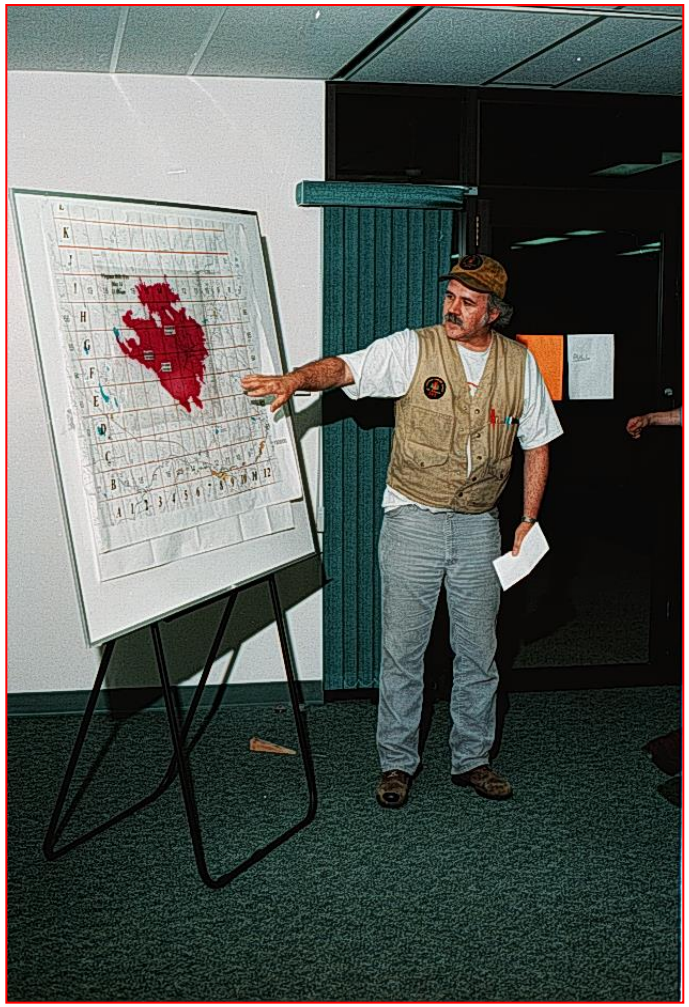
Thoughts on Living With Fire in Canada's Forests

Marty Alexander, PhD, RPF

ICLR Friday Forum – May 15, 2020

Background of presenter in brief

- **Fought first wildfire as a 13-yr-old boy scout (1965)**
- **Hotshot firefighter (1972 & 1973)**
- **CFS fire research (1976-2010)**
- **Worked in every province and territory except Nunavent**
- **Personally observed many large-scale boreal wildfires**



As Fire Behaviour Analyst, 1998 Virginia Hills Fire, near Whitecourt AB

“Road Map” to presentation

- Analyzing the Wildland-Urban Interface (WUI) Fire Problem in Canada
- Wildfire Behaviour 101
- Fire Suppression in Relation to Fire Suppression
- The Concept of Fuels Management
- Are Aspen Fuelbreaks a Viable Solution to the WUI Fire Problem?
- Looking Ahead

Analyzing the Wildland-Urban Interface (WUI) Fire Problem in Canada

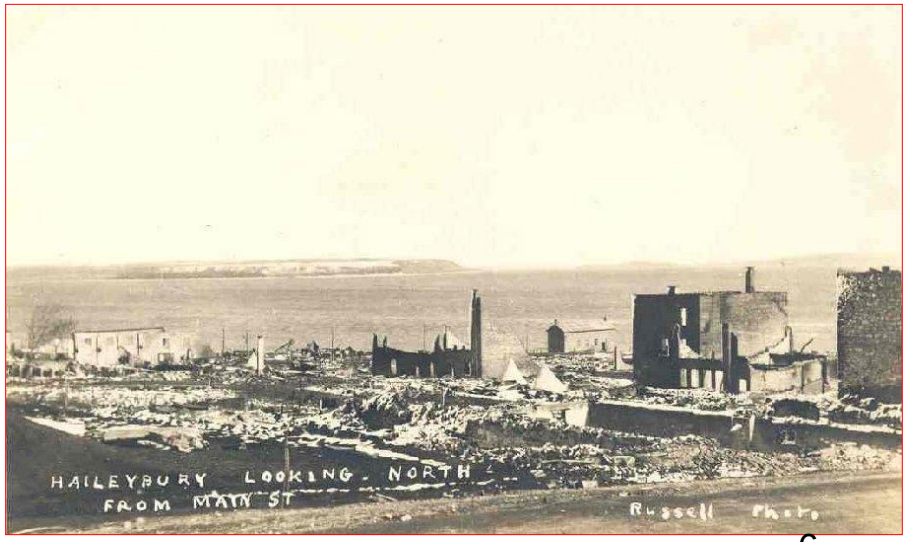
Wildfires are a Threat to Human Safety and other Values-at-Risk

