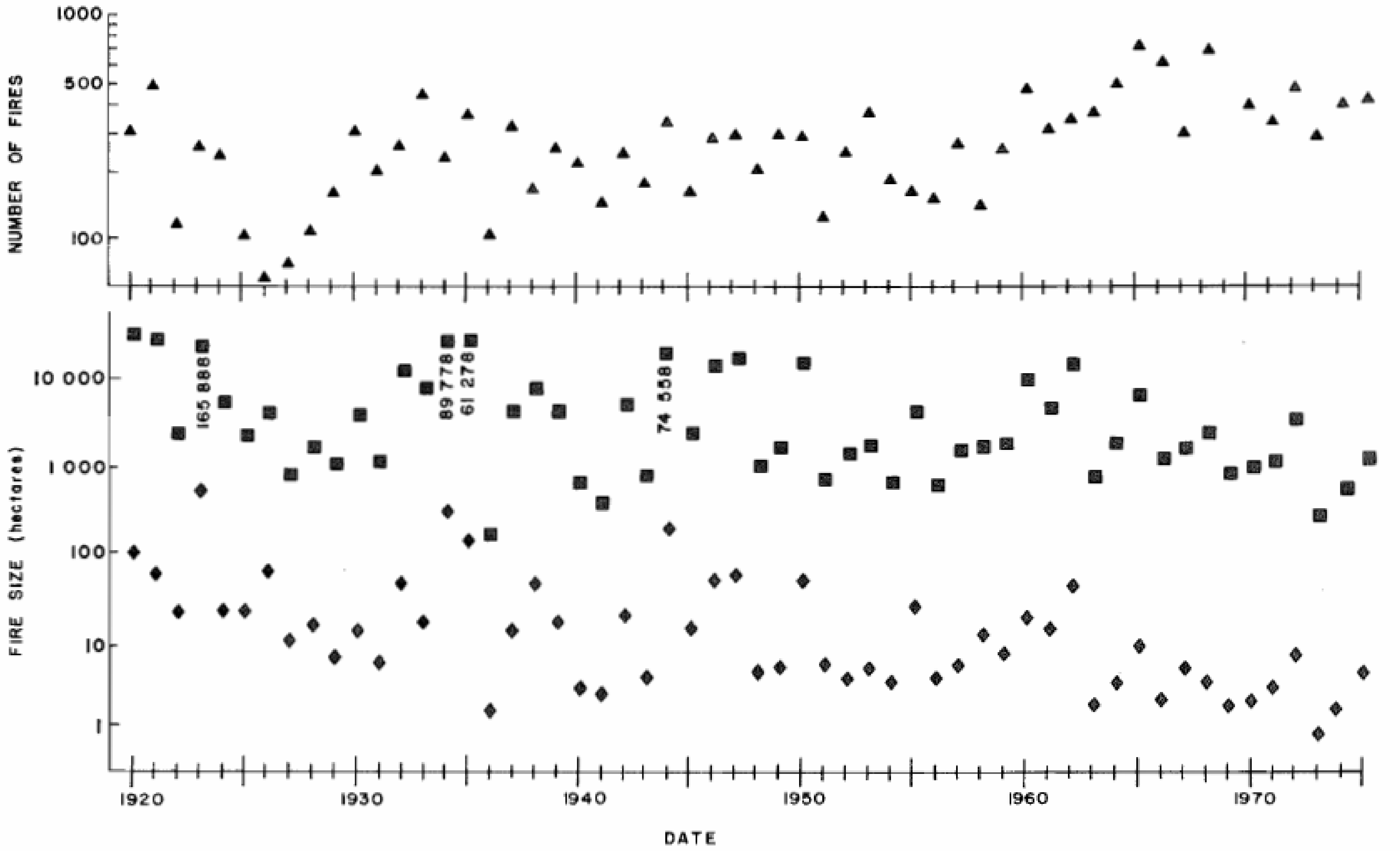


FIG. 1. Number of fires (▲), total area burned (■), and mean fire size (◆) per year for the period of 1920 to 1975.

Wein and Moore (1977)
Seasonality of Forest Fire Occurrence

TABLE 2. Means and standard deviations for number of fires by month and size during the period 1929 to 1975. Data include all recorded fires

	Fire size (ha)								
Month	<0.1	0.2–0.4	0.4–2	2–4	4–20	20–40	40–200	>200	Total
March	T*	T	T	T	T	0	0	0	T
April	3±4	5±8	9±12	3±5	4±6	1±3	T	0	25
May	21±15	18±13	32±32	12±7	18±11	4±4	6±7	2±3	113
June	18±15	8±8	7±4	2±2	3±3	T	1±1	T	39
July	20±23	7±7	5±5	2±5	2±2	T	T	T	36
Aug.	25±22	9±8	9±10	2±2	3±3	T	1±2	1±3	50
Sept.	8±9	3±3	4±5	T	1±1	T	T	T	16
Oct.	3±4	3±3	5±7	3±8	4±6	T	T	T	18
Nov.	T	T	T	T	T	T	0	0	T
Dec.	T	T	0	0	0	0	0	0	T
Total	98	53	71	24	35	5	8	3	

*T < 0.5.

Seasonal Changes in Forest Flammability

Seasonal Changes in NS Fuels (D. Graham photos

History and Evolution of Forest Fire Protection in New Brunswick

History and Evolution of Forest Fire Protection in New Brunswick

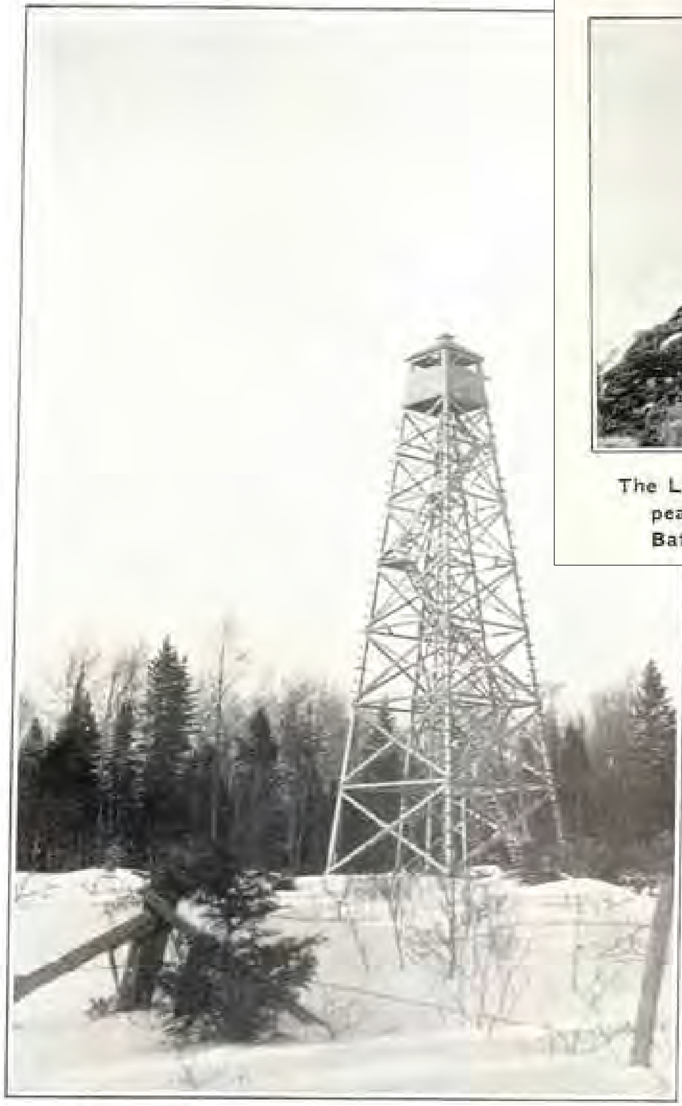
Kedgwick fires—showing in foreground all that is left of settlers' home and barns—The results of years of labor destroyed by carelessness with Clearing Fires

Fire Prevention

Do not forget to be careful of fire even when on a motoring or picnic party. Gentle reminders stretched across the highway road between Chatham and Bathurst, now a trunk road, and passing through 35 miles of unbroken forests

Two causes of forest fires--a Locomotive and a Camper. The former has protective appliances, but there are no restrictions on the latter, but he is expected to use every precaution and extinguish his camp fire thoroughly

Fire Detection



80 foot look-out tower on Ashton Hill, Northumberland County. A similar tower 90 feet high has just been completed about 6 miles east of Red Pine in Gloucester County, and a 60 foot tower on Quisibis Mountain, Madawaska County. Extensive areas are visible from all these lookouts

The Lookout Observer's cabin at Mt. Carleton, the highest peak in New Brunswick. Connected with telephone to Bathurst

Steel Tower erected on Blue Mountain in 1923. Blue Mountain is situated at the head of the Benjamin River in Restigouche County. Elevation 1800 feet. Twelve miles of woods telephone line was built. The Geodetic Survey co-operated in the erection of the Tower and the Louison Lumber Company in the free use of their five mile private telephone line.

Early Fire Suppression with Hand Tools

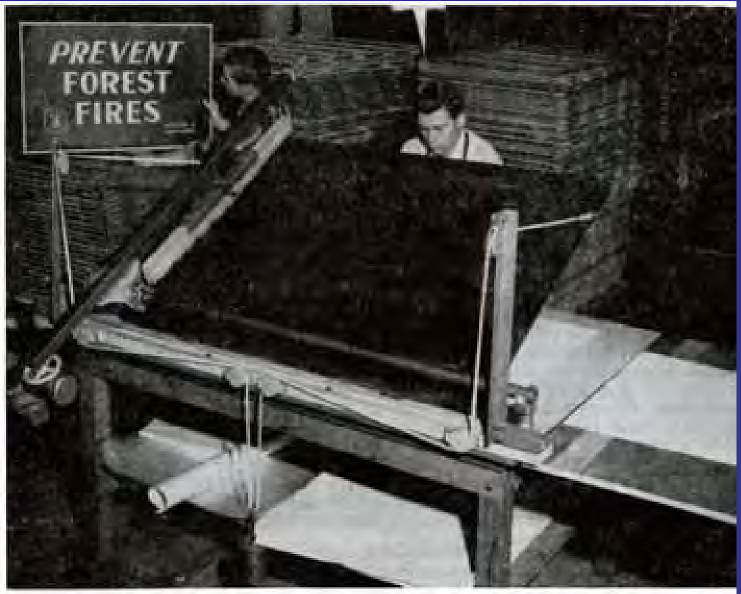
Devastation caused by carelessness. Fire fighters putting out some smoking embers

Dr. J.M. “Hoot” Gibson
UNB Dean of Forestry

Dr. Gibson undertook a 2-year study of the forest fire prevention and control system in New Brunswick, including organization, personnel, equipment and methods. Study initiated in advance of the 1946 fires season. Final report published in January 1948.

Fire Detection and Fire Prevention Efforts Continued

Young Softwood Forest After Fire. The Loss Is Not Only Stumpage Value But Also Future Wages and Income.



Printing forest fire signs with silk screen equipment.

Fire Detection Technology

AERIAL DETECTION CONTROL CENTRE AT CAMPBELLTON

Beaver aircraft equipped with amphibian landing gear under contract by Department of Lands and Mines for forest fire patrol.

One of the aircraft chartered for Aerial Forest Fire Patrol in 1948. Two smaller aircraft, one equipped with floats, were also used.

Improvements in Infrastructure for Fire Protection

NEW BRUNSWICK FOREST SERVICE. EQUIPMENT DEPOT AT FREDERICTON

NEW RANGER OFFICE AND STOREROOM OF TYPE REQUIRED

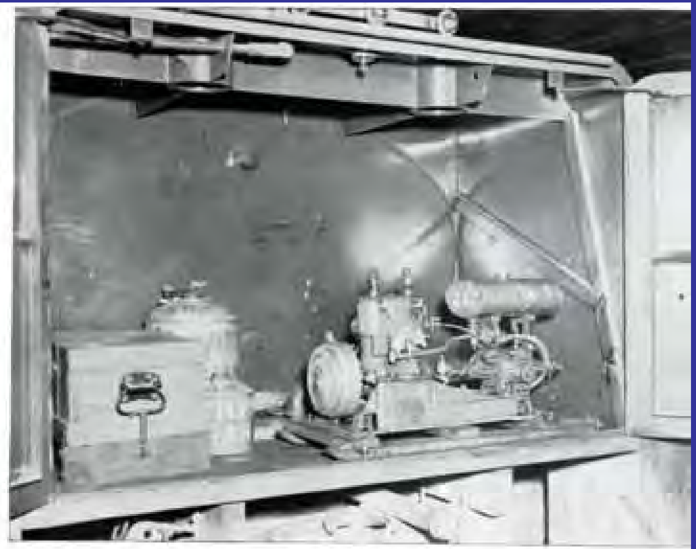
This type of building is most satisfactory for Ranger Headquarters and Equipment Depot.

OLD SINGLE GARAGE USED FOR EQUIPMENT STORAGE. A HAZARD TO EQUIPMENT AND THE COMMUNITY

OVERHAULING PUMP UNITS AT FREDERICTON SHOP IN WINTER IS PART OF ROUTINE MAINTENANCE PROGRAM

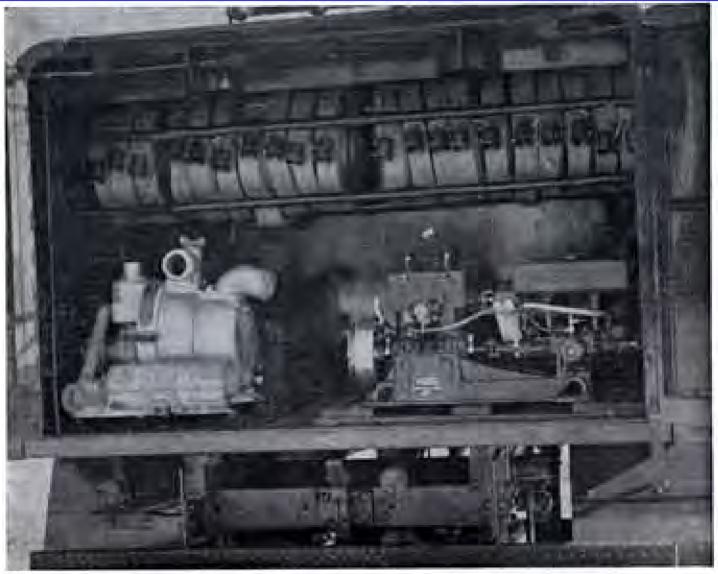
Fire Suppression Mechanization

TANK TRUCK PURCHASED FROM WAR ASSETS CORPORATION AND USED FOR FOREST FIRE FIGHTING



PUMP ATTACHED TO TANK READY FOR IMMEDIATE USE IN FOREST FIRE CONT

Tanker with Tandem drive rear axles. These are more satisfactory to woods roads than single rear axles on the dual wheels.



Each tanker is equipped with a compartment at the rear with equipment as illustrated above. The tanker can be filled in from four to six minutes by the low pressure pump at the left. This will supply the high pressure fire pump for from thirty to forty minutes. Each tanker carries 2,000 feet of hose.

ONE OF THE DEPARTMENT'S 52 TANKERS AT WORK
EACH TANKER HAS A CAPACITY OF 800 TO 1000 GALLONS

Tractor with Bulldozer building fire trail around a forest fire. Trucks with tanks of water and pumps are brought in along the trail to prevent the fire from crossing the trail and to extinguish it.

JEEP AND TRAILER CARRYING PUMP UNIT AND HOSE AVAILABLE FOR USE IN DIFFICULT LOCATIONS

Aerial Fire Suppression became of age

AG-CAT AND SNOW WATER BOMBERS AT DUNPHY AIRSTRIP

A SNOW COMMANDER WATER BOMBER

But still ... the firefighter on the ground is the most valuable commodity

The Back Tank, an important weapon on the fire line

Fire Training

FIRST GRADUATING CLASS AND STAFF MARITIME FOREST RANGER SCHOOL—DECEMBER, 1947

BACK ROW: N. R. Harrington; R. G. MacDermott; N. J. Henry; A. F. Crowe; E. R. Campbell; H. D. Archibald; C. A. A. Cox; K. Quick; A. B. Duthie; G. H. Currie; L. H. Rowan; G. B. Gulliver. FOURTH ROW: J. E. Woods; J. N. Roy; H. J. White; V. R. Burrill; J. A. Flanagan; E. S. Clowater; R. E. Crosthwaite; N. R. McKinley; M. J. Selvet; H. J. Coady. THIRD ROW: V. P. Shephard; J. A. Kennedy; W. Harrington; J. A. Smith; J. H. Beattie; T. Fraser; W. H. Vye; J. E. Morais; C. A. MacArthur; T. J. Pelletier; H. L. Lockhart; V. I. McCarthy. SECOND ROW: G. C. Elgee (Instructor); C. E. J. Chisholm; E. C. Crossman; E. R. Pace; R. O. Downey; G. A. Porter; W. J. Casey; C. R. Anderson; R. M. M. Adams; C. W. Hanscome; C. M. Atkinson; J. E. Gracie (Instructor). FRONT ROW: A. W. Chisholm; E. F. Campbell; G. G. O'Donnell; B. B. Arnold; E. M. Burpee; D. A. MacPhail (Director); H. A. Meissner (Instructor); L. A. Hovey; C. A. Arthurs; D. H. Mealey.

Forest fire suppression training. With the forest fire simulator trainees are subjected to the pressures and problems encountered on an actual fire. The four overhead projectors superimpose increasing size of perimeter, smoke and fire movement on the landscape.

A Refresher Course in Forest Fire Protection was given to Forest Service Staff and representatives of other forest protection organizations.

Co-operative fire suppression equipment training

Gordon L. Miller:
A Key Figure During the Formative Years

ADMINISTRATION—FIRE PROTECTION[1]

By G. L. MILLER[2]

Administration in fire protection services in Canada covers a wide field extending across this nation from coast to coast . Each province has its own organization quite separate and apart from any of its neighboring provinces and quite peculiar to its own particular needs and local conditions. Differences in organization, of course, indicate quite different methods of administration. There are, however, certain salient features in administration quite common to all provinces and all organizations within a province.

In organizing a forest fire protective service or association, certain important features must of necessity be kept in mind.

1. The organization must have a chief administrative officer, preferably a graduate forest engineer with years of administrative and practical experience, whose first duty should be to organize sufficient staff to take care of all administrative duties. He must make sure all members of his staff know their duties and realize their responsibilities and have the will to carry them out promptly and efficiently.

2. The area under protection should be divided into administrative units or districts each under a fully qualified district forester with administrative ability and years of practical experience

3. Each forest district should then be subdivided into forest ranger districts with fully qualified forest rangers in charge, preferably men with years of practical experience in the field of fire suppression. They should be assisted by as many qualified assistant forest rangers as necessary to do all the administrative and operational jobs. They must be able to supervise the sub-staff, or temporary personnel, in all operational functions of the service.

4. Sufficient office staff must be employed on a full time basis to take care of the usual administrative routine and in addition, sufficient clerks, time keepers, radio operators and other personnel must be employed, if not permanently then at least on a part time basis, during periods of high hazard and during fire suppression operations. In the latter case some definite arrangement should be made with industry to supply men, temporarily on loan, to do these jobs. The above is not an entirely satisfactory arrangement since there is not the same interest nor the same devotion to duty. There is the danger that decisions may be made from the company viewpoint rather than from the point of view of the provincial organization.

5. Finances must be provided either through direct legislation, where certain funds from taxation are earmarked for fire protection purposes, or through some method of assessment with legislative approval. Budgets should be carefully set up to cover all items which may be estimated in advance. Since budgets for actual fire suppression costs cannot be accurately estimated, an average of previous expenses should be assumed to be the amount required or an estimated figure should be allowed using the average as a guide. Any

1 A paper prepared for the 1953 Annual Meeting of C.I.F. at Winnipeg.
2 Chief Forester, New Brunswick Forest Service, Fredericton, N.B.

1954. *Forestry Chronicle* article

GEORGE LEE MILLER

Fire Research

GENERAL VIEW OF ACADIAN FOREST EXPERIMENT STATION HEAD-QUARTERS. THE ADMINISTRATION BUILDING AND SUPERIN-TENDENT'S COTTAGE ARE IN THE FOREGROUND.

Fire Danger Rating Research

John G. Wright

Herbert W. Beall

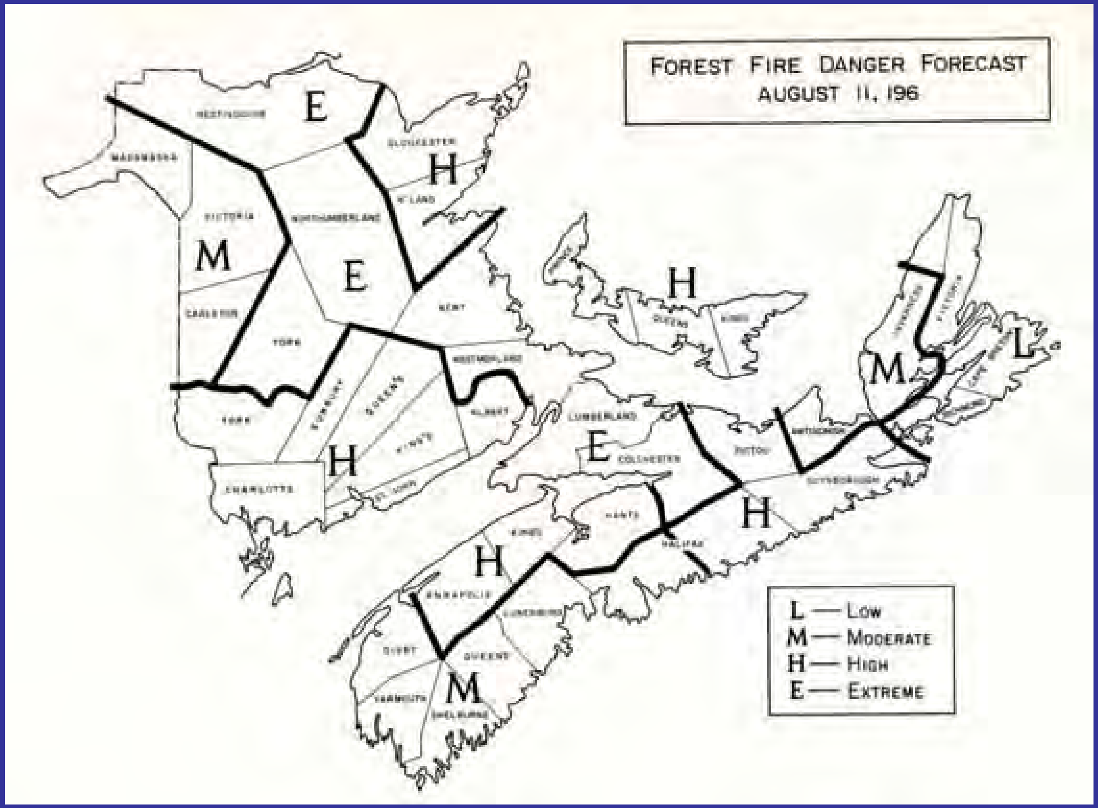
Forest fire sign designed to warn the woods travelling public of forest fire danger.