The WUI is not a new issue in Canada *per se*

Fernie, BC – 1908: 22 fatalities

Porcupine, ON – 1911: ~73 fatalities

Sask./Alta – 1919: 13 fatalities



Haileybury, ON – 1922: 43 fatalities

… and in modern times as well

Kelowna, BC - 2003

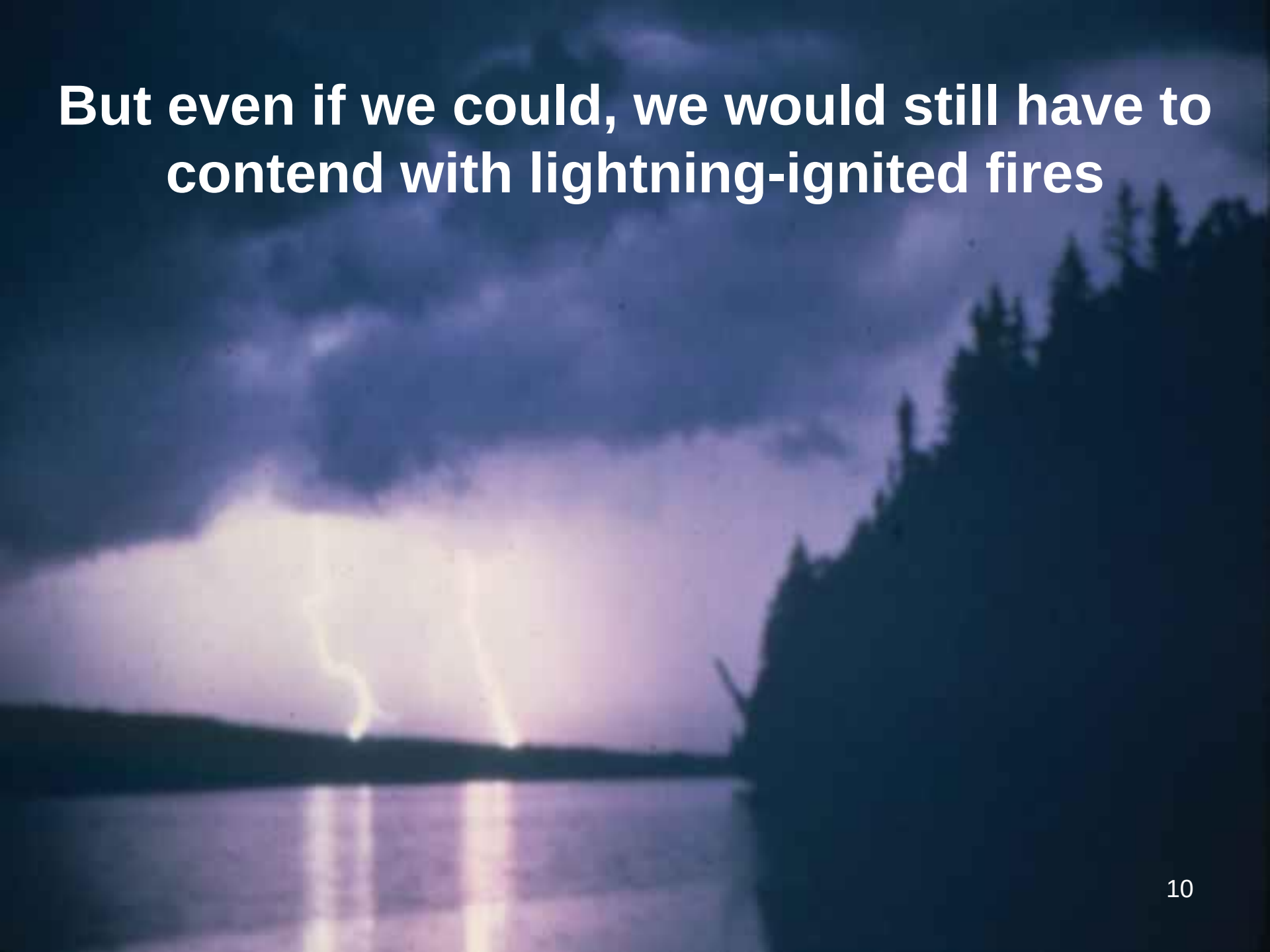
Halifax, NS - 2009