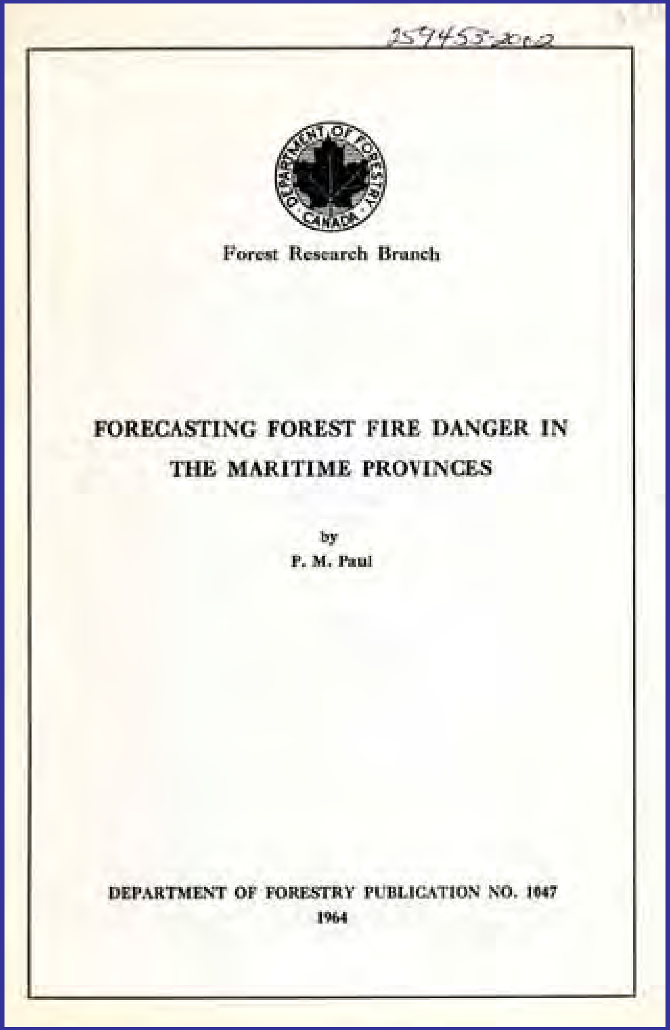
LABORATORY AT THE FOREST-FIRE HAZARD RESEARCH STATION. HERE RAINFALL, TEMPERATURE, HUMIDITY, WIND VELOCITY ETC., AND THEIR EFFECT ON FIRE HAZARD IN THE SURROUNDING FORESTS ARE MEASURED AND RECORDED. CHARTS, THUS DEVELOPED, WILL BE OF GREAT VALUE IN ESTIMATING THE DANGER OF FOREST FIRES.

METEOROLOGICAL EQUIPMENT AT THE ACADIA FOREST EXPERIMENT STATION.

The apparatus shown is quite typical of the twenty-one forest weather stations now established in New Brunswick. The ventilated box in the centre contains instruments for measuring the temperature and relative humidity of the air. Mounted on the posts to the left and right of the picture are an evaporimeter and a rain-gauge respectively.

Fire Danger Forecasting





Forest Research Branch

FORECASTING FOREST FIRE DANGER IN THE MARITIME PROVINCES

by

P. M. Paul

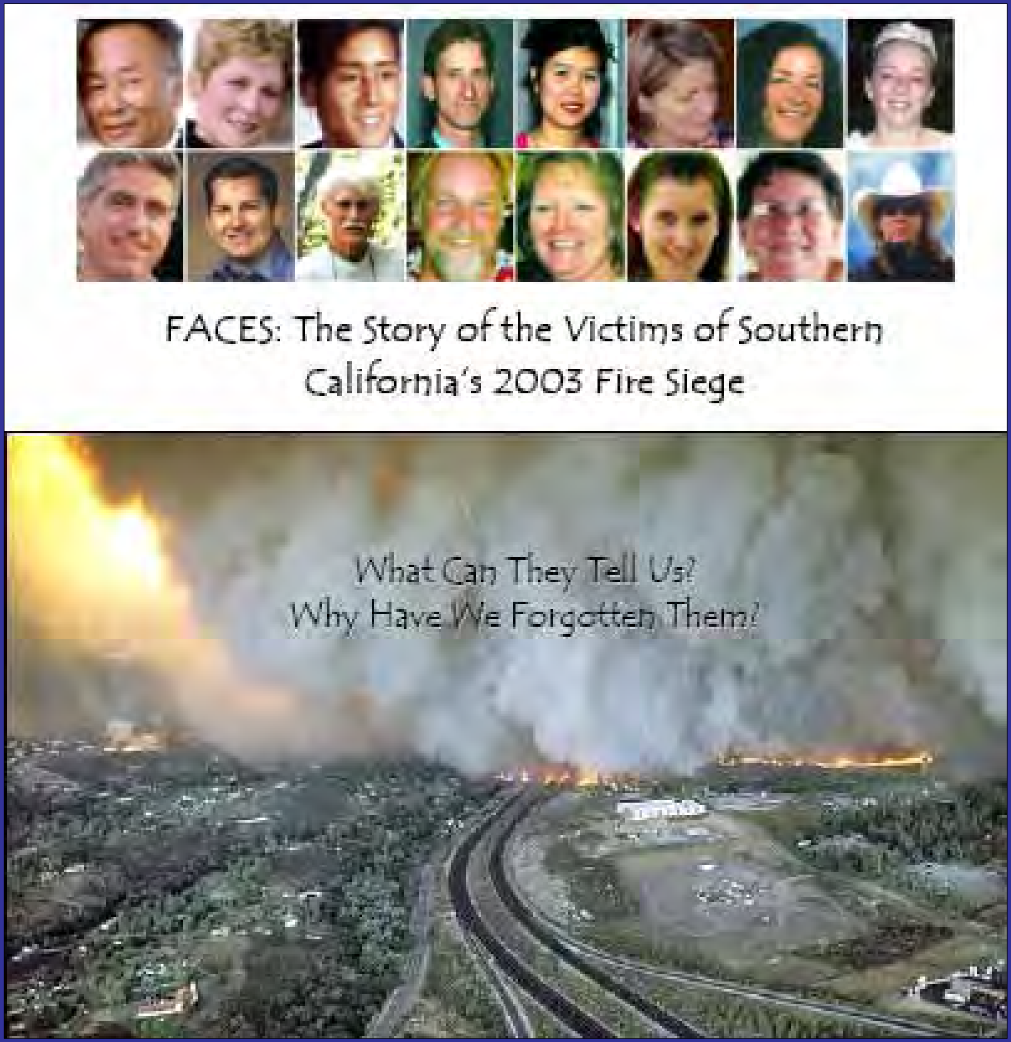
DEPARTMENT OF FORESTRY PUBLICATION NO. 1047

1964

Modern Era Fire Protection Today

The
Wildland-Urban Interface (WUI):
Globally, Canada and in New Brunswick

Southern California Fires – 2003 & 2007



31 Fatalities

The Greek Fire Tragedy – 2007

NATIONAL POST

VOL. 9 NO. 256 TUESDAY, AUGUST 28, 2007 www.nationalpost.com

'WE HAVE BEEN LEFT AT THE MERCY OF GOD'

67 Civilian Fatalities

Victoria, Australia – February 2009

173 Fatalities and Counting

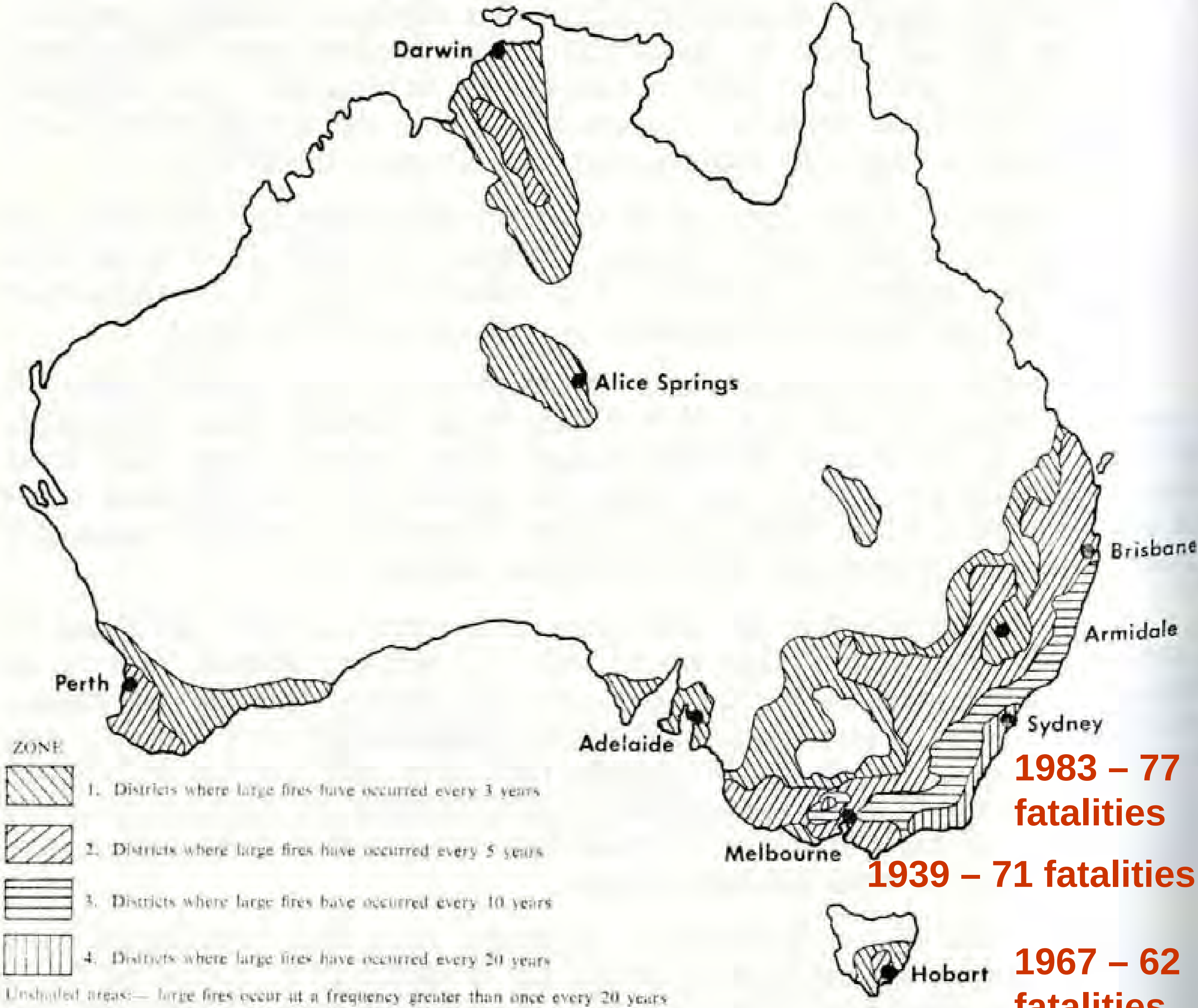
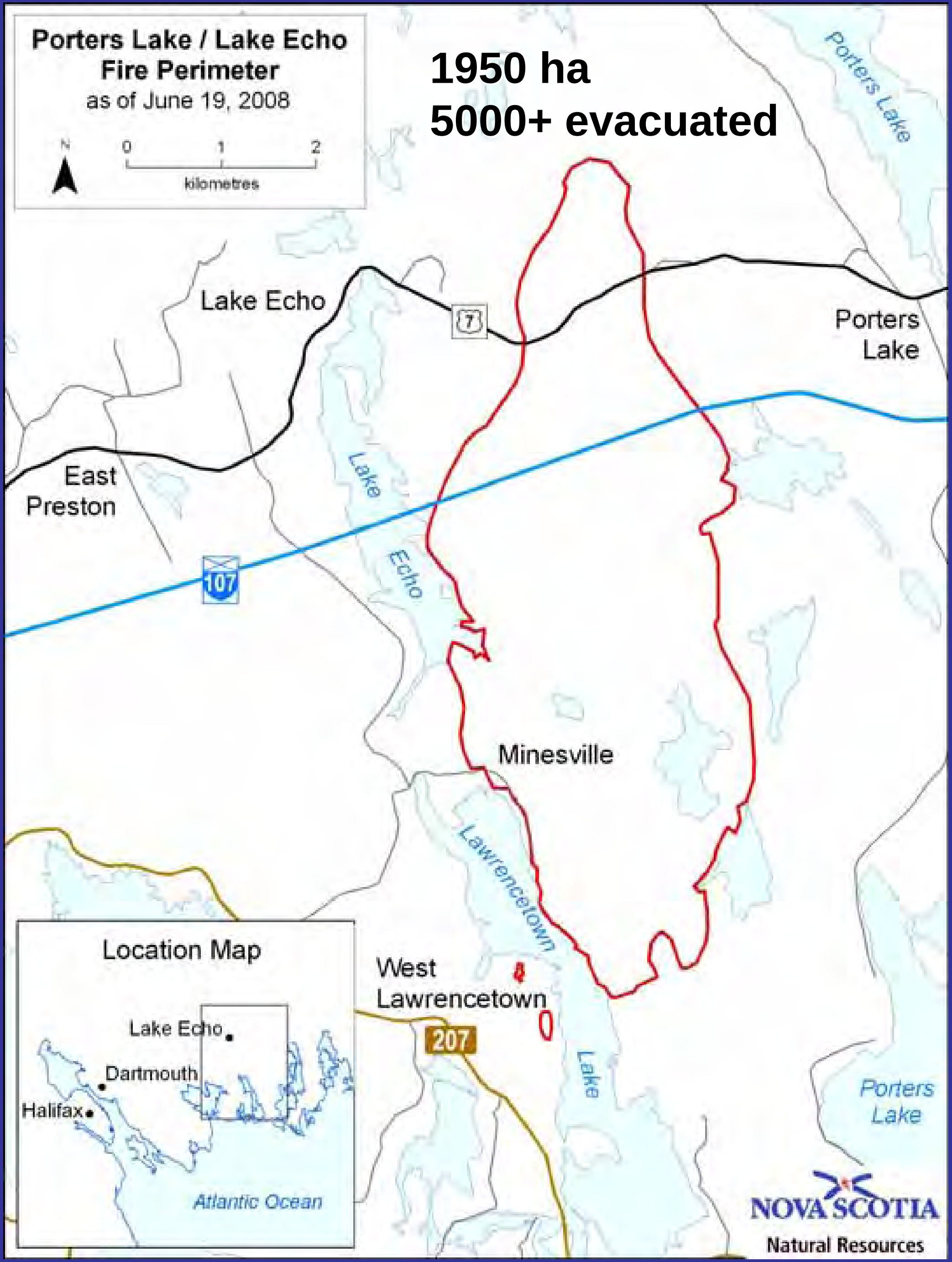


Figure 3.
Frequency of large-fire occurrence. Australia 1945-1975

1916 – Matheson Fire - NE Ontario

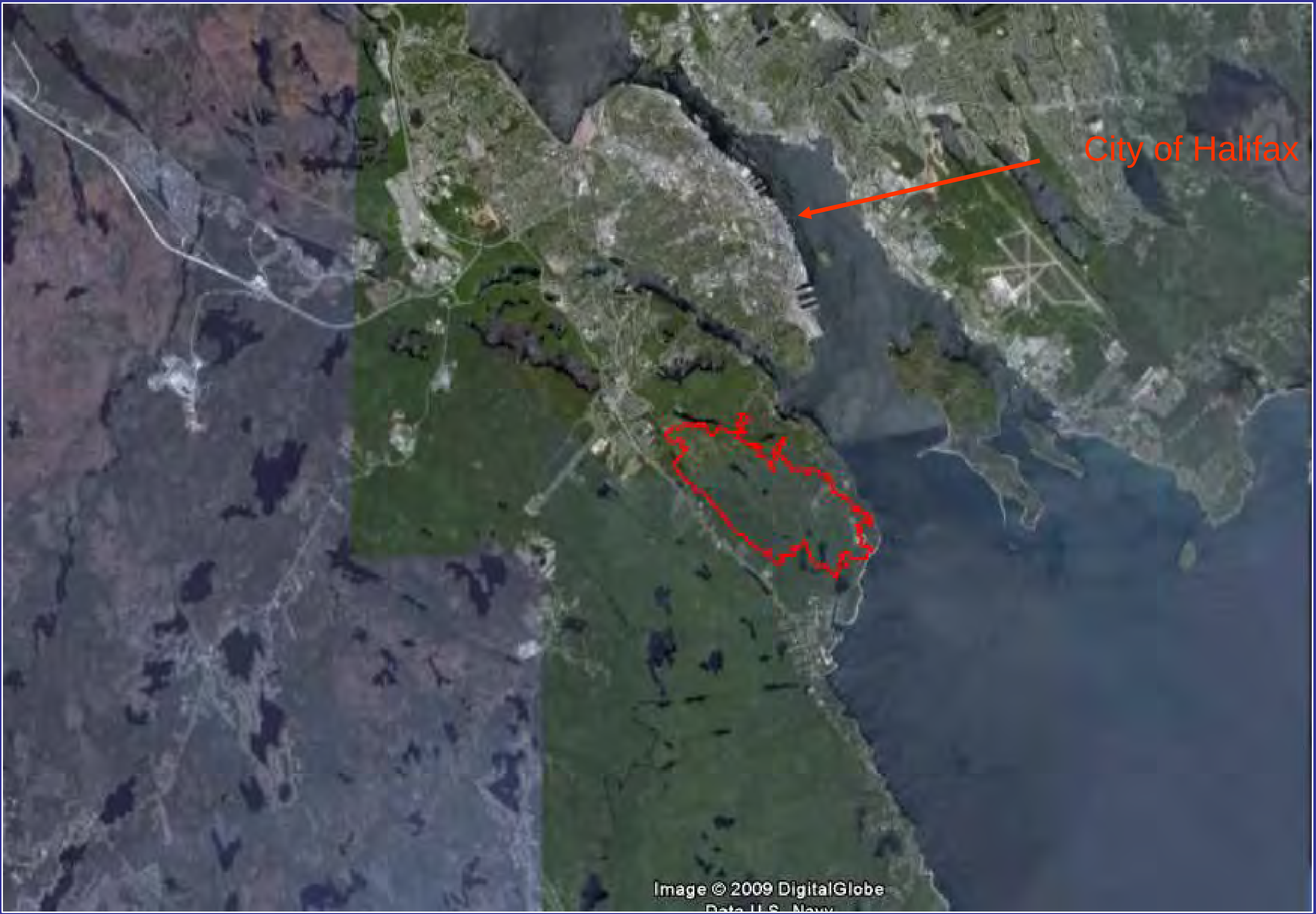
~ 300 fatalities

The growing number of wildland-urban interface fires is compounding the problem



A
Wakeup
Call
?

Halifax – April 2009


City of Halifax
Image © 2009 DigitalGlobe

Another Wake Up Call?

New Brunswick is no exception

TYPE OF SETTLERS CABIN BUILT TO RELPACE THOSE BURNED BY FOREST FIRES

HOMES, CROPS, FENCES, WOODLAND IN THIS AREA WIPED OUT BY FOREST FIRE

FAMILIES LIVED IN TENTS UNTIL HOMES COULD BE REBUILT

1934 – 11 homes lost

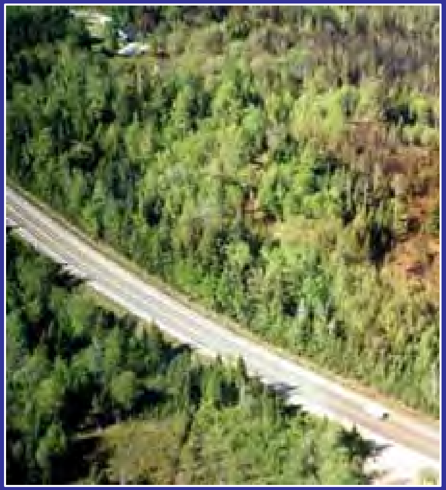
1935 – 117 homes lost

1972

The cost of forest fire. Remains of a house in Blissfield, one of the several, destroyed during the fire in May that burned 1,800 acres.

Gagetown – May 1986

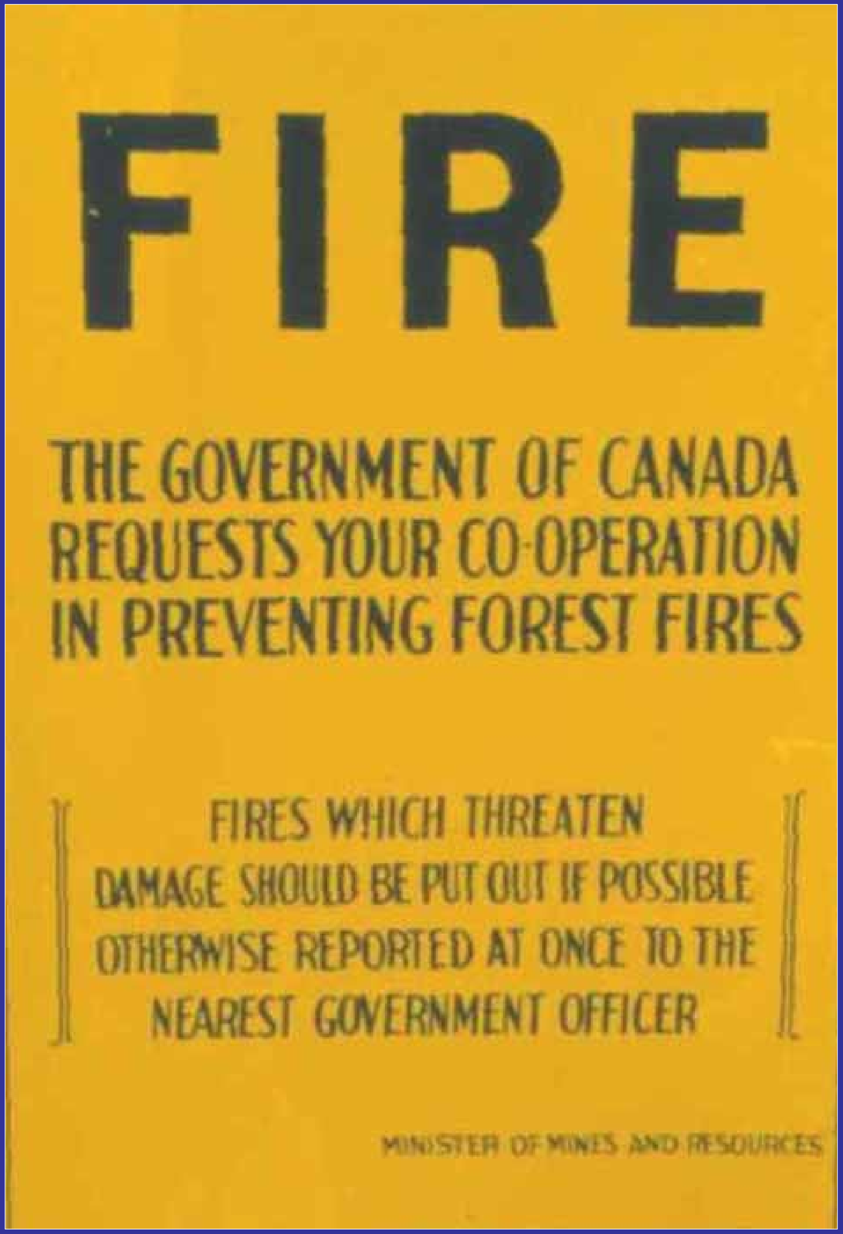
Other recent WUI inciddents in NB

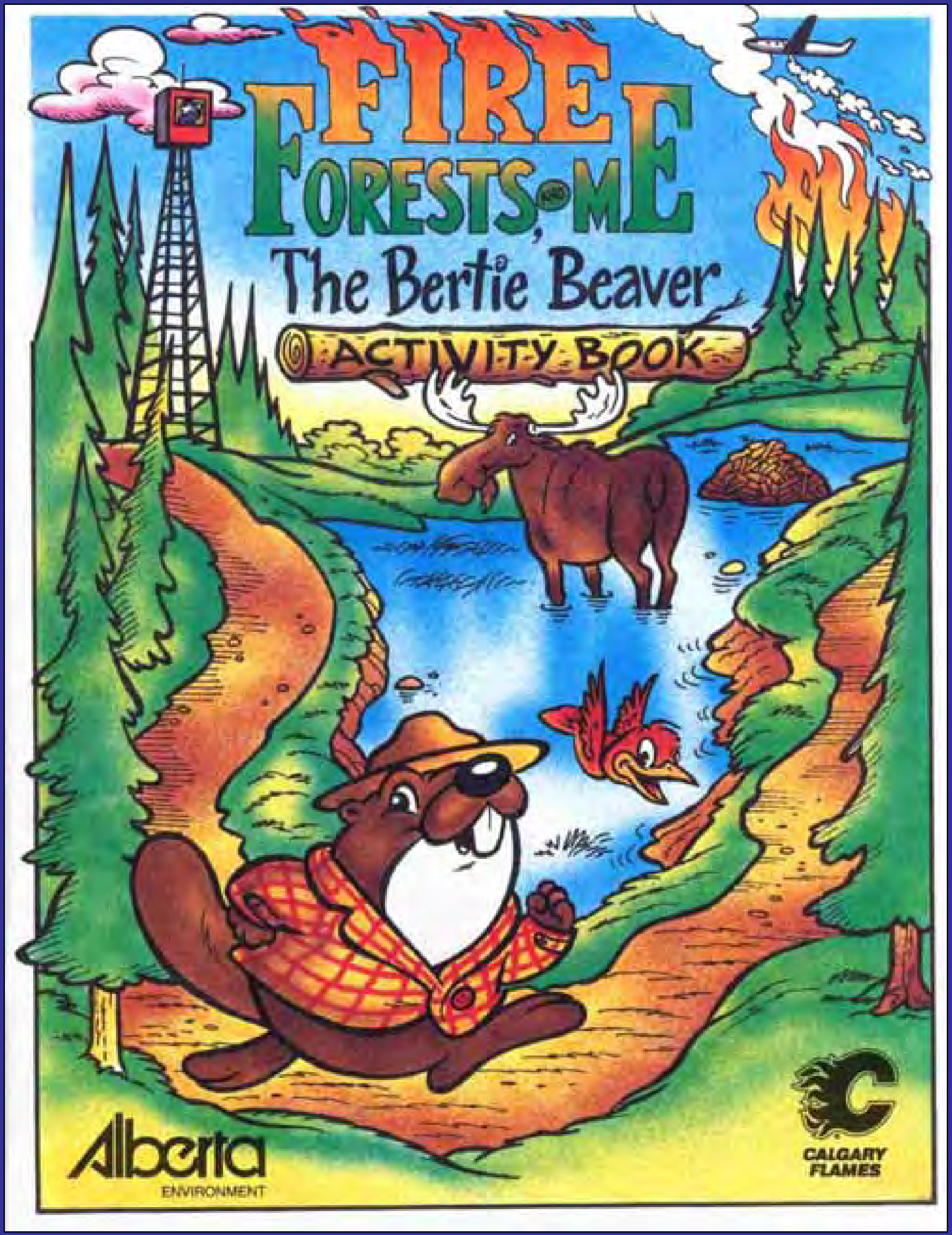


The
Realities of
Wildland Fire

Is it not possible to simply eliminate the wildfire problem?

The goal of fire prevention is to reduce fire occurrence





Winter Brush Burning

The following steps will help you prepare to burn brush more safely. Winter Burning may take place from November 1 - March 1. Please check with your local Fire Department before burning; some municipalities require a burning permit year round.

1

Gather and pile brush in an open area away from over-hanging branches.

2

In the fall, cover the brush pile with a tarp. Keep the pile covered for at least two months before you burn.

3

When you are ready to burn, choose a calm day (wind 10 km/h and below) with snow on the ground. Remove the tarp.

4

Place crumpled pieces of newspaper into the brush around the base of the pile.

5

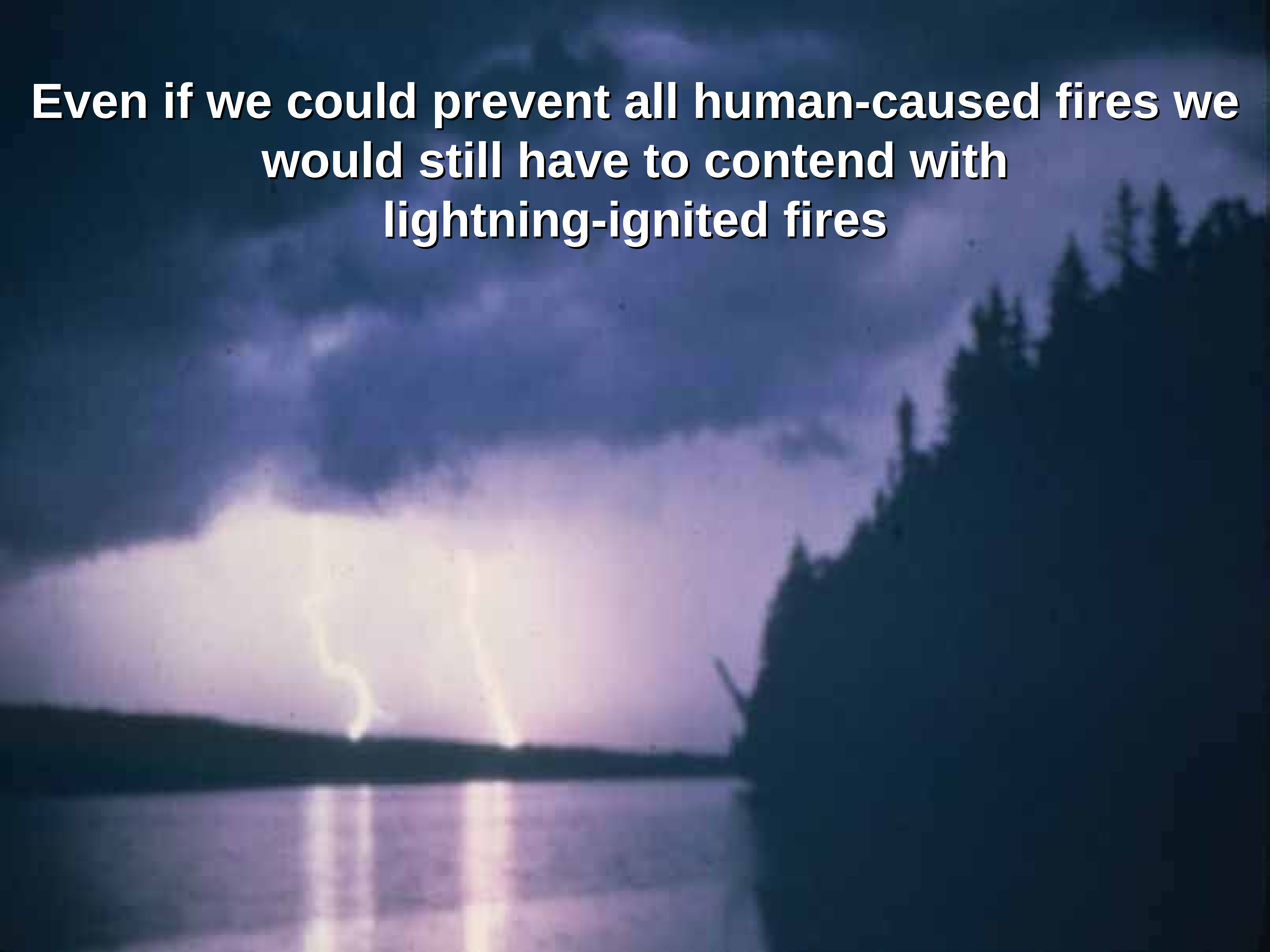
Light the paper all around the base of the pile. Do not use the fire to dispose of household garbage, or use old tires, oil or other accelerants.

6

Enjoy a safer, cleaner burn with very little smoke.

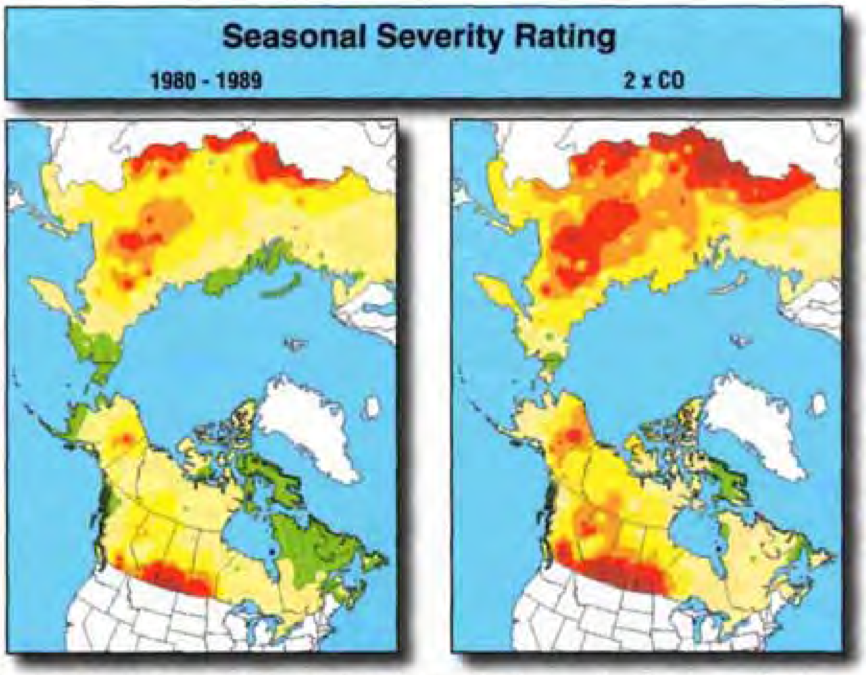
Every human-caused fire is a fire prevention failure!

Even if we could prevent all human-caused fires we would still have to contend with lightning-ignited fires



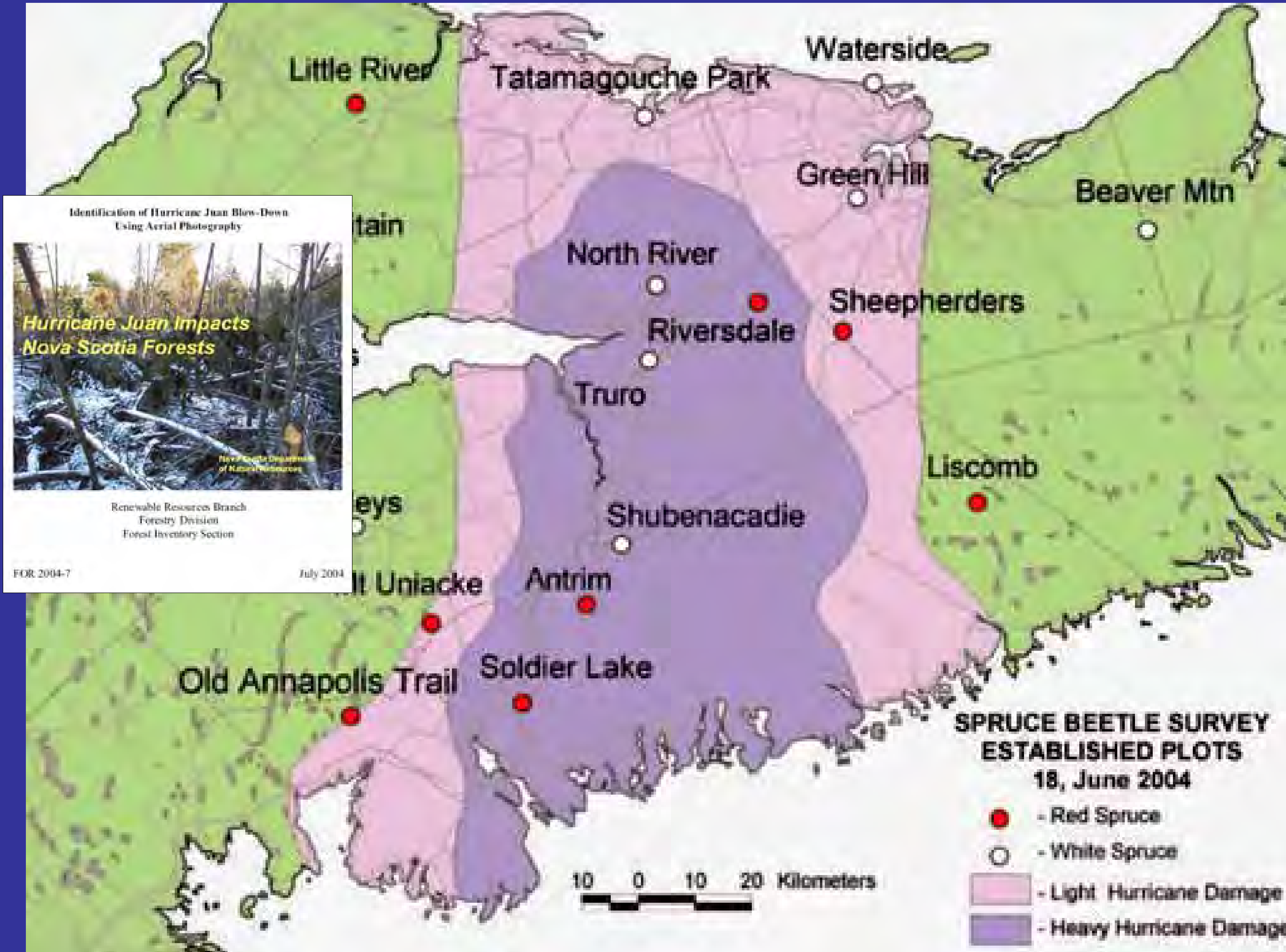
Is it realistic to expect we can control all fires before they reach conflagration levels?

… especially in light of increasing frequency of severe fire weather and forest health issues



General circulation model-projected changes in circumpolar fire danger levels with a doubling of atmospheric carbon dioxide.

Crown fire in mountain pine beetle infested forest


Identification of Hurricane Juan Blow-Down
Using Aerial Photography
Hurricane Juan Impacts
Nova Scotia Forests
Renewable Resources Branch
Forestry Division
Forest Inventory Section
FOR 2004-7
July 2004
Little River
Tatamagouche Park
Waterside
Green Hill
Beaver Mtn
North River
Sheepherders
Riversdale
Truro
Liscomb
Shubenacadie
Antrim
Soldier Lake
Old Annapolis Trail
SPRUCE BEETLE SURVEY
ESTABLISHED PLOTS
18, June 2004
- Red Spruce
- White Spruce
- Light Hurricane Damage
- Heavy Hurricane Damage
10 0 10 20 Kilometers

Hurricane created fuel complexes

Damage by Hurricane Edna 1954

Socially irresponsible to jeopardize the safety of firefighters in the wildland/urban interface because of homeowner expectations regarding fire protection

No radically new concept in fire suppression can be anticipated.

Would more airtankers eliminate the wildfire problem?

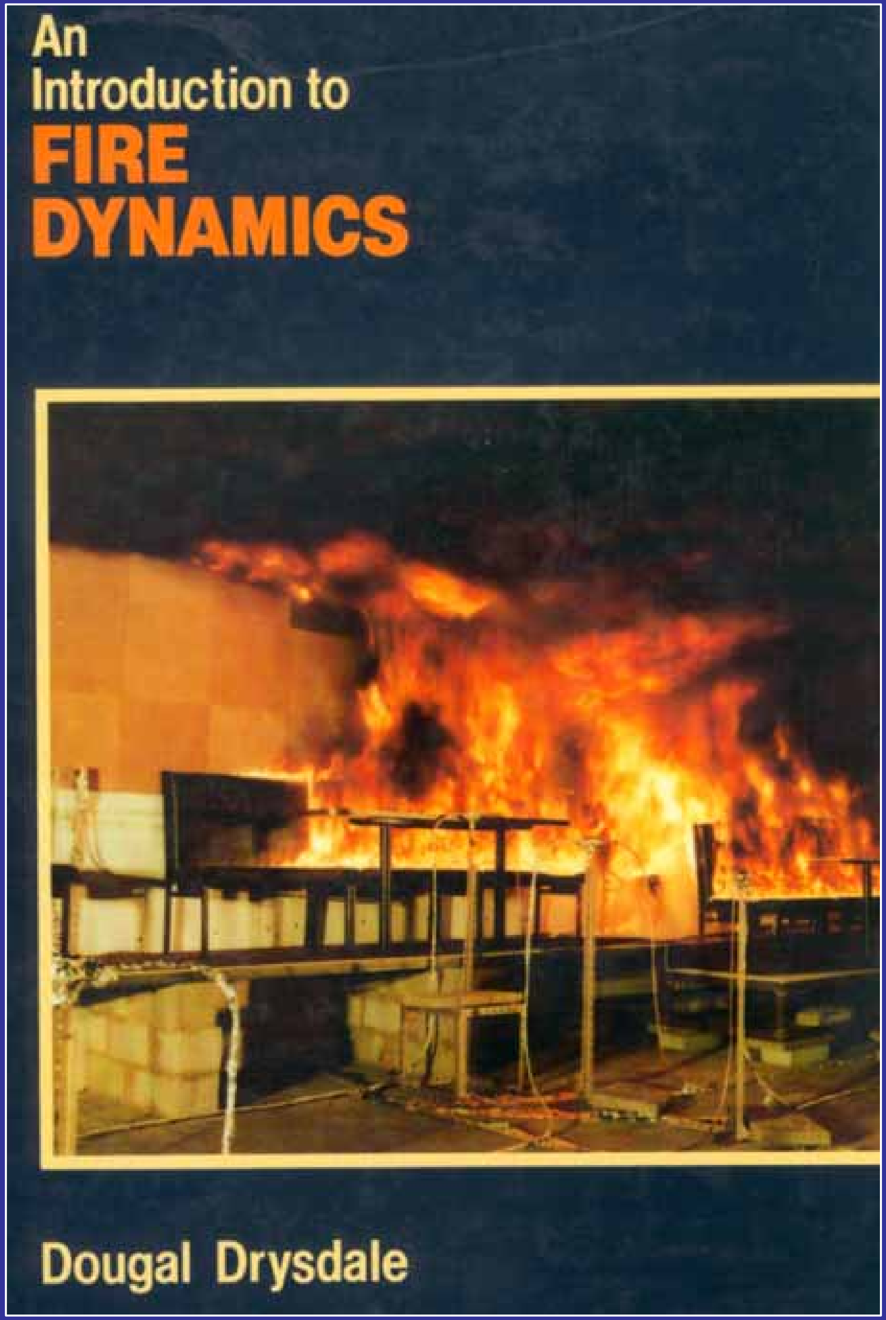
Are these realistic solutions to the wildfire problem?

Are these realistic solutions to the wildfire problem?

Are these realistic solutions to the wildfire problem?

Are these realistic solutions to the wildfire problem?

The city has its corner fire alarm boxes, but deep in the Green River woodlands of Fraser Companies, Limited are these self-serve fire fighting stands located at tops of hills or every two miles along the main haul road. With shovel, bucket of sand, and hand pump attached to a constantly filled 5 gallon tank of water, anyone can douse a small forest or automobile fire before it spreads to the nearby woods. The scarlet and white painted posts are recurring reminders to forest workers to guard against fire.



"... *further major advances in combating wildfire are unlikely to be achieved simply by continued application of the traditional methods. What is required is a more fundamental approach which can be applied at the design stage …*

Such an approach requires a detailed understanding of fire behaviour ..."

Drysdale (1985)

Wildland
Fire
Behavior
101

Fire Behavior !

What is it?

Fire behavior is defined as the manner in which fuel ignites, flame develops, fire spreads and exhibits other related phenomena as determined by the the fire environment.

Extreme fire behavior represents a level of fire activity that often precludes any fire suppression action. It usually involves one or more of the following:

- High Rate of Spread & Intensity

- Crowning

- Prolific Spotting

- Large Fire Whirls

- Well-developed Convection Column

The Fire Environment Defined

The surrounding conditions, influences and modifying forces of topography, fuel and fire weather that determine fire behavior.