Slave Lake, AB - 2011

Fort McMurray, AB - 2016

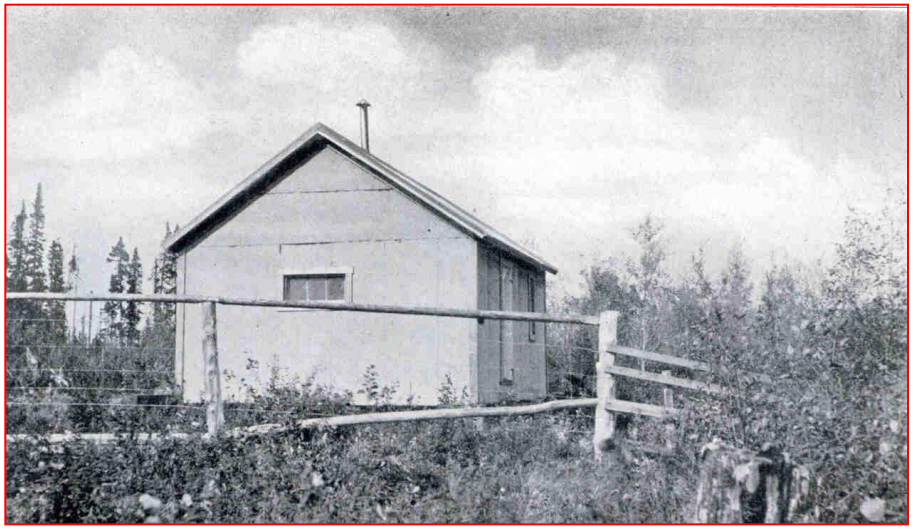
Can we not simply eliminate the WUI problem?

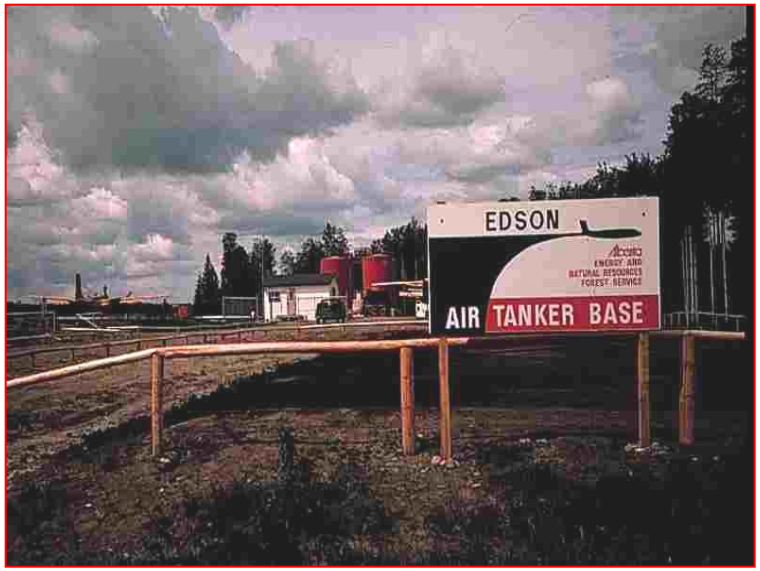
We do not seem able to prevent human-caused fire occurrences



But even if we could, we would still have to contend with lightning-ignited fires