Fire Environment Factors

Fuel Characteristics:
- Quantity
- Moisture
- Size & Shape
- Depth/Height
- Arrangement

Weather Characteristics:
- Wind Speed & Direction
- Relative Humidity
- Air Temperature
- Rainfall Amounts & Duration
- Cloud Clover
- Atmospheric Instability

Topographic Characteristics:
- Slope Steepness & Aspect
- Elevation
- Configuration
- Barriers to Fire Spread

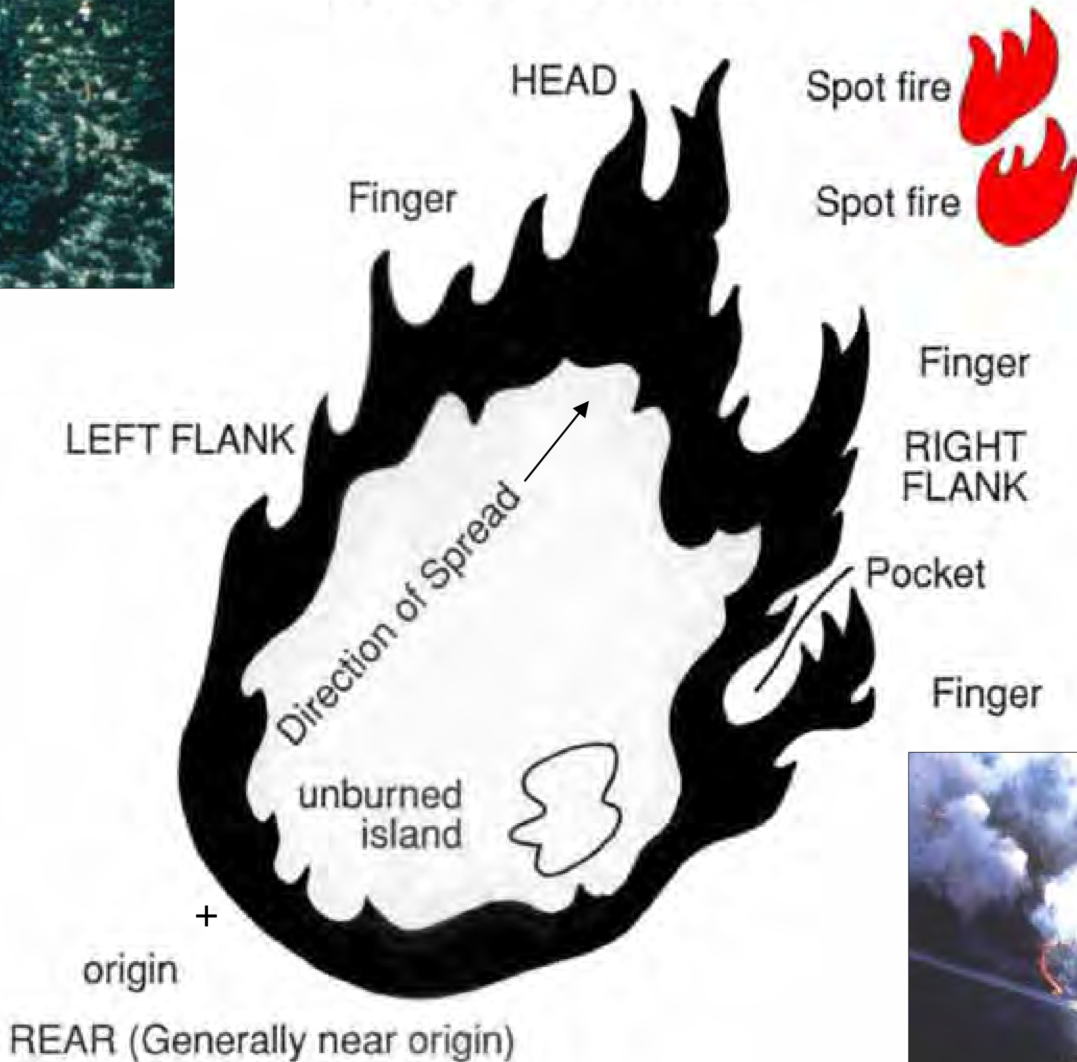
The more important fire behavior characteristics from the practical standpoint of fire suppression are:

- Forward Rate of Spread
- Fire Intensity
- Flame Front Dimensions
- Spotting Pattern (densities & distances)
- Fire Size and Shape
- Rate of Perimeter Increase
- Burn-out Time

What distinguishes wildland fires from structural or urban fires is their horizontal spread potential and in turn areal extent.

Most forest or wildland fires start from a point.

PARTS OF A FIRE



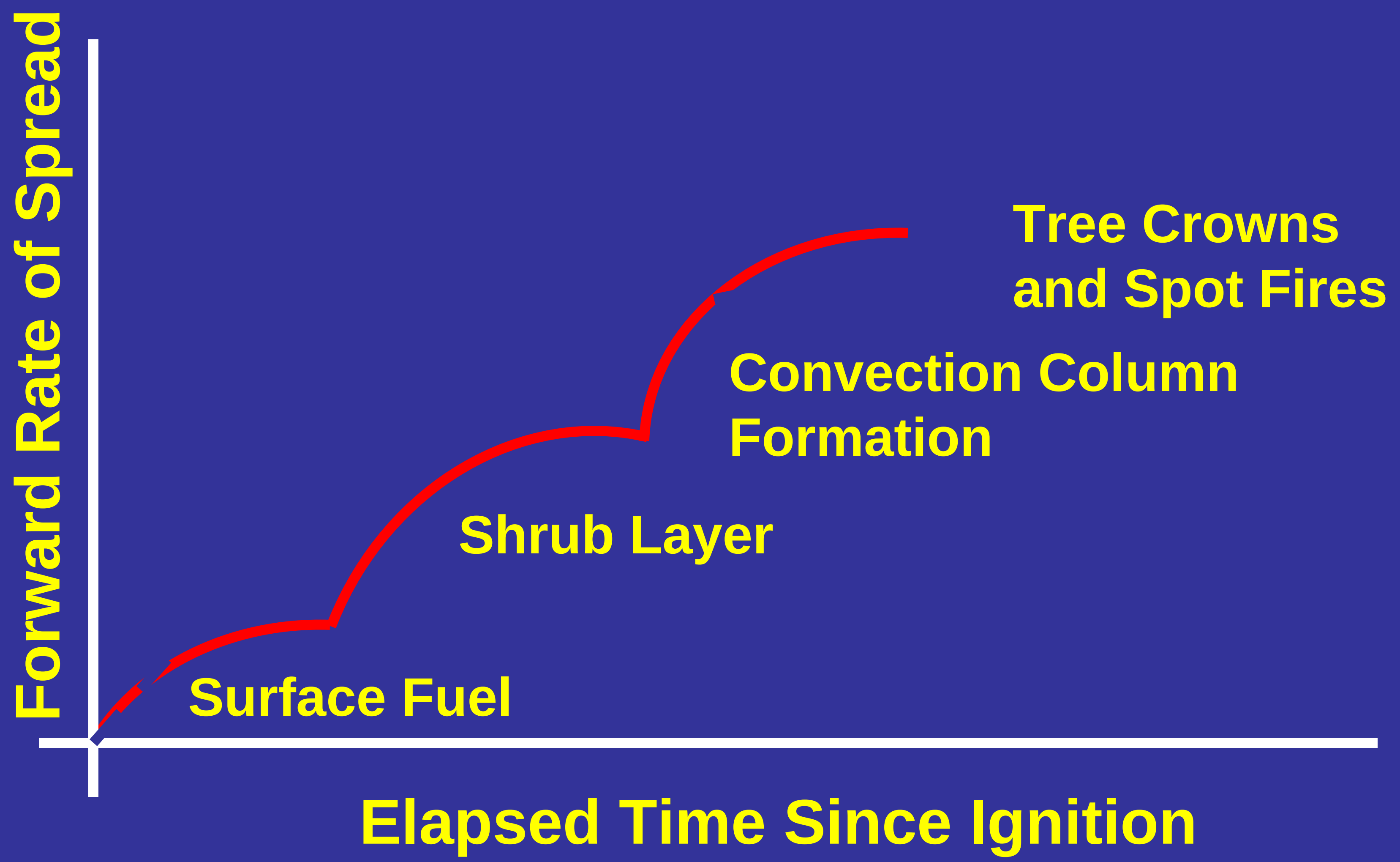
A fire originating from a single point source gradually increases its rate of forward progress until a rate of spread approaching a "quasi" or equilibrium steady state is reached.

Porter Lake Experimental Point Source Fire P2

Porter Lake Experimental Point Source Fire P2

Acceleration patterns in forest fires are very variable but generally the more severe the burning conditions the longer a fire will continue to accelerate.

Acceleration Pattern Observed in Forest Fires



The acceleration phenomena in forest fires typically follows a "stepped" pattern or stages.

Nominal Spread Rates for Wildland Fires

Ground or Subsurface Fires: < 0.01 m/min

Surface Backfires
in Forests:
0.1 – 1.0 m/min

Surface Head Fires
in Forests:
1 - 10 m/min

Crown Fires in Forests:
15 - 200 m/min

Grass Fires:
up to 250 - 350 m/min

Basic Features of a Wildland Fire:

It spreads …

it consumes or “eats” fuel and …

it produces heat energy and light in …

… a visible flaming combustion reaction.

Fire Intensity

$$I = H \times W \times R$$

I	*H*	*W*	*R*
Fire Intensity (kW/m)	Heat of Combustion (18 000 kJ/kg)	Fuel Consumed (kg/m^2)	Rate of Fire Spread (m/sec)

<u>**Fire Intensity Spectrum**</u>

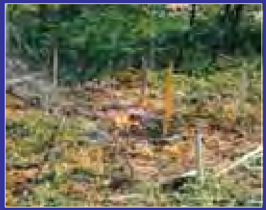
10 kW/m – Lower limit of surface fire spread

100 kW/m – Ideal for prescribed under-burning

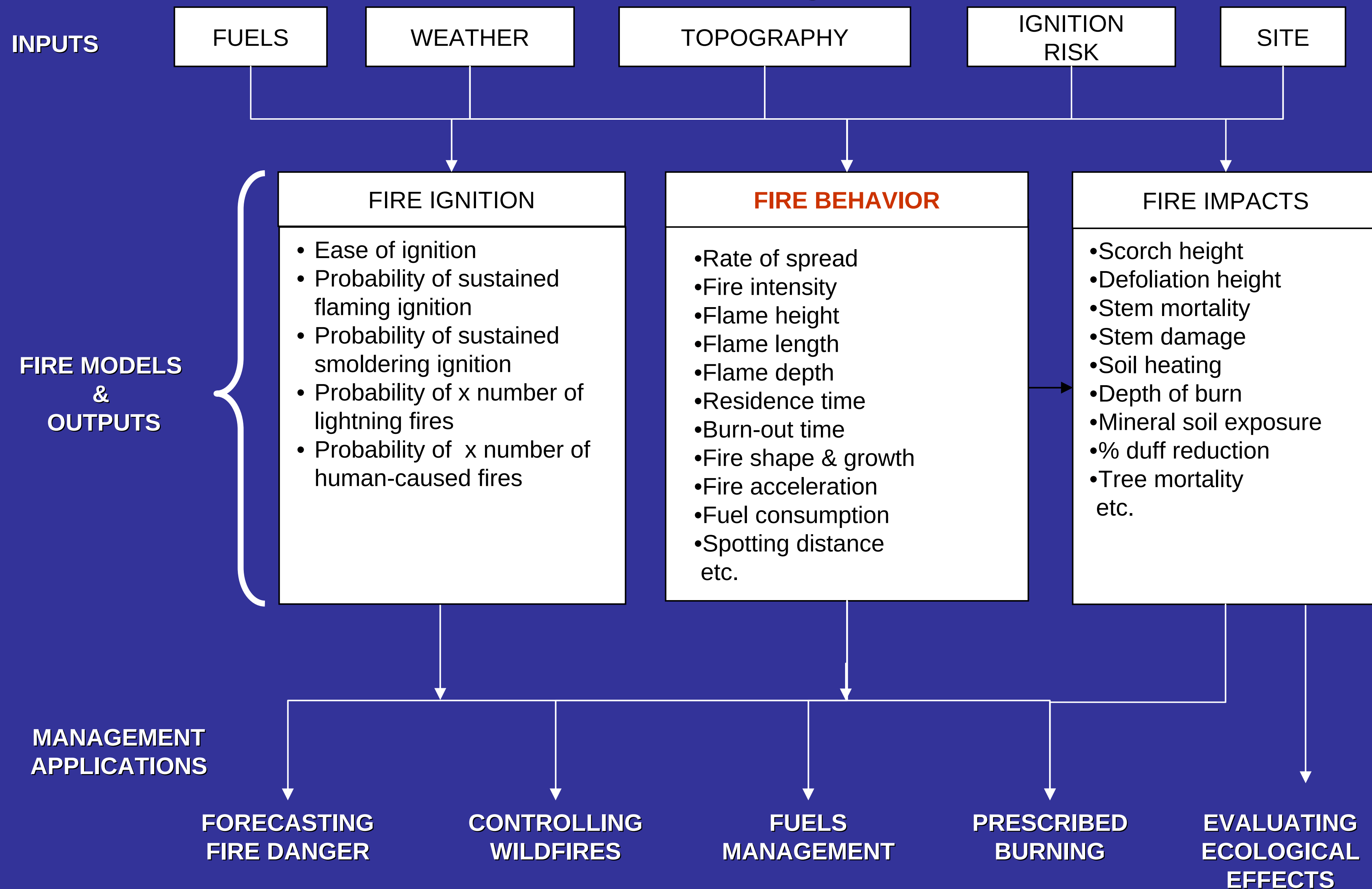
1000 kW/m – Limit of suppression capability by hand crews

10 000 kW/m – Active crown fires have developed

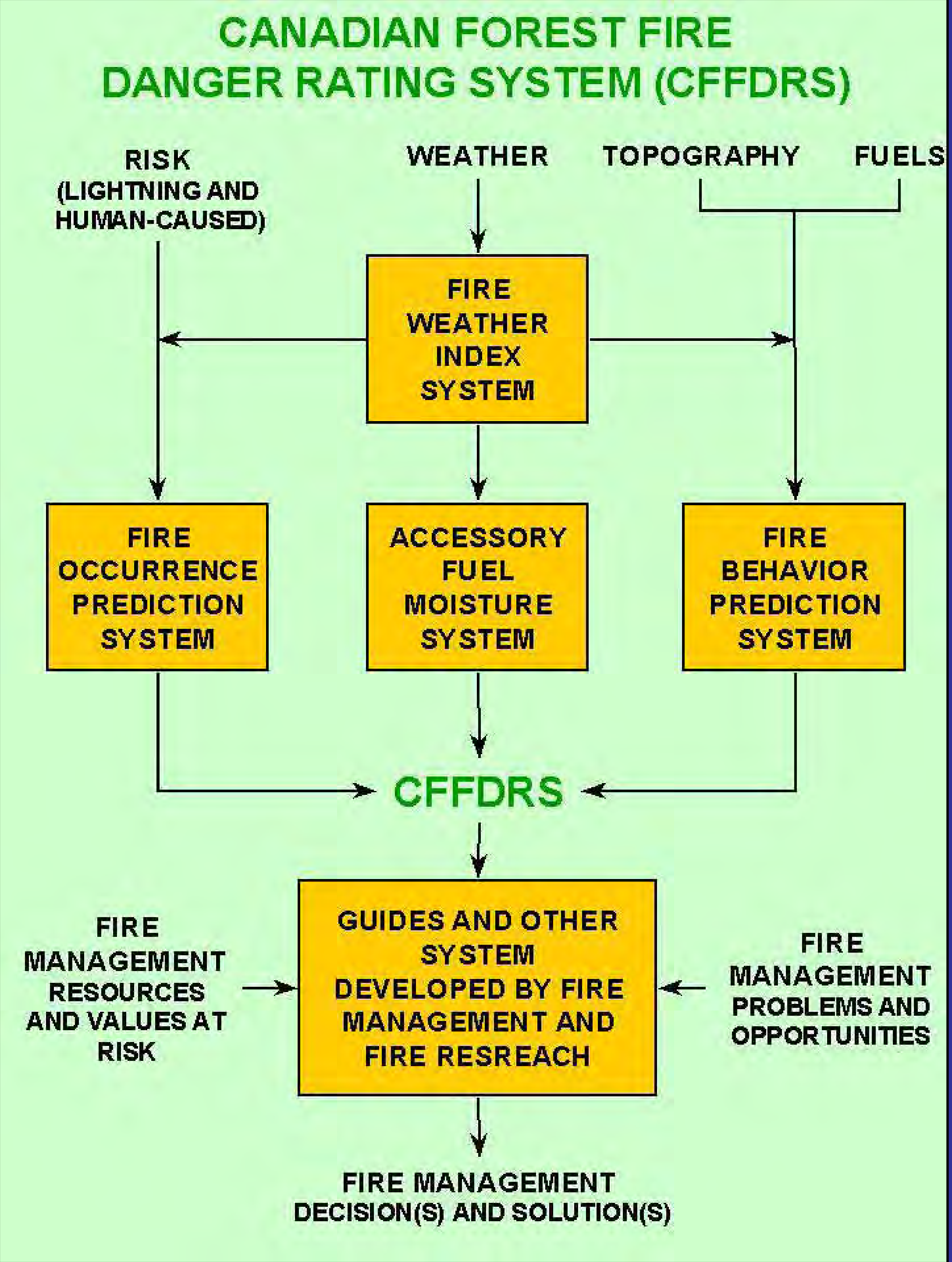
100 000 kW/m – Major conflagrations



Conceptual Model of Scientifically-based Forest Fire Management



Canada has traditionally taken an empirical approach to developing fire behavior models based on conducting outdoor experimental fires

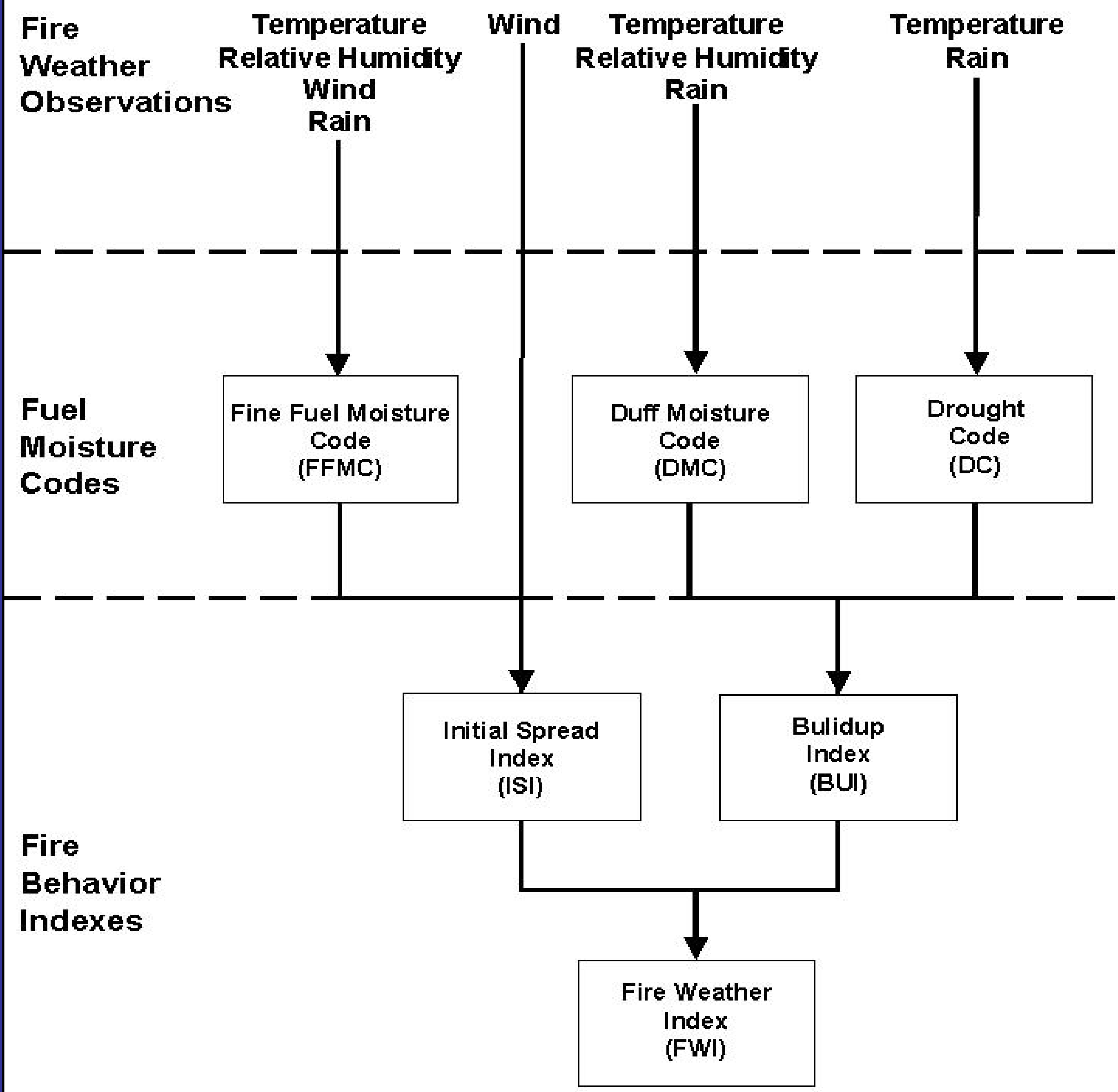


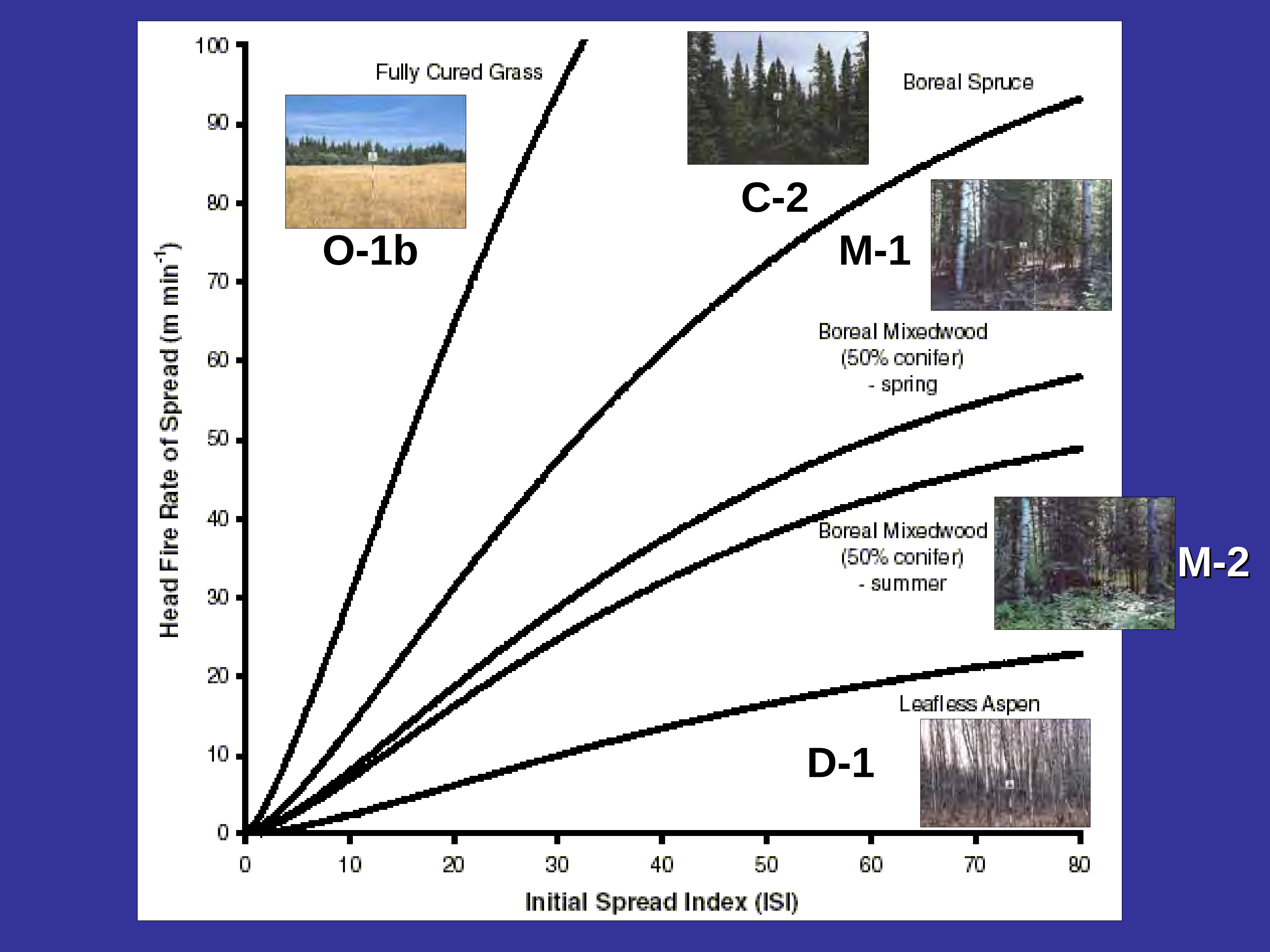
Simplified CFFDRS structure diagram illustrating the linkage to fire management actions

C F F D R S

Structure of the Canadian Forest Fire Weather Index (FWI) System

C F F D R S





Fully Cured Grass
O-1b
C-2
Boreal Spruce
M-1
Boreal Mixedwood
(50% conifer)
- spring
Boreal Mixedwood
(50% conifer)
- summer
M-2
Leafless Aspen
D-1
Head Fire Rate of Spread (m min^{-1})
Initial Spread Index (ISI)
0
10
20
30
40
50
60
70
80
90
100

The Practically Oriented Field Guide

FIELD GUIDE TO THE CANADIAN FOREST FIRE BEHAVIOR PREDICTION (FBP) SYSTEM

S.W. Taylor
R.G. Pike
and
M.E. Alexander

Natural Resources Canada / Ressources naturelles Canada
Canadian Forest Service / Service canadien des forêts
Canada

Table 4.3
Equilibrium rate of spread (m/min) and fire intensity class

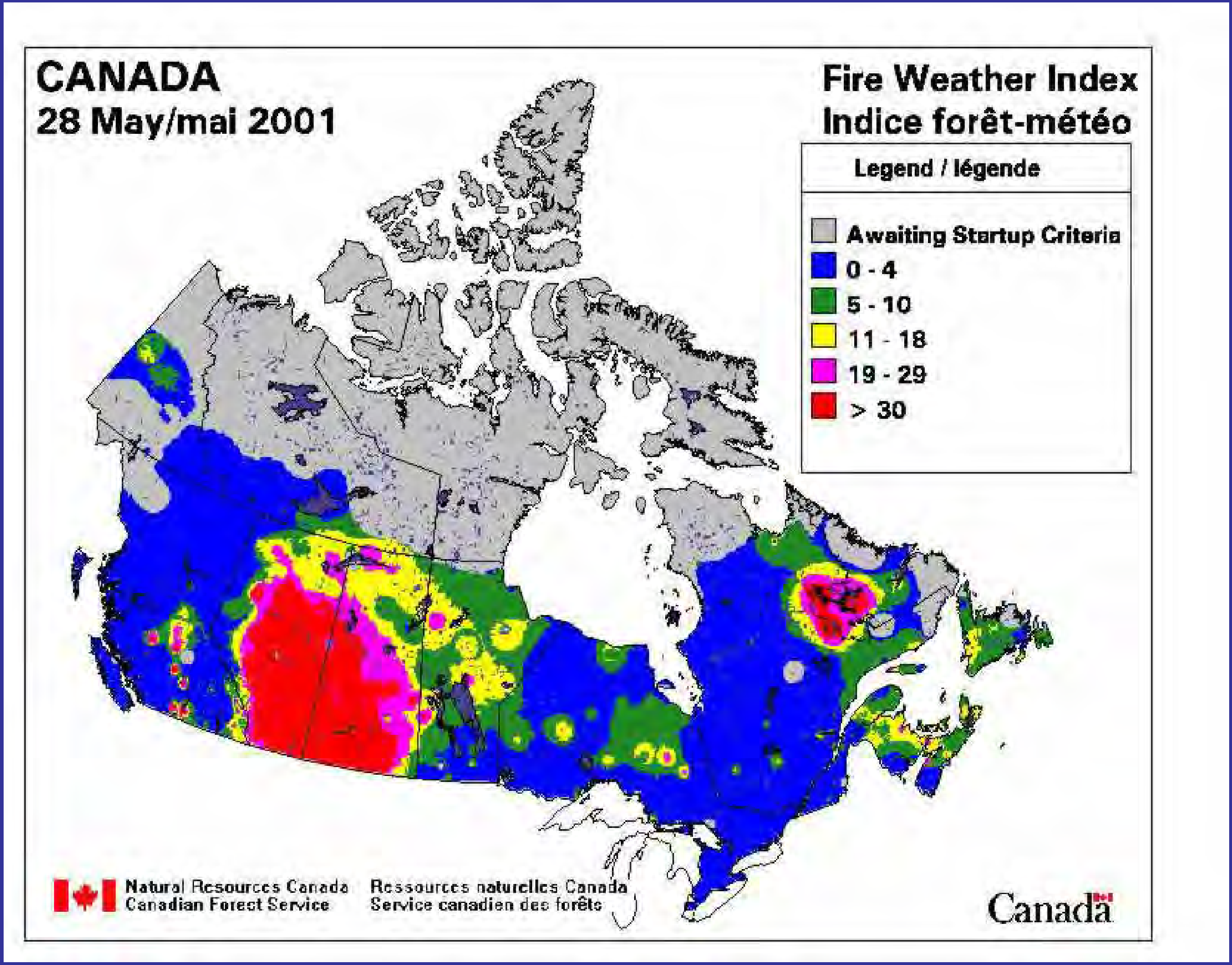
C-3 mature jack or lodgepole pine

Intensity class
- 1 < 10 kW/m
- 2 10 – 500
- 3 500 – 2 000
- 4 2 000 – 4 000
- 5 4 000 – 10 000
- 6 > 10 000

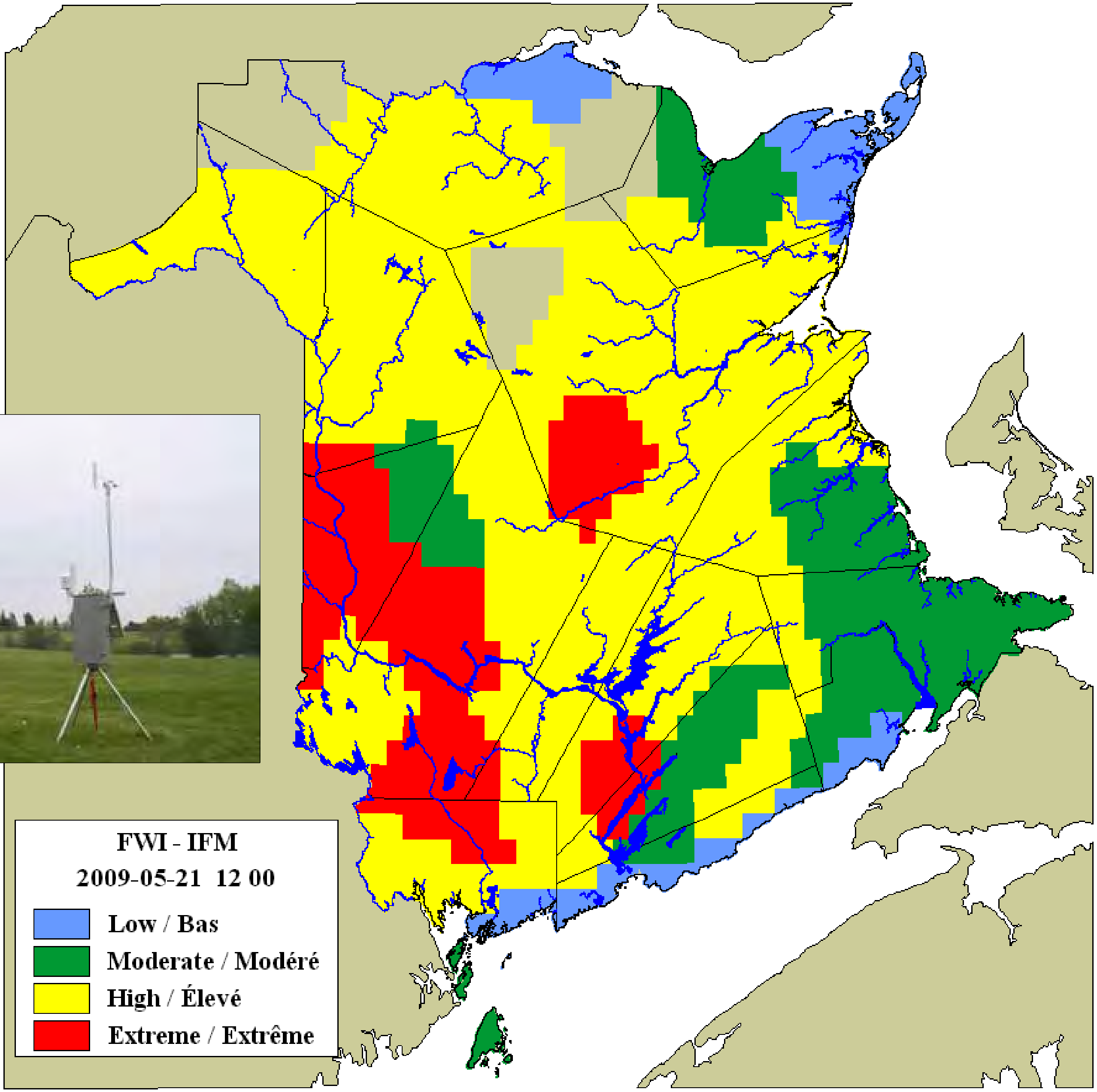
	BUI							
ISI	0–20	21–30	31–40	41–60	61–80	81–120	121–160	161–200
1	0	0	0	0	0	0	0	0
2	0	<0.1	0.1	0.1	0.1	0.1	0.1	0.1
3	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
4	0.1	0.3	0.4	0.4	0.5	0.5	0.5	0.5
5	0.2	0.6	0.7	0.8	0.9	0.9	1	1
6	0.4	1	1	1	1	2	2	2
7	0.7	2	2	2	2	2	2	2
8	1	2	2	3	3	3	3	3*
9	1	3	3	4	4	4	4*	5*
10	2	4	4	5	5	6*	6*	6*
11	2	5	5	6	7*	7*	7*	7*
12	2	6	7	7	8*	8*	9*	9*
13	3	7	8	9	10*	10*	11*	11*
14	3	8	9	10*	11*	12*	12*	13*
15	4	9	11	12*	13*	14*	14	15
16	4	10	12	14*	15*	16	16	17
17	5	12	14	16*	17	18	19	19
18	6	13	15	17*	19	20	21	21
19	6	15	17*	19	21	22	23	24
20	7	16	19*	21	23	25	26	26
21–25	9	21	24*	27	30	31	33	34
26–30	12	28*	33	38	41	43	45	46
31–35	16	36*	42	47	51	55	57	58
36–40	18	43	50	56	61	65	68	69
41–45	21	49	57	64	70	74	77	79
46–50	23	54	63	71	77	82	86	88
51–55	25	58	69	77	84	89	93	95
56–60	27	62	73	82	89	95	99	101
61–65	28	65	77	86	94	100	104	106
66–70	29	68	80	90	97	103	108	110

Constants: foliar moisture content = 97%; crown base height = 8 m. ☐ = average BUI.
Type of fire: **surface**, **intermittent crown***, continuous crown. _ = CFB 50%.

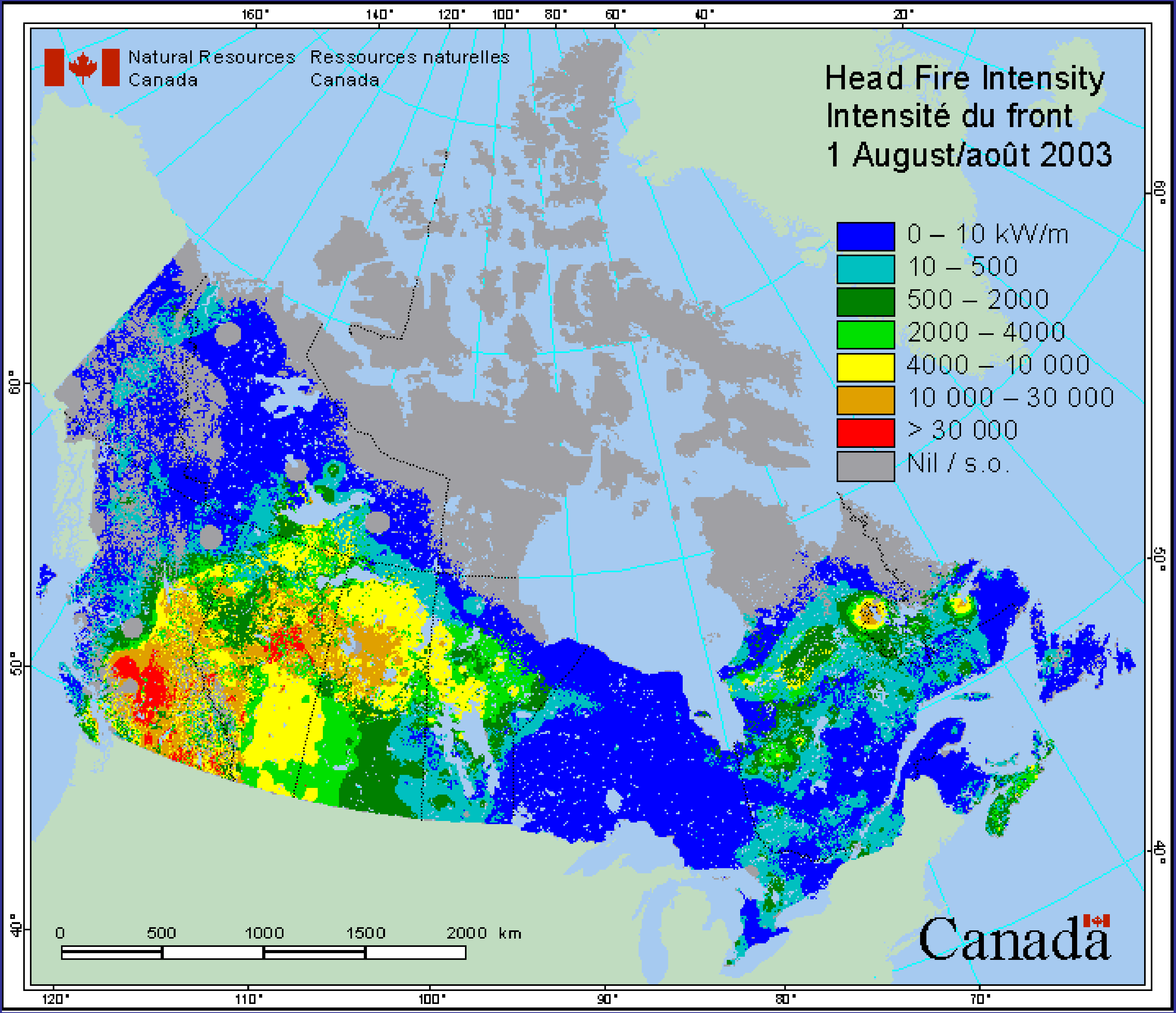
Canadian Wildland Fire Information System

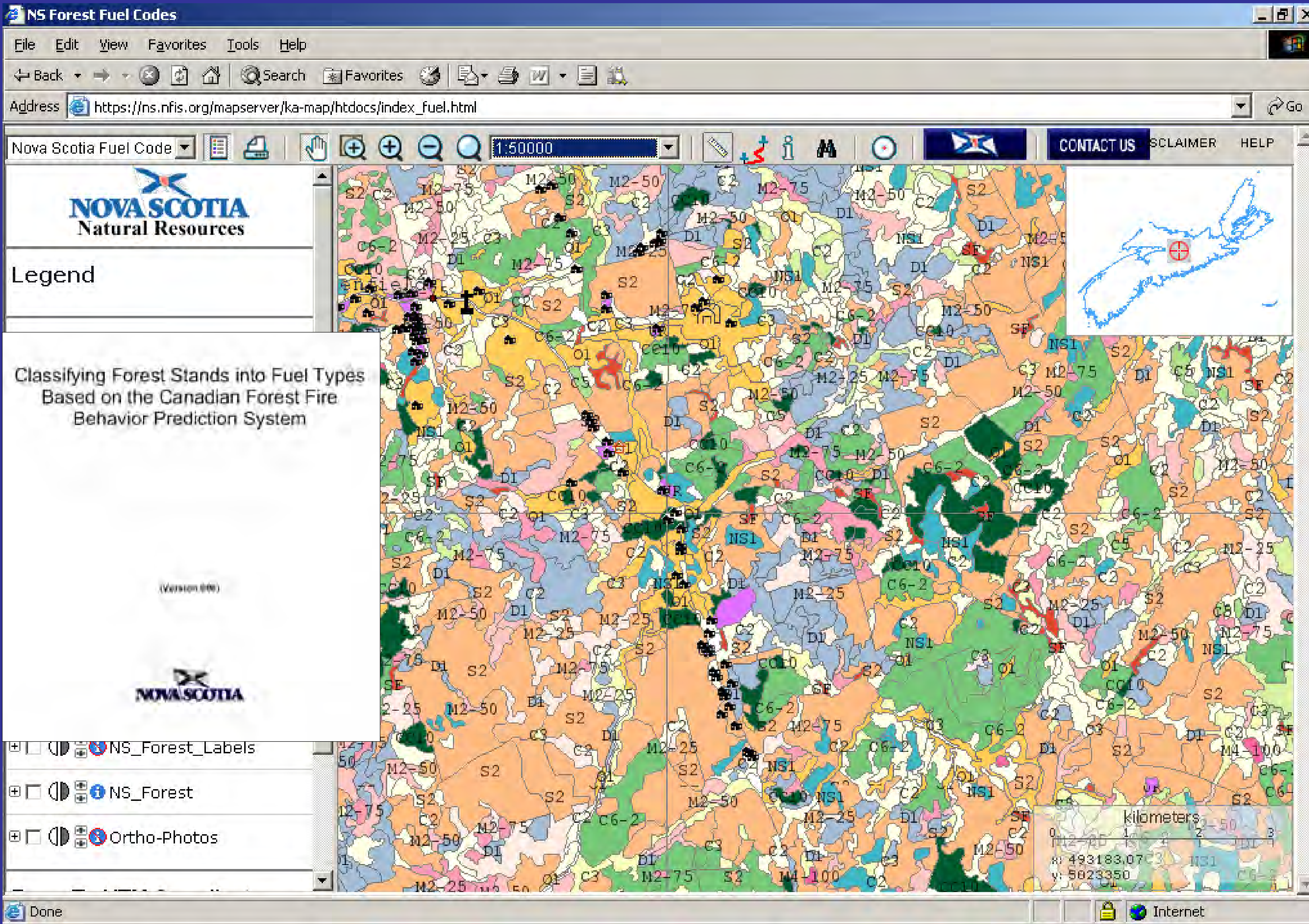


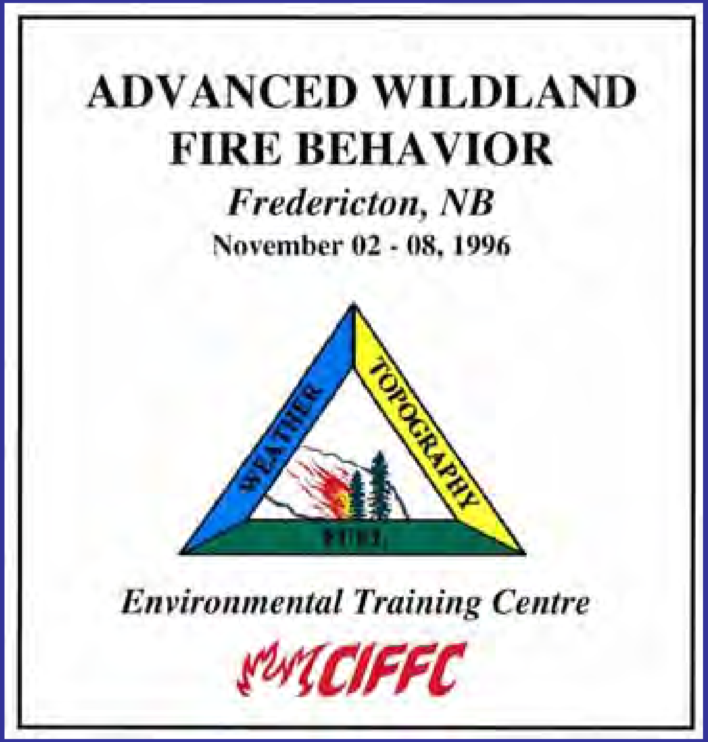
http://fms.nofc.cfs.nrcan.gc.ca/cwfis/



FWI - IFM
2009-05-21 12 00
Low / Bas
Moderate / Modéré
High / Élevé
Extreme / Extrême