Fire protection then and now





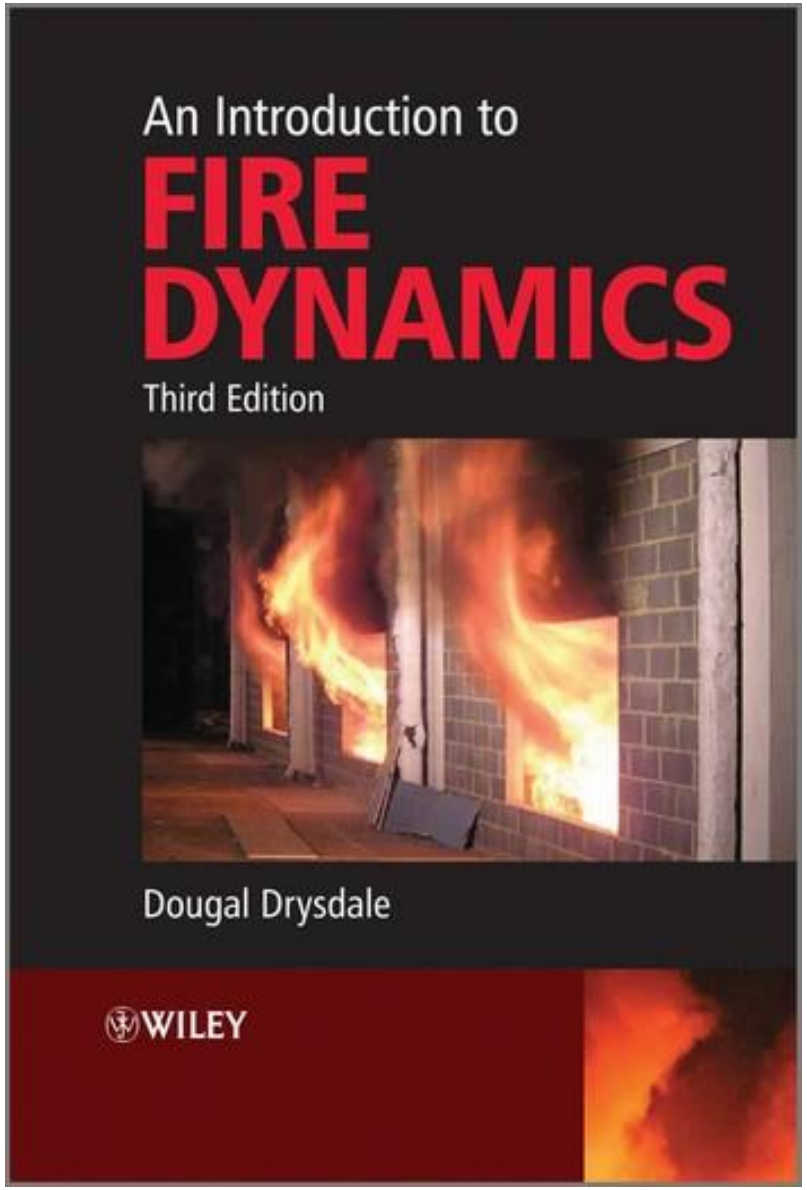
No radically new concept in fire suppression can be anticipated

CL-215 airtanker – late 60s

Helitorch – mid 70s

‘*Early forest fire control practice in Canada was simple – one tried to keep wild fires out of the settlements and in the woods where they belonged. There was no planning – fire was fought wherever it could not be avoided.*’