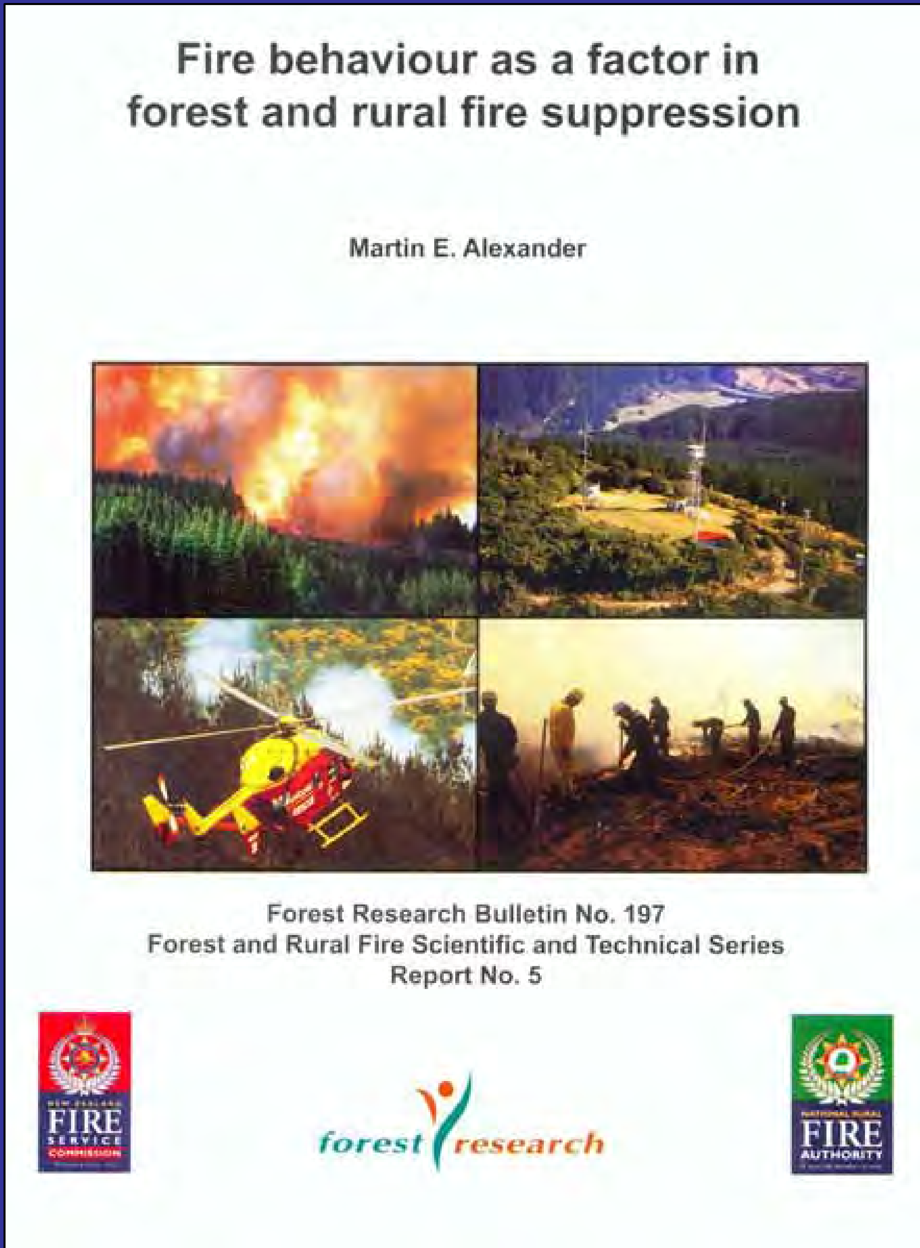

Natural Resources Canada
Ressources naturelles Canada
Head Fire Intensity
Intensité du front
1 August/août 2003
0 – 10 kW/m
10 – 500
500 – 2000
2000 – 4000
4000 – 10 000
10 000 – 30 000
> 30 000
Nil / s.o.
0
500
1000
1500
2000 km
Canada
160°
140°
120°
100°
80°
60°
40°
20°
60°
50°
40°
120°
110°
100°
90°
80°
70°

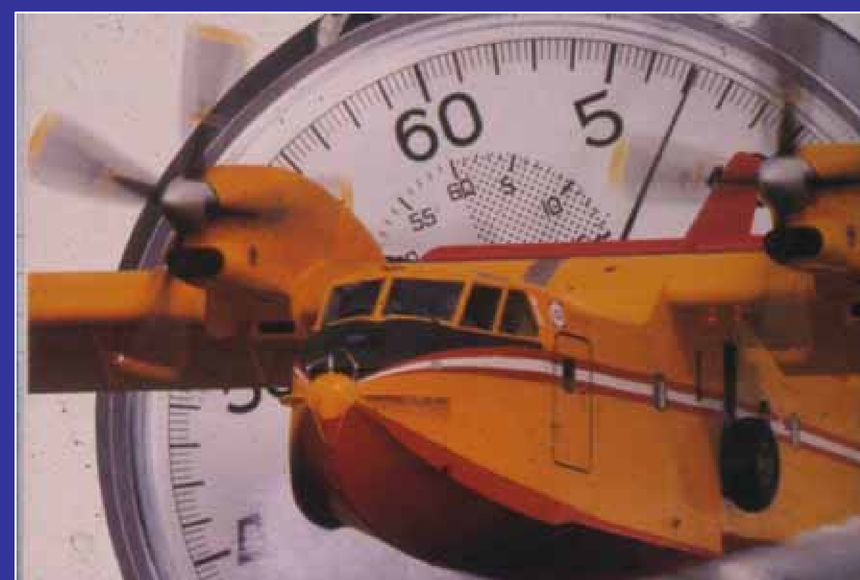

NS Forest Fuel Codes
File Edit View Favorites Tools Help
Back Search Favorites
Address https://ns.nfis.org/mapserver/ka-map/htdocs/index_fuel.html
Go
Nova Scotia Fuel Code
1:50000
CONTACT US
SCLAIMER
HELP
NOVA SCOTIA
Natural Resources
Legend
Classifying Forest Stands into Fuel Types Based on the Canadian Forest Fire Behavior Prediction System
NOVA SCOTIA
NS_Forest_Labels
NS_Forest
Ortho-Photos
kilometers
0 1 2 3
x: 493183.07
y: 5023350
Done
Internet



Wildland Fire Behavior Specialist Course

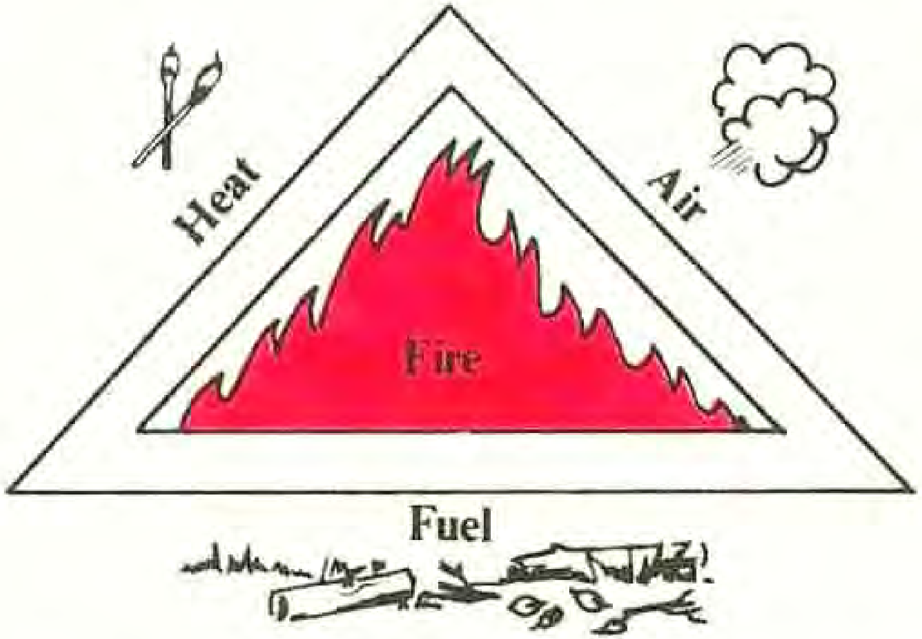
Fire Behavior and the Connection to Fire Suppression


Fire behaviour as a factor in
forest and rural fire suppression
Martin E. Alexander
Forest Research Bulletin No. 197
Forest and Rural Fire Scientific and Technical Series
Report No. 5
FIRE SERVICE COMMISSION
forest research
NATIONAL RURAL FIRE AUTHORITY


60
5

FOR A FIRE TO BURN, YOU MUST HAVE...

HEAT AIR FUEL



TO STOP A FIRE FROM BURNING, YOU MUST REMOVE EITHER...

HEAT AIR FUEL

To stop a fire one can:

(1) Remove the fuels ahead of the spreading combustion zone





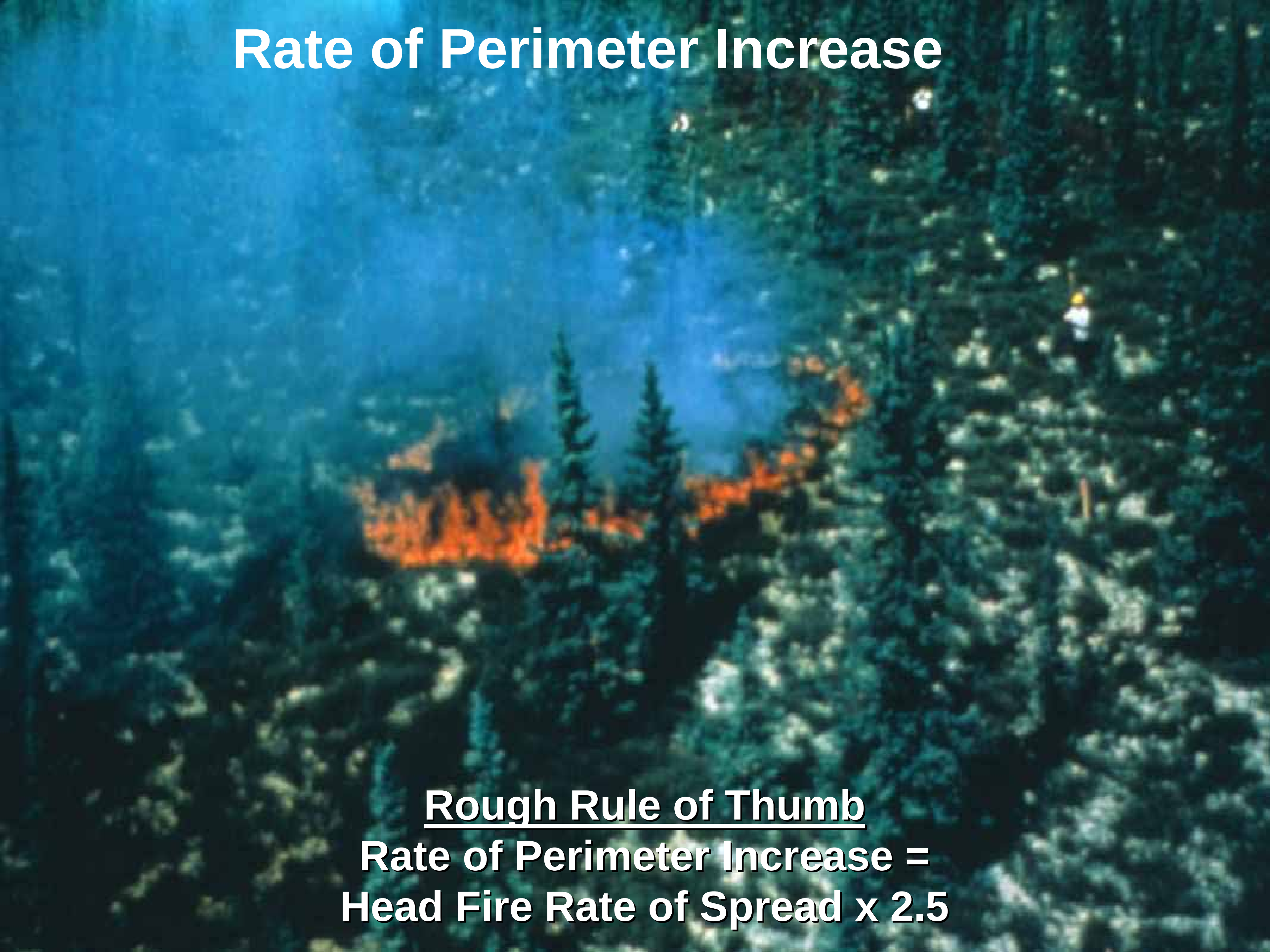
To stop a fire one can: (2) Reduce the temperature of the burning fuels

To stop a fire one can:

(3) Exclude oxygen from reaching the combustion zone

Fire Intensity	Minimum Control Requirements
< 500 kW/m	hand tools
500-2000 kW/m	water under pressure and/or heavy machinery
2000-4000 kW/m	helitankers & airtankers using chemical retardants
4000+ kW/m	very difficult to control

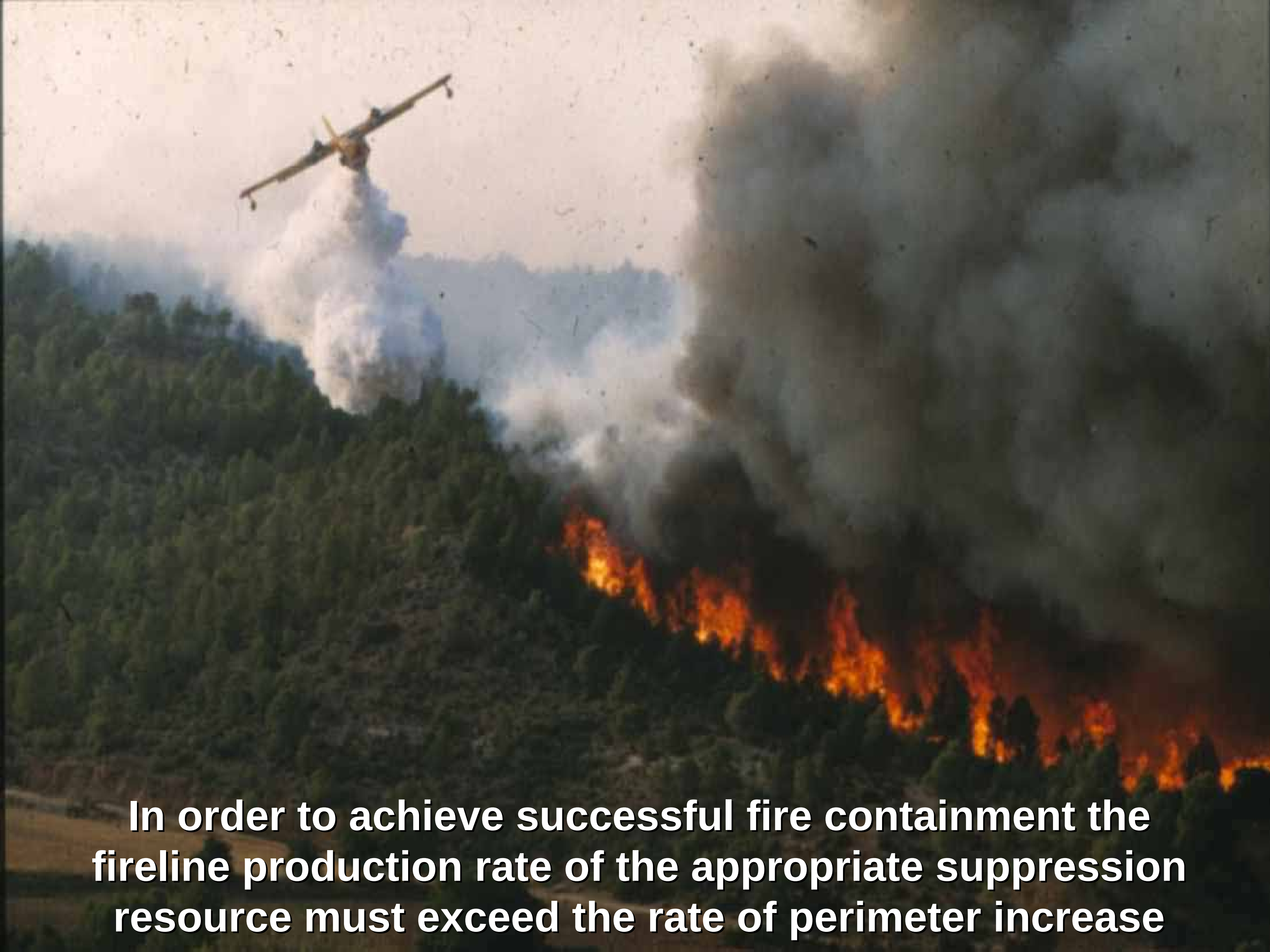
Rate of Perimeter Increase



<u>Rough Rule of Thumb</u>

Rate of Perimeter Increase =

Head Fire Rate of Spread x 2.5


In order to achieve successful fire containment the
fireline production rate of the appropriate suppression
resource must exceed the rate of perimeter increase


EXTREME
FIRE HAZARD
DON'T EVEN FART
IN THE FOREST

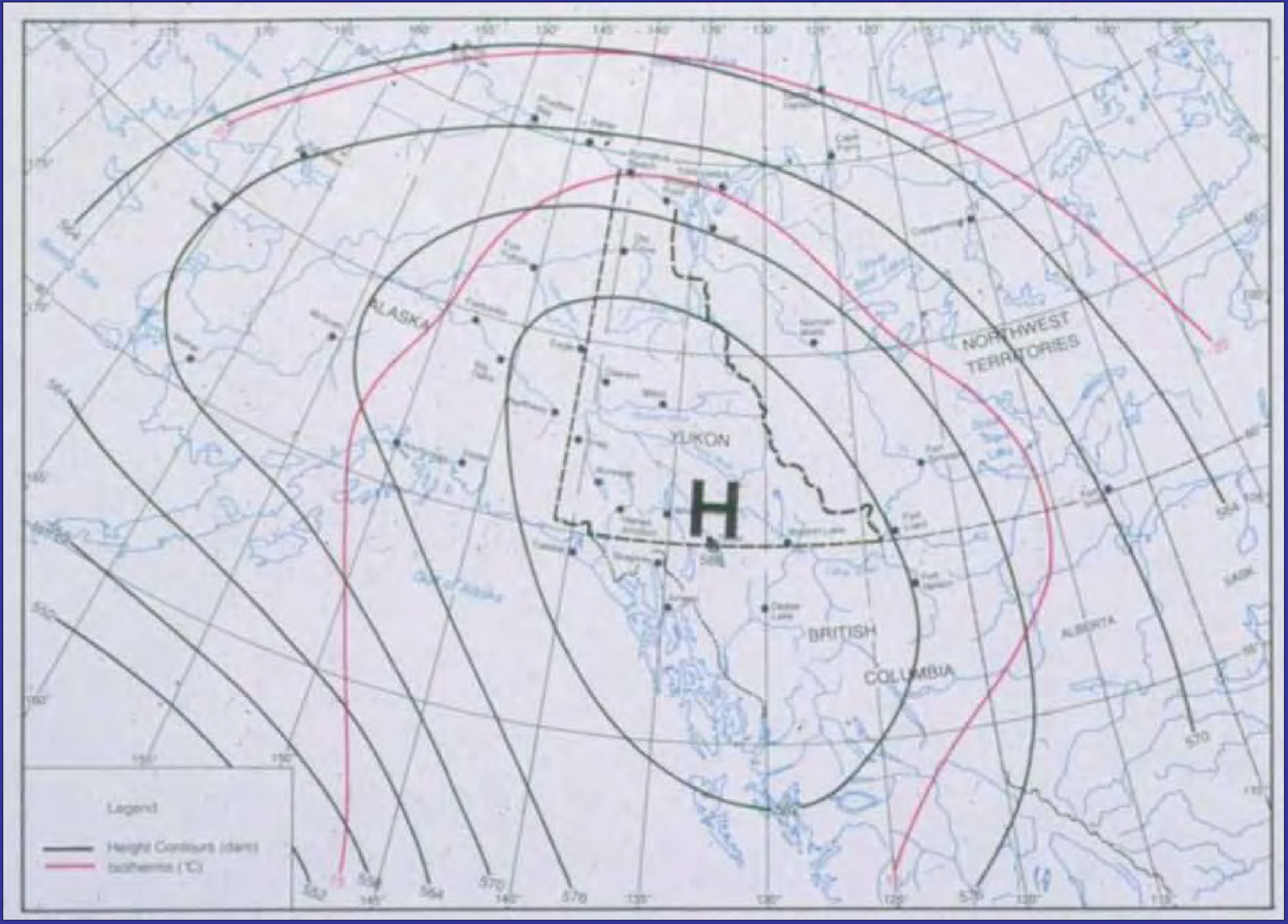
On some days adverse fuel, weather and topographic conditions coupled with an ignition source lead to instances of extreme fire behavior which are impossible to contain until burning conditions ameliorate.

So just how can we hope to accomplish this?

The Concept
of
Fuels Management

We cannot readily modify the topographic component of the fire environment

Nor can we readily modify the air mass or weather component of the fire environment



Or can we?

National Research Council Canada
Conseil national de recherches Canada

FOREST FIRES AND CUMULUS CLOUDS

BY

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MAY, 1975

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Forestry Service / Service des Forêts

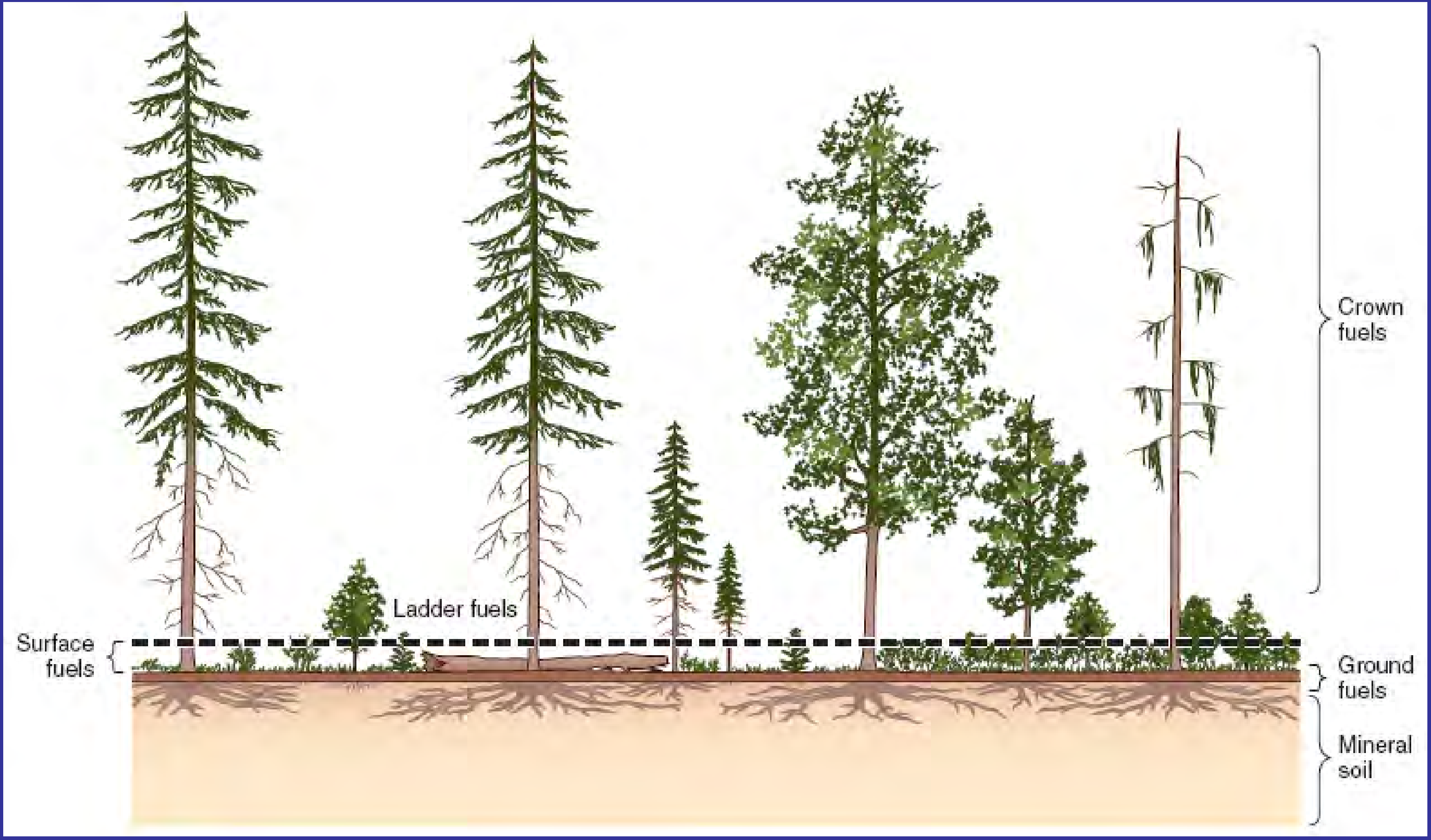
PROSPECTS FOR ECONOMIC SUPPRESSION OF LARGE FOREST FIRES BY INDUCED SHOWERS

by L.B. MacHattie, G.A. Isaac and N.R. Bobbitt

FOREST FIRE RESEARCH INSTITUTE
OTTAWA, ONTARIO
INFORMATION REPORT FF-X-59

June 1976

How about the fuel component of the fire environment?
Is it possible to manage the fuels (i.e., Fuels Management)?



What is the Basic Premise Behind Fuels Management?

We cannot really do much to control the weather or reshape the topography but we can and of influence the quantity and character of wildland fuels.

What is Fuels Management?

Fuels management is the planned manipulation and/or reduction of living or dead forest fuels for forest management and other land use objectives (e.g., hazard reduction, silvicultural purposes, wildlife habitat improvement).

This is accomplished by:

- prescribed fire
- mechanical means
- chemical means
- biological means
- changing stand structure and species composition

What is the Purpose of Fuels Management?

The goal is to proactively lessen the potential fire behavior and thereby increase the probability of successful containment and minimize adverse impacts.

More specifically, it's to decrease the rate of fire spread and in turn fire size and intensity as well as crowning and spotting potential.

Fuels management can be accomplished by three principal means:

- Reduction & Manipulation

- Conversion

- Isolation

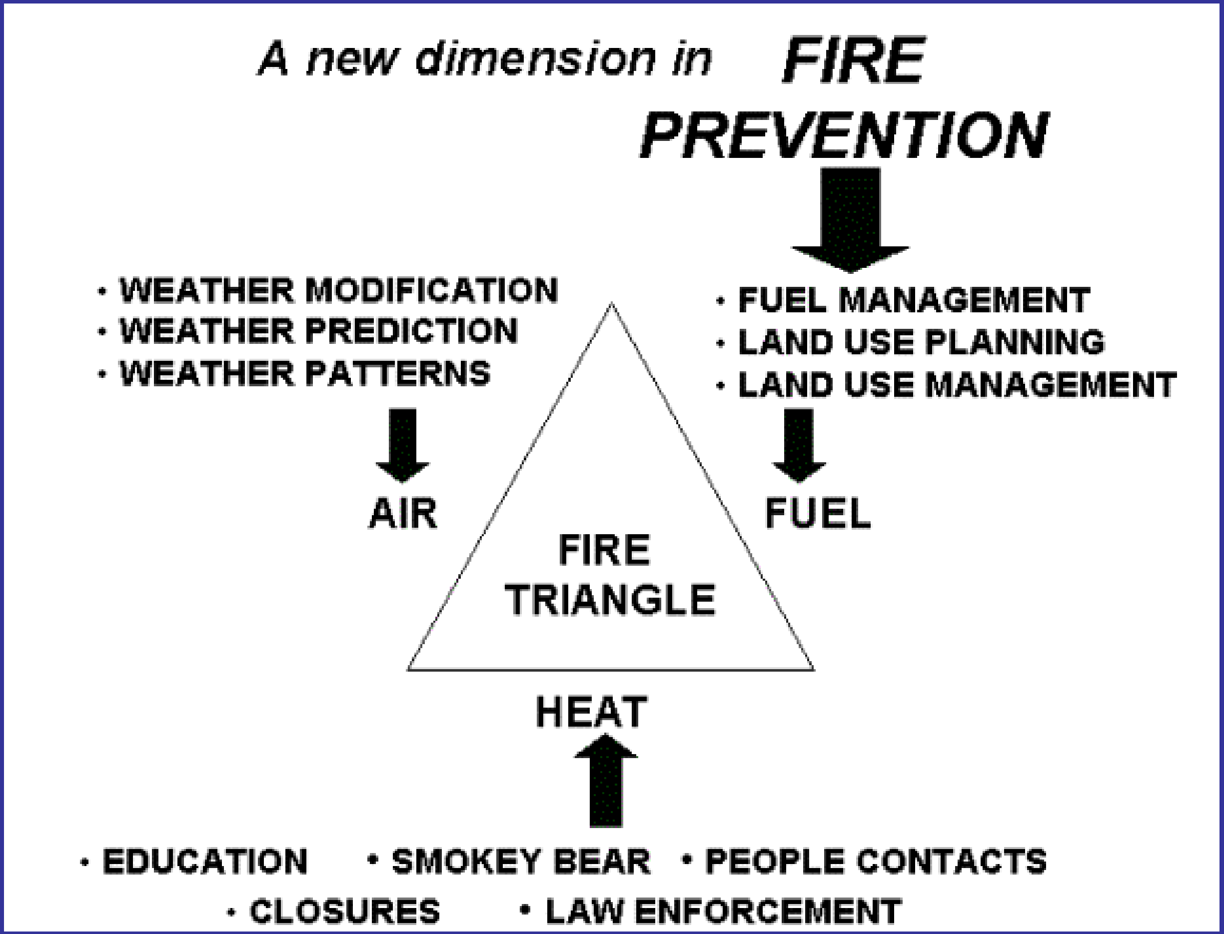
International Crown Fire Modelling Experiment

Treated/Untreated Plot - June 14, 2000

Aspen Plot - June 17, 1999

Spot Fires Breaching Fireguard Downwind of a ICFME Experimental Fire

Preventing the Occurrence of "Large" Fires Through Fuels Management



"NB Solutions for NB Problems"?

Some Recommendations, Suggestions and Other Take-home Messages

THE BOTTOM LINE

While it does seem theoretically possible to completely eliminate the threat of at least human-caused conflagrations, this is unlikely to happen – continuance of attempted fire exclusion is impractical and in the long term, very costly.

Even with the most highly effective fire prevention, fuels management and fire suppression program, the likelihood that members of the public will encounter a high-intensity wildfire event at some point in their lives is gradually increasing as long as they continue to live, recreate, and work in a fire-prone environment such as the boreal forest.

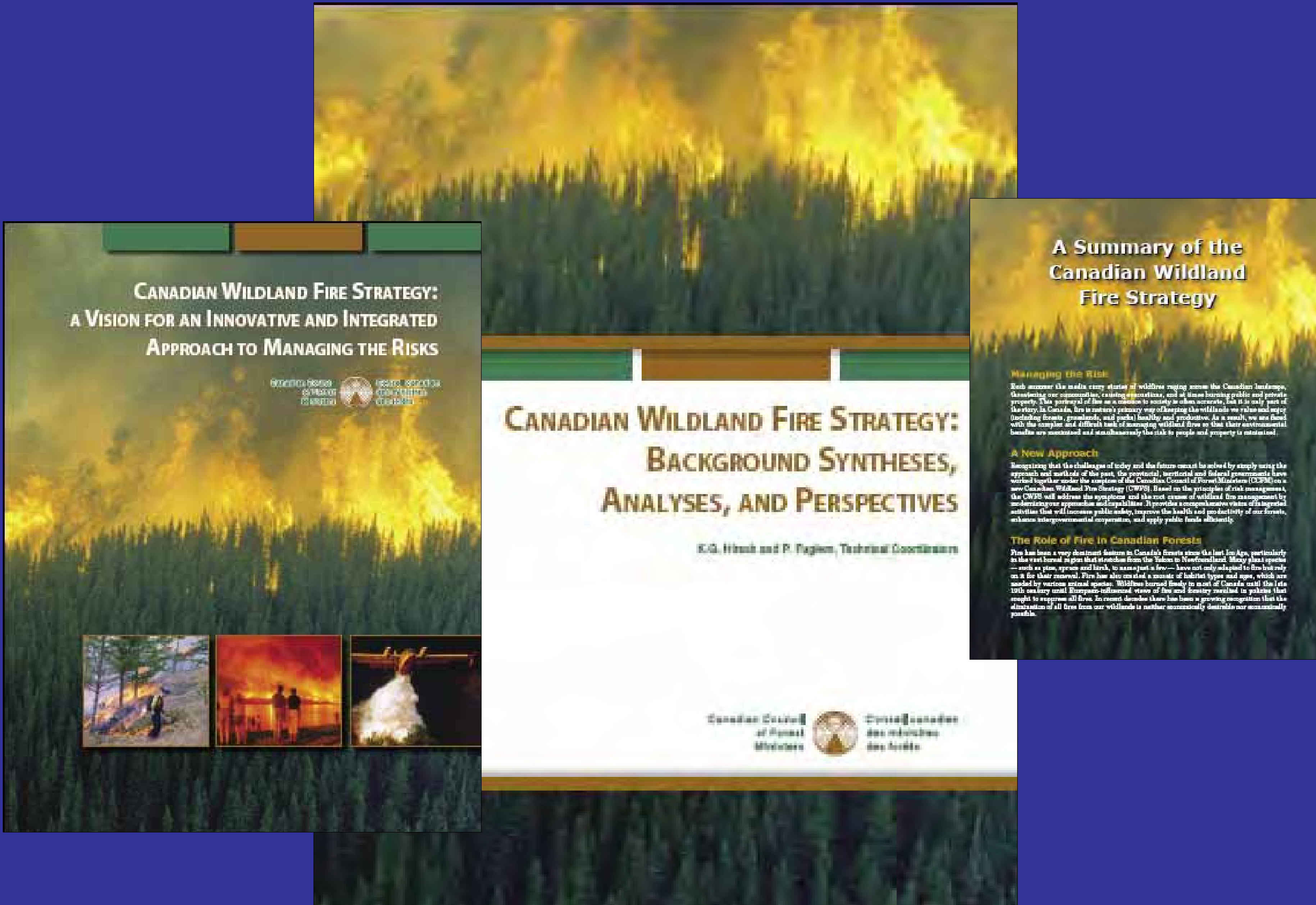
Co-existence or living with fire involves taking a proactive stance, including being prepared for the day when wildfire comes knocking!

Partnerships and Cooperation

CIFFC
Canadian Interagency Forest Fire Centre

NFFPC
NORTHEASTERN
FOREST FIRE PROTECTION
COMMISSION

Atlantic Canada Forest Fire Management Coordinating Committee



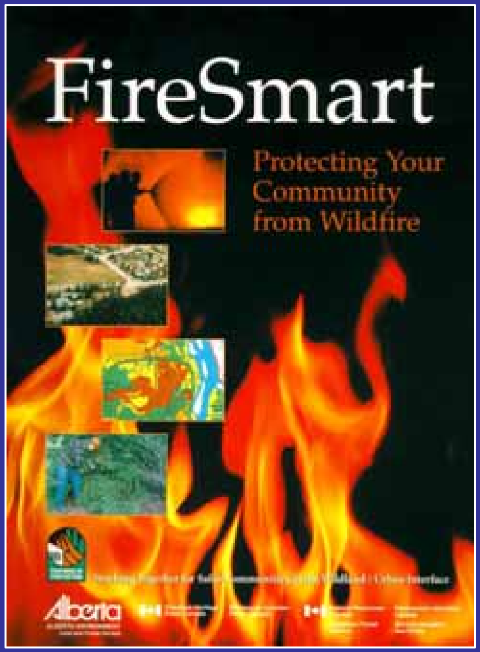
http://www.ccfm.org/

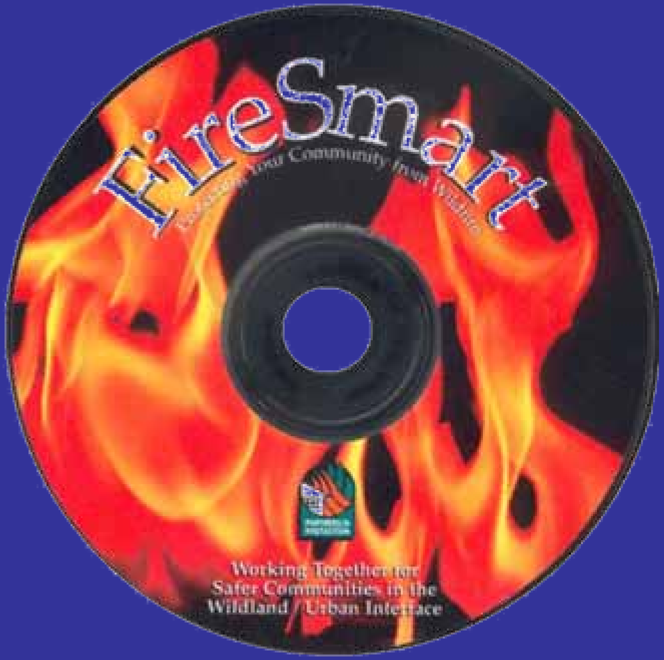
Canadian Wildland Fire Strategy

- ❑ Canadian FireSmart Initiative
- ❑ Improved Preparedness and Response Capability
- ❑ Public awareness campaign
- ❑ Innovation through S&T

Partners in Protection

PIP has produced a comprehensive manual, available in both book and CD-ROM form, which deals with nearly every facet of the wildland/urban interface fire problem





http://www.partnersinprotection.ab.ca/

"Working together for a safer communities in the wildland/urban interface"

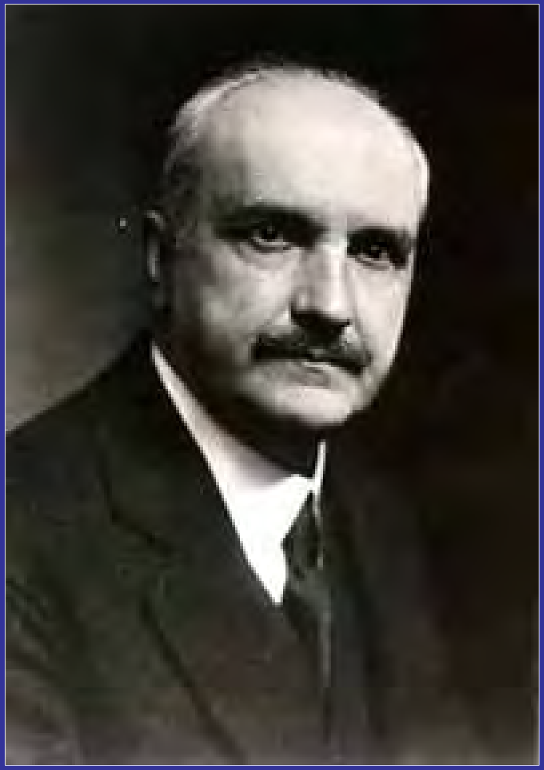
1992 Dubee Fire,
New Brunswick

A " Close Call":
Burn Injuries to Wildland Firefighter

Leadership and Fire Management: Challenges for the Future

- Always strive for vigilance -- resist complacency or "resting on your laurels" – don't hesitate or fail to fear the worst
- People have short memories so establish and maintain an institutional memory regarding fire
- Appreciate the importance of succession planning and mentorship in your organization
- Try to avoid having disasters take place in order for change to occur

"Those who cannot learn from history are doomed to repeat it." – George Santayana (1906)



The heavy line indicates the area within which were the local fires often collectively grouped together as the Great Fire. The shaded places show known areas of fire, the definiteness and destructiveness being indicted by depth of shading. The Newcastle-Northwest area shows the extent of the Great Fire proper.

Book on the 1825 Miramichi Fire forthcoming in 2011

Author:
Dr. Alan MacEachern
University of Western Ontario

More Localized Wildland Fire Research is Needed!

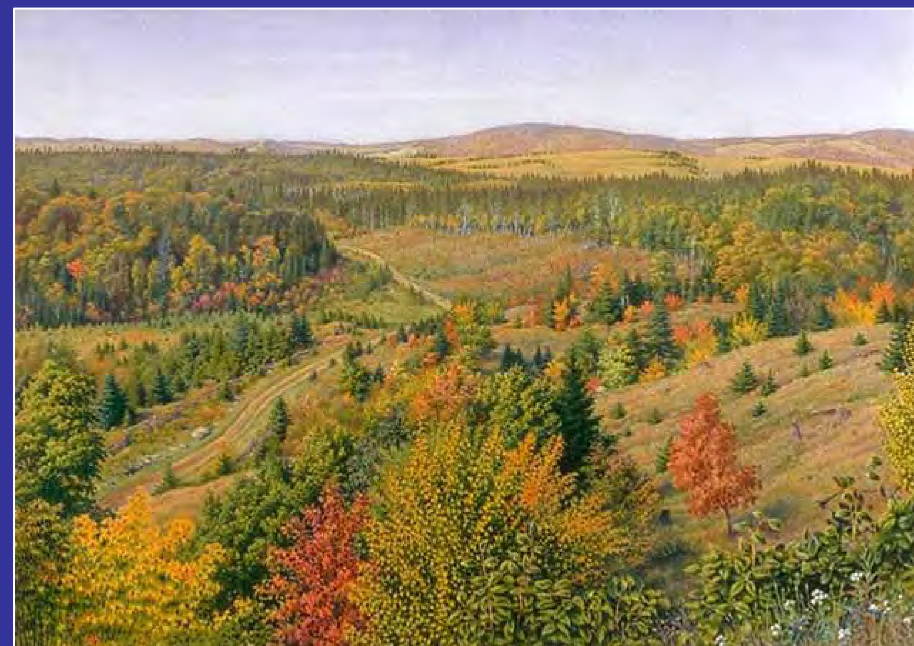
The Fire Science Centre at U.N.B.: Its Role and Development

A. J. KAYLL, Co-Director

Fire Science Centre
University of New Brunswick
Fredericton, N. B.

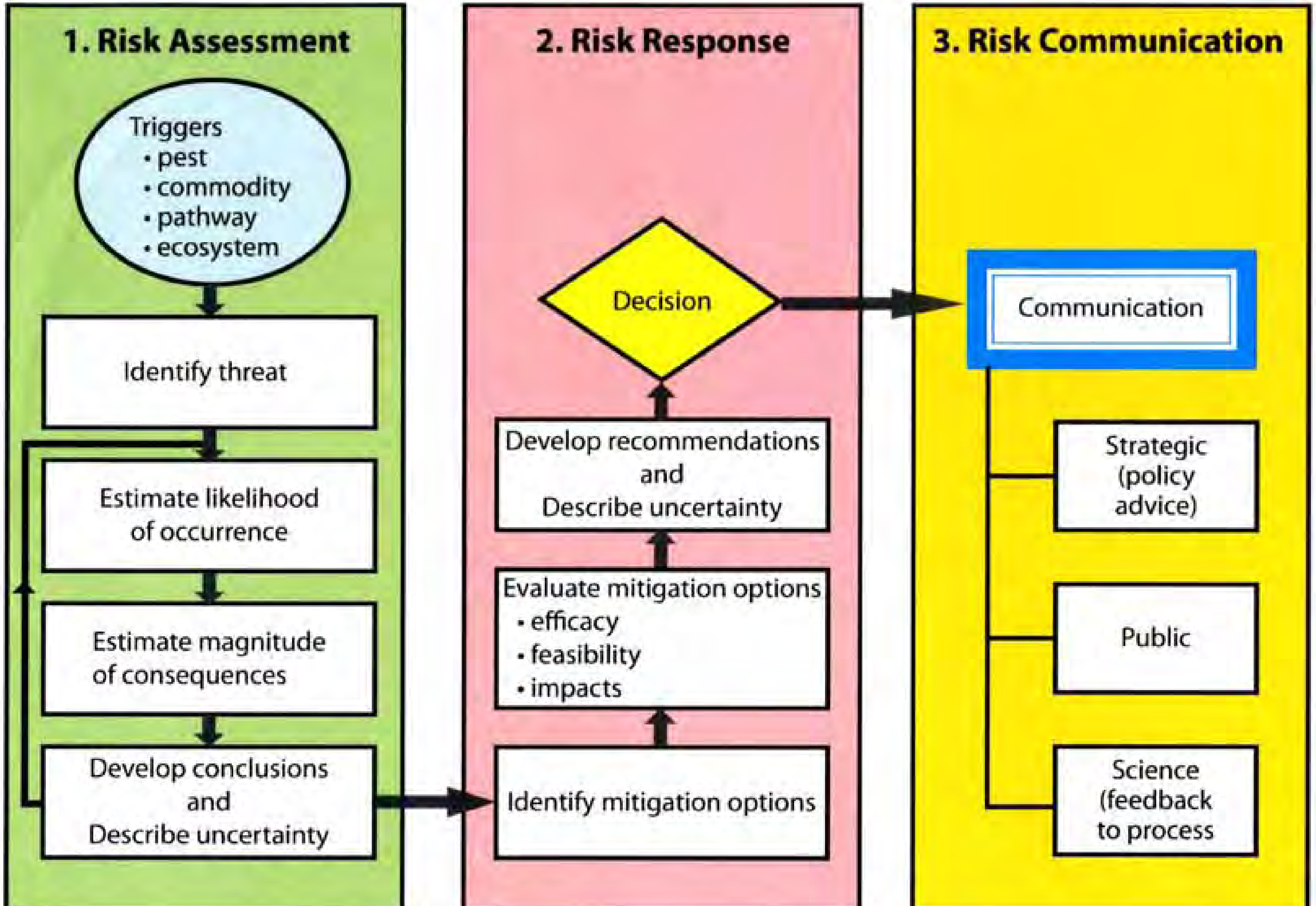
The Fire Science Centre at the University of New Brunswick was established in 1967 by members of the Departments of Chemical Engineering, Chemistry, and the Faculty of Forestry to conduct and direct interdisciplinary research and study on fires and flames burning under artificial and natural conditions. Students with suitable backgrounds may work towards Master of Science (M.Sc.) or Doctorate (Ph.D.) degrees in Chemistry or Chemical Engineering, or Master of Forestry (M.F.) or Master of Science in Forestry (M.Sc.F.) degrees. In Chemistry, the emphasis is on research in the general field of combustion and oxidation, with course work as required. In Chemical Engineering, graduate courses are offered in radiative and conductive heat transfer, thermal properties of materials, combustion and other basic and applied studies, with research and preparation of a thesis being an integral requirement of the degrees. In Forestry, course work in fire ecology, fire control, fire use, and other related topics is offered. A major report is required for the M.F. degree, while greater emphasis is placed on research and a thesis for the M.Sc.F. degree.