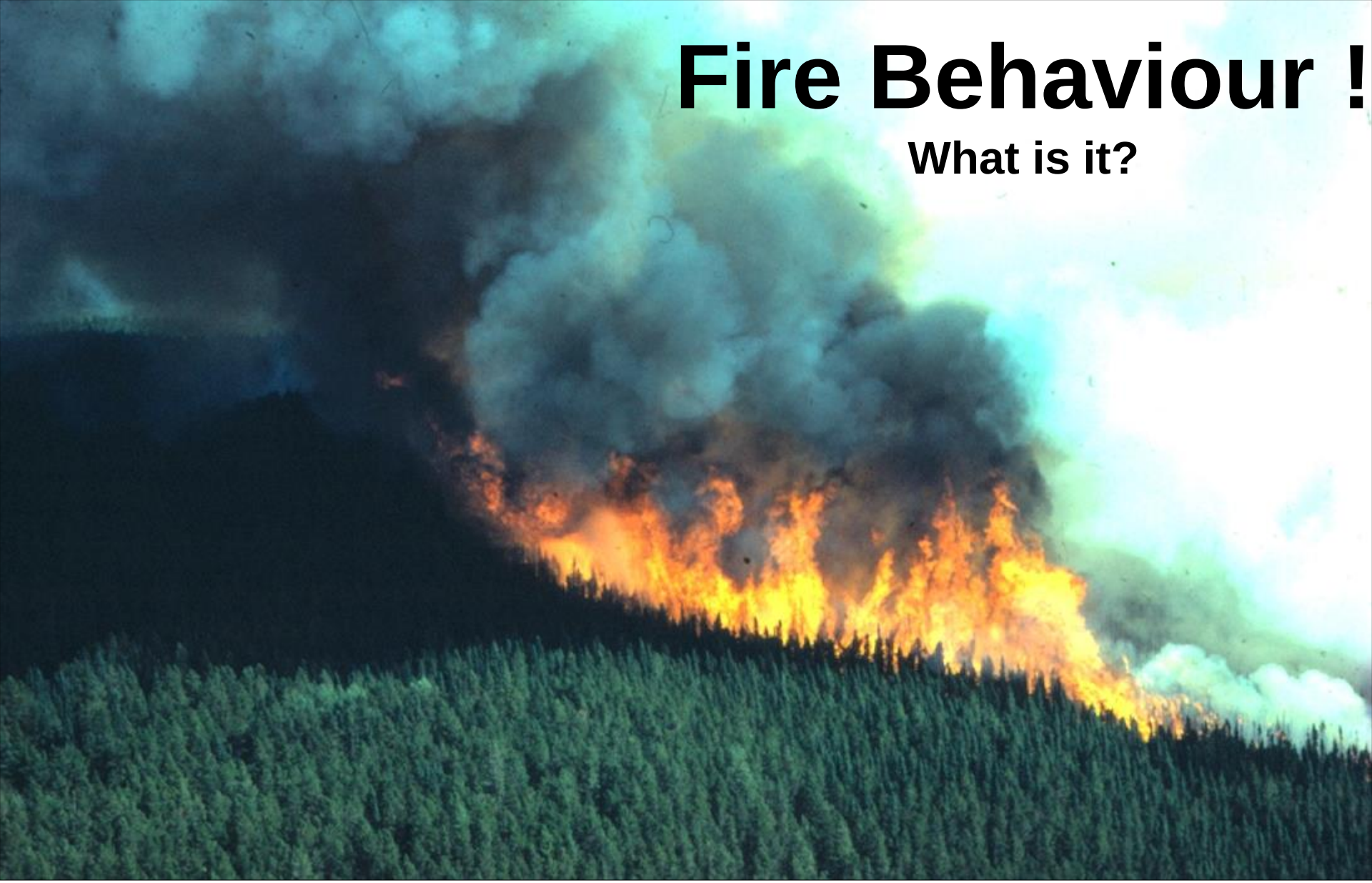
David E. Williams (1963)
Canada Dept. of Forestry Publication 1027



"... 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 (2011)

Wildfire Behaviour 101



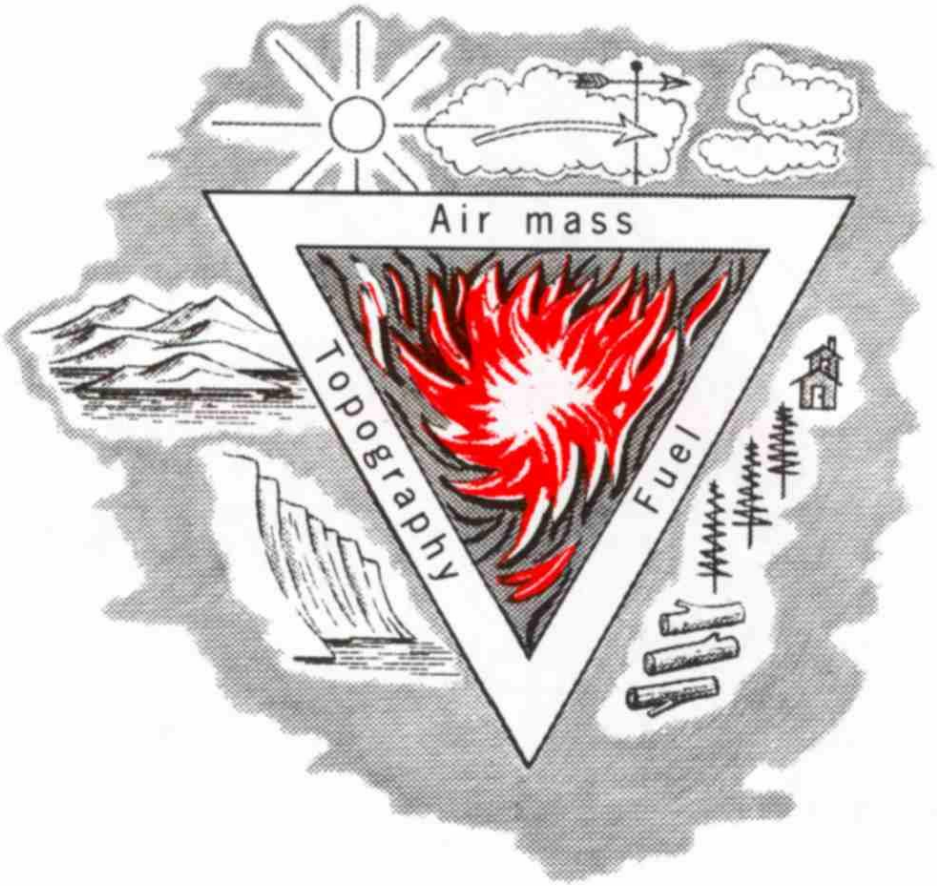
Fire Behaviour !