The staff of the Centre is composed of members from various



The Acadian Forest

RISK ANALYSIS



Candle Lake

Box 114
CANDLE LAKE, SK S0J 3E0
Phone Number (306) 929-2236
Fax Number (306) 929-2201

Community Threat Ranking Findings

Potential Fire Behaviour	Historical Ignitions	FireSmart & Preparedness	Overall Threat Ranking
VERY HIGH Risk	LOW Risk	VERY HIGH Risk	VERY HIGH Risk

Risk Legend
- Extreme
- Very High
- High
- Moderate
- Low

Community FireSmart and Preparedness Findings

Infrastructure	
Access: two paths of egress	Y
Access: Well-marked street signs	Y
Access: Roadways wider than 6.1m	N
Water: Municipal system	N
Water: Independant power supply	N
Electrical line clearance > 1 tree length	N
Vac. Land w/ volatile fuels > 20% in comm.	Y
Garbage dump within 20km	Y
Campground / Picnic site within 20km	Y

Structure	
FireSmart participation >25% of households	N
Houses have unique house numbers	N
Distance between houses > 10m	N

Preparedness	
Community Fuel Management Plan	Y
Community Emergency Response Plan	Y
Fire Danger sign posted	Y
Regulation of open burning	Y

Suppression and Detection	
FMFP fire base within 20km	N
Lake suitable for waterbombers within 20km	Y
Water suitable for helicopter bucketing	Y
Volunteer Fire Department	Y
Dedicated form of detection	Y

Inventory	
Less than 100 permanent residents	N
Assessed value of community < $1m	N

There are two water pump houses with an independent electrical supply on one of the pump houses. There is regulated open burning by local bylaw.
FiresSmart preparedness results are shown for Waskateena Beach. Other subdivisions considered are Van Impe and Minowukaw.

Hazard Abatement Notes

Minowukaw Fuel Break NE Flank - Recommended

There is an existing fuel break north of the community that ties into highway 120. There is a proposal to thin to a width of 50 m on each side of the fuel break. The HAT recommends following highway 120 from there south to Torch River.

Note: The hazard abatement suggestions are based on fire behaviour potential only and are not meant to be fuel management plans. Fuel management plans must examine site-specific social, ecological and economic issues associated with the proposed fuel treatment and require extensive stakeholder consultation.

Original Production Date: 06/07/2005

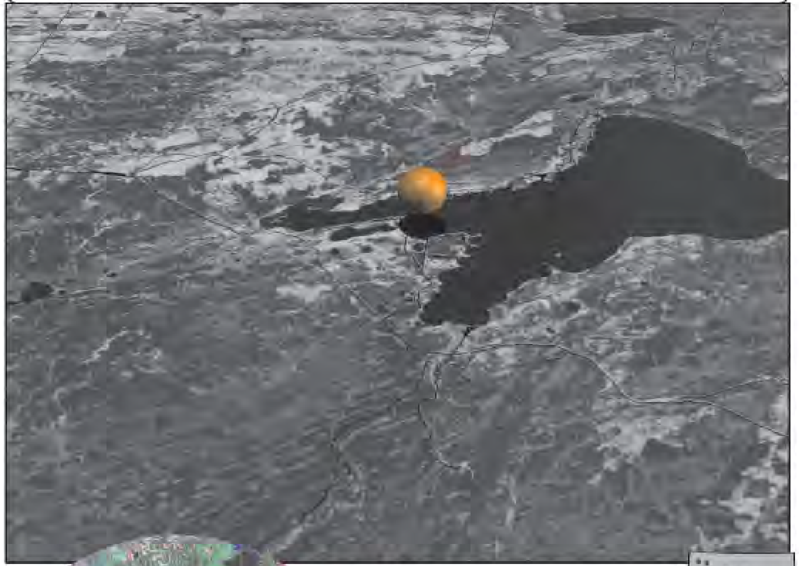
SaskCAP Sponsors

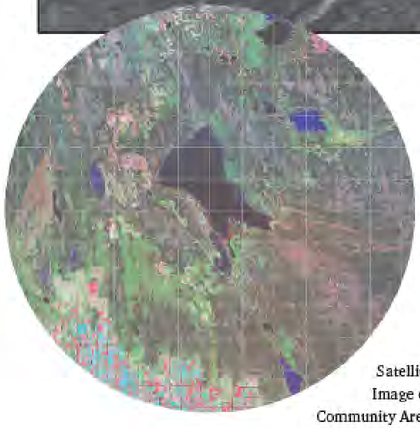
For more information on:
- options to reduce wildfire risks to your home or community
- how to prepare for a wildfire event
- the community wildfire risk assessment process

Contact the Provincial Fire Centre
(306) 953 - 3245
http://www.se.gov.sk.ca/fire/

1-800-667-9660 Report a wildfire

Candle Lake





Satellite Image of Community Area

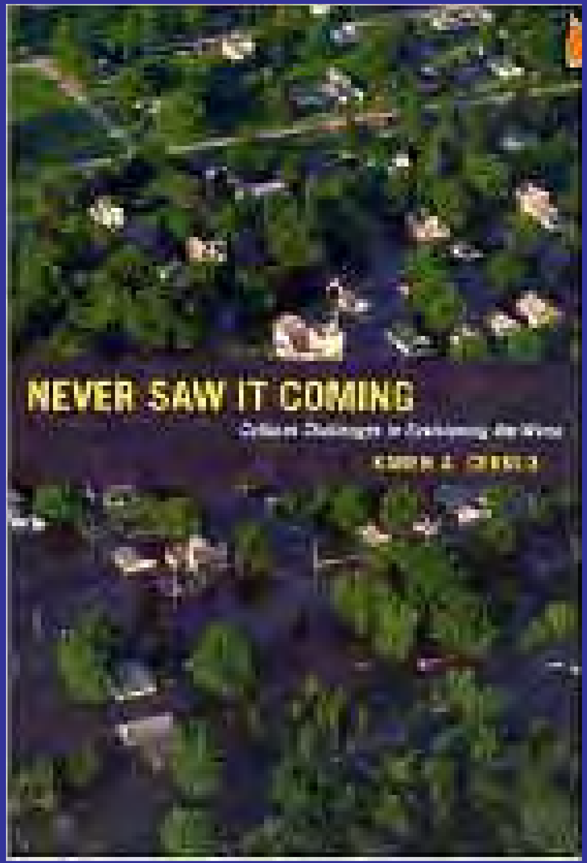
Community Wildfire Risk Assessment Project

This document summarizes the relative risk posed by wildfire to the community of Candle Lake. It is part of a strategic review & ranking of Saskatchewan communities in the boreal forest.

VERY HIGH Risk

Wildland Fire, the General Public (and the Media)* ... the human or people side of the business

*Recognize they can be your best friend or your worst nightmare.



People are by and large optimists.

The book “Never Saw It Coming” examines one of the most common, yet least studied, human traits – a blatant disregard for worst-case scenarios.

Roundup: 500 flee homes due to Halifax forest fires; Mexico starts a five-day shutdown - Posted

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NATIONAL POST

NP POSTED

Watching the news, so you don't have to

Roundup: 500 flee homes due to Halifax forest fires; Mexico starts a five-day shutdown

Posted: May 01, 2009, 8:48 AM by Kenny Yum
News Roundup

500 flee homes due to Halifax forest fire: Emergency crews are to take to the skies above Halifax on Friday to determine the extent of a wildfire that has forced nearly 500 people from their homes and damaged at least 20 houses.

Shaune MacKinley, a spokeswoman for the Halifax Regional Municipality, said the city's firefighters and crews from the provincial Department of Natural Resources will fly above the blaze south of the city in an attempt to map out the fire, to see if it was still growing and how best to tackle it.

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tural Resources

res in Bathurst area cause evacuations (09/05/15)

. 690

y 15, 2009

THURST (CNB) - Forest fires in the Bathurst area caused some residents to be briefly evacuated from their homes on Thursday, May 14.

cal firefighters battled the fires, and Emergency Measures Organization volunteers helped with the evacuations.

their worst, the fires were classified as out of control. High winds hampered firefighting efforts and prevented AT-802 fire-tanker aircraft from taking off. The kers are one of the most useful tools for fighting forest fires.

acuees were allowed to return to their homes once the fires had died down late Thursday. A local ranger is assessing the fires. There is no indication that they will e a further threat, although officials are monitoring the situation in case winds reignite the blaze.

05/15

EDIA CONTACT: Matt Jones, Department of Natural Resources, 506-453-2635.

05/15


Houses protect people and people protect houses
“Prepare, Stay and Defend or Go Early”

*…there is one overriding challenge to fire management: that of **maintaining full respect for the power of fire and the effects of this power** on both wildland environments and the people who live and work in these environments.*

Jack S. Barrows (1974)

Four Basic Options for Surviving a Wildland Fire Entrapment or Burn-over (in no particular order)

- Retreat from the Fire and Reach a Safe Haven

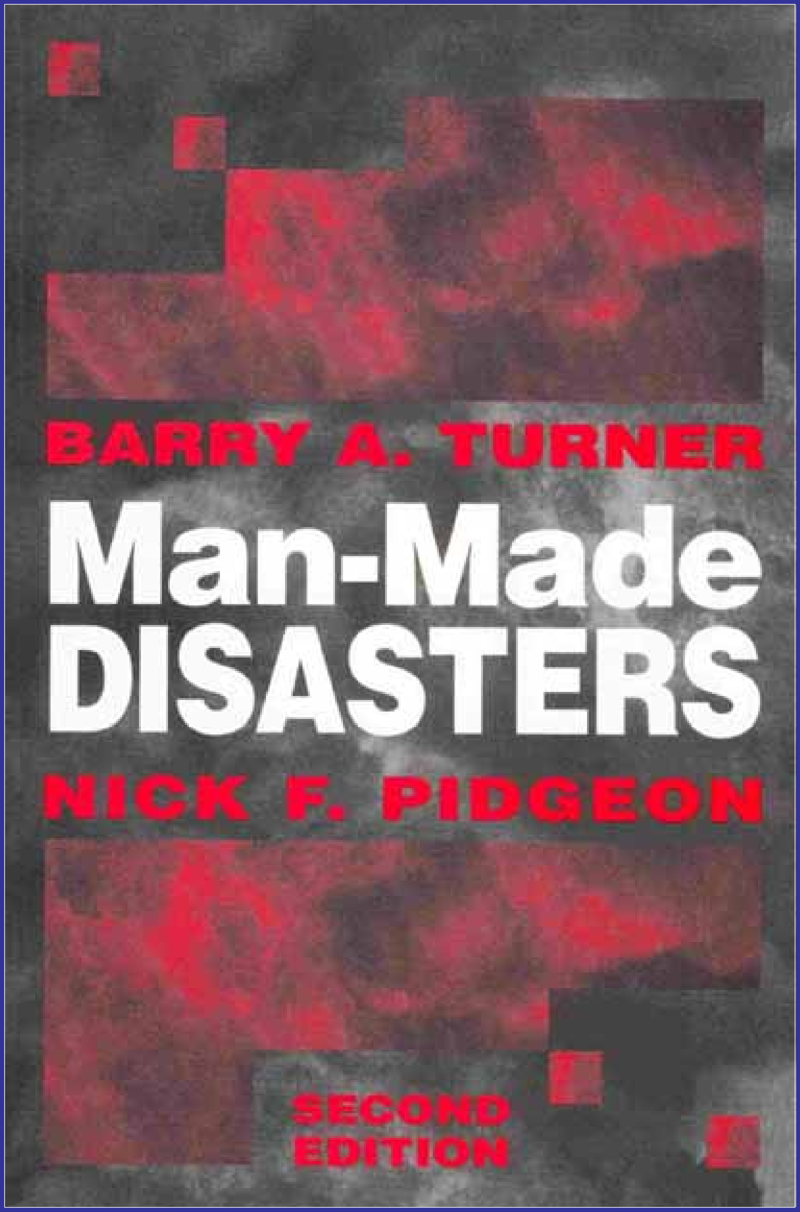
- Burn Out a Safety Area

- Hunker in Place

- Pass Through the Fire Edge into the Burned-out Area

Turner's (1986) Disaster Model

Stage I: Predisaster Point
Stage II: Incubation Period
Stage III: Precipitating Undesirable Event
Stage IV: Onset
Stage V: Suppression, Rescue and Salvage
Stage VI: Full Cultural Readjustment

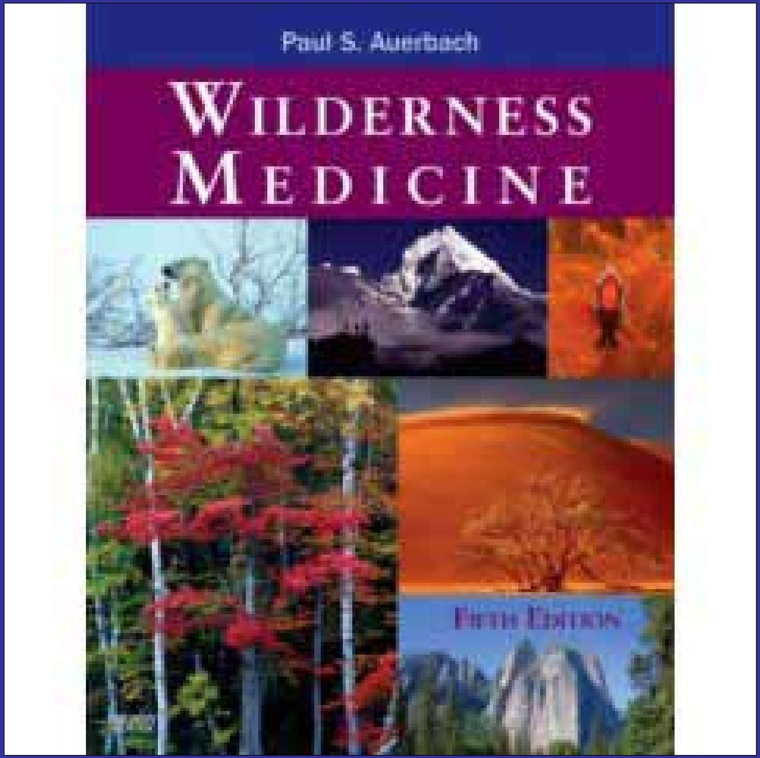


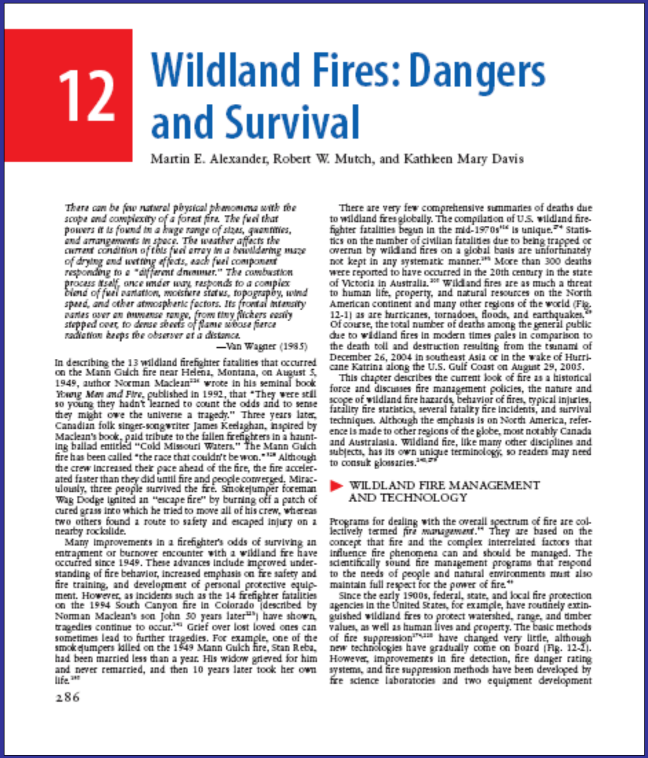
Stage II - The Incubation Period

The accumulation of events that detracted from adhering to safe work practices.

To Learn More

Alexander, M.E.; Mutch, R.W.; Davis, K.M. 2007. Wildland fires: Dangers and survival. *in* Auerbach, P.S. (Ed.), Wilderness Medicine. 5th edition. Mosby, Philadelphia, PA. pp. 286-335.





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Wildland Fires: Dangers and Survival

Martin E. Alexander, Robert W. Mutch, and Kathleen Mary Davis

There can be few natural physical phenomena with the scope and complexity of a forest fire. The fuel that powers it is found in a huge range of sizes, quantities, and arrangements in space. The weather affects the current condition of this fuel array in a bewildering maze of drying and wetting effects, each fuel component responding to a "different drummer." The combustion process itself, once under way, responds to a complex blend of fuel variation, moisture status, topography, wind speed, and other atmospheric factors. Its frontal intensity varies over an immense range, from tiny flickers easily stepped over, to dense sheets of flame whose fierce radiation keeps the observer at a distance.

—Van Wagner (1985)

In describing the 13 wildland firefighter fatalities that occurred on the Mann Gulch fire near Helena, Montana, on August 5, 1949, author Norman Maclean[226] wrote in his seminal book *Young Men and Fire*, published in 1992, that "They were still so young they hadn't learned to count the odds and to sense they might owe the universe a tragedy." Three years later, Canadian folk singer-songwriter James Keelaghan, inspired by Maclean's book, paid tribute to the fallen firefighters in a haunting ballad entitled "Cold Missouri Waters." The Mann Gulch fire has been called "the race that couldn't be won."[328] Although the crew increased their pace ahead of the fire, the fire accelerated faster than they did until fire and people converged. Miraculously, three people survived the fire. Smokejumper foreman Wag Dodge ignited an "escape fire" by burning off a patch of cured grass into which he tried to move all of his crew, whereas two others found a route to safety and escaped injury on a nearby rockslide.

Many improvements in a firefighter's odds of surviving an entrapment or burnover encounter with a wildland fire have occurred since 1949. These advances include improved understanding of fire behavior, increased emphasis on fire safety and fire training, and development of personal protective equipment. However, as incidents such as the 14 firefighter fatalities on the 1994 South Canyon fire in Colorado (described by Norman Maclean's son John 50 years later[225]) have shown, tragedies continue to occur.[141] Grief over lost loved ones can sometimes lead to further tragedies. For example, one of the smokejumpers killed on the 1949 Mann Gulch fire, Stan Reba, had been married less than a year. His widow grieved for him and never remarried, and then 10 years later took her own life.[387]

There are very few comprehensive summaries of deaths due to wildland fires globally. The compilation of U.S. wildland firefighter fatalities begun in the mid-1970s[416] is unique.[274] Statistics on the number of civilian fatalities due to being trapped or overrun by wildland fires on a global basis are unfortunately not kept in any systematic manner.[395] More than 300 deaths were reported to have occurred in the 20th century in the state of Victoria in Australia.[207] Wildland fires are as much a threat to human life, property, and natural resources on the North American continent and many other regions of the world (Fig. 12-1) as are hurricanes, tornadoes, floods, and earthquakes.[84] Of course, the total number of deaths among the general public due to wildland fires in modern times pales in comparison to the death toll and destruction resulting from the tsunami of December 26, 2004 in southeast Asia or in the wake of Hurricane Katrina along the U.S. Gulf Coast on August 29, 2005.

This chapter describes the current look of fire as a historical force and discusses fire management policies, the nature and scope of wildland fire hazards, behavior of fires, typical injuries, fatality fire statistics, several fatality fire incidents, and survival techniques. Although the emphasis is on North America, reference is made to other regions of the globe, most notably Canada and Australasia. Wildland fire, like many other disciplines and subjects, has its own unique terminology, so readers may need to consult glossaries.[140,279]

WILDLAND FIRE MANAGEMENT AND TECHNOLOGY

Programs for dealing with the overall spectrum of fire are collectively termed *fire management*.[44] They are based on the concept that fire and the complex interrelated factors that influence fire phenomena can and should be managed. The scientifically sound fire management programs that respond to the needs of people and natural environments must also maintain full respect for the power of fire.[44]

Since the early 1900s, federal, state, and local fire protection agencies in the United States, for example, have routinely extinguished wildland fires to protect watershed, range, and timber values, as well as human lives and property. The basic methods of fire suppression[274,218] have changed very little, although new technologies have gradually come on board (Fig. 12-2). However, improvements in fire detection, fire danger rating systems, and fire suppression methods have been developed by fire science laboratories and two equipment development

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International Association of Wildland Fire

www.iawfonline.org

THANK YOU FOR YOUR ATTENTION

Questions? Comments?