What is it?

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

Fire Environment

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



Extreme fire behaviour 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

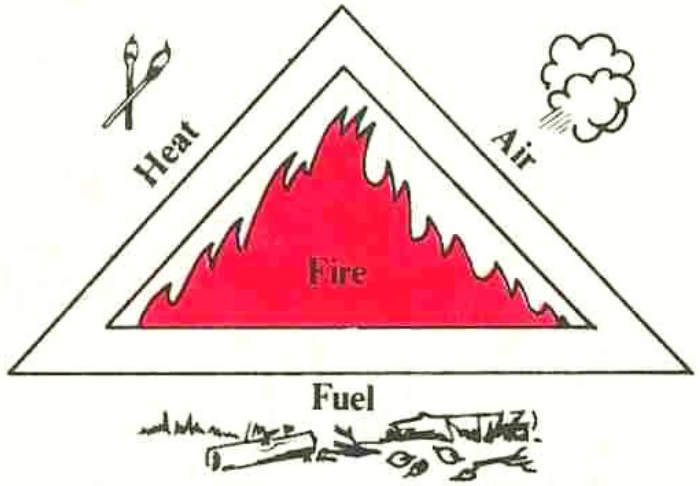
- Prolific Spotting
- Large Fire Whirls

- Well-developed Convection Column

Fire Suppression in Relation to Wildfire Behaviour

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

HEAT AIR FUEL



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

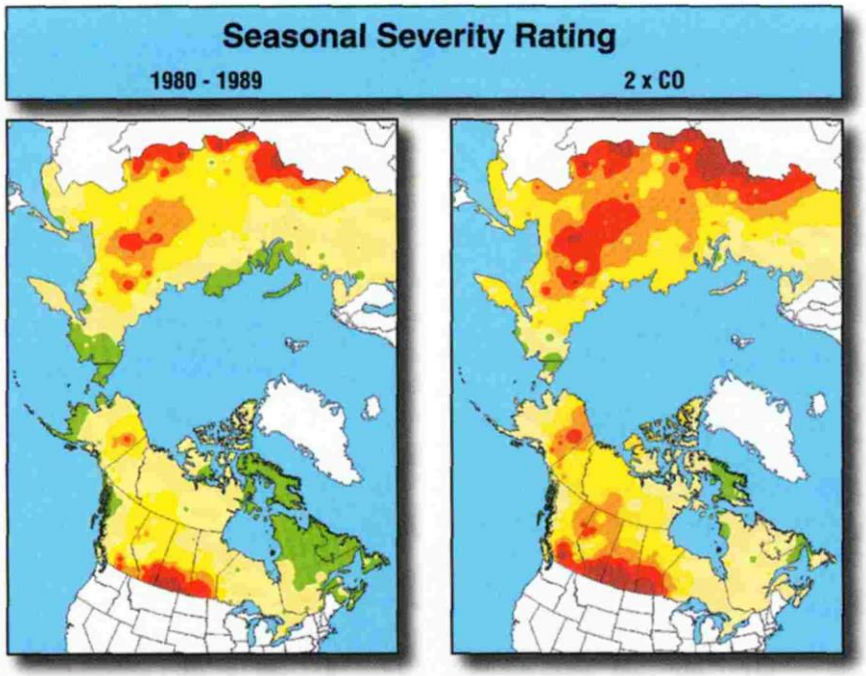
HEAT AIR FUEL

For successful containment the resource production must exceed the fire's rate of perimeter increase

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

Adverse fuel, weather and topographic conditions coupled with an ignition source can lead to cases of extreme fires

… especially in light of the increasing frequency of severe fire weather, forest health issues, and a legacy of attempted fire exclusion in some jurisdictions



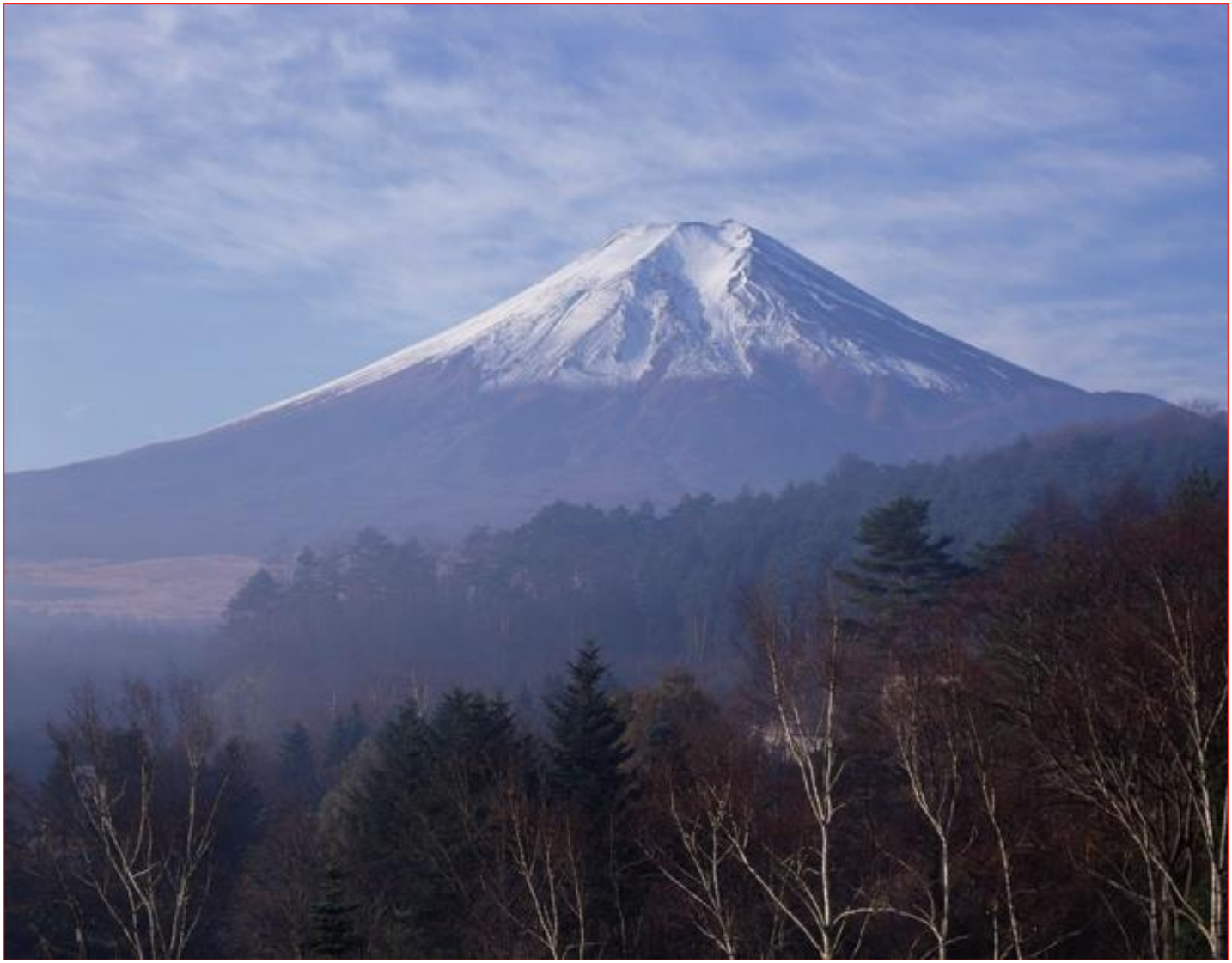
General circulation model-projected changes in circumpolar fire danger levels with a doubling of atmospheric carbon dioxide.

Crown fire in mountain pine beetle infested forest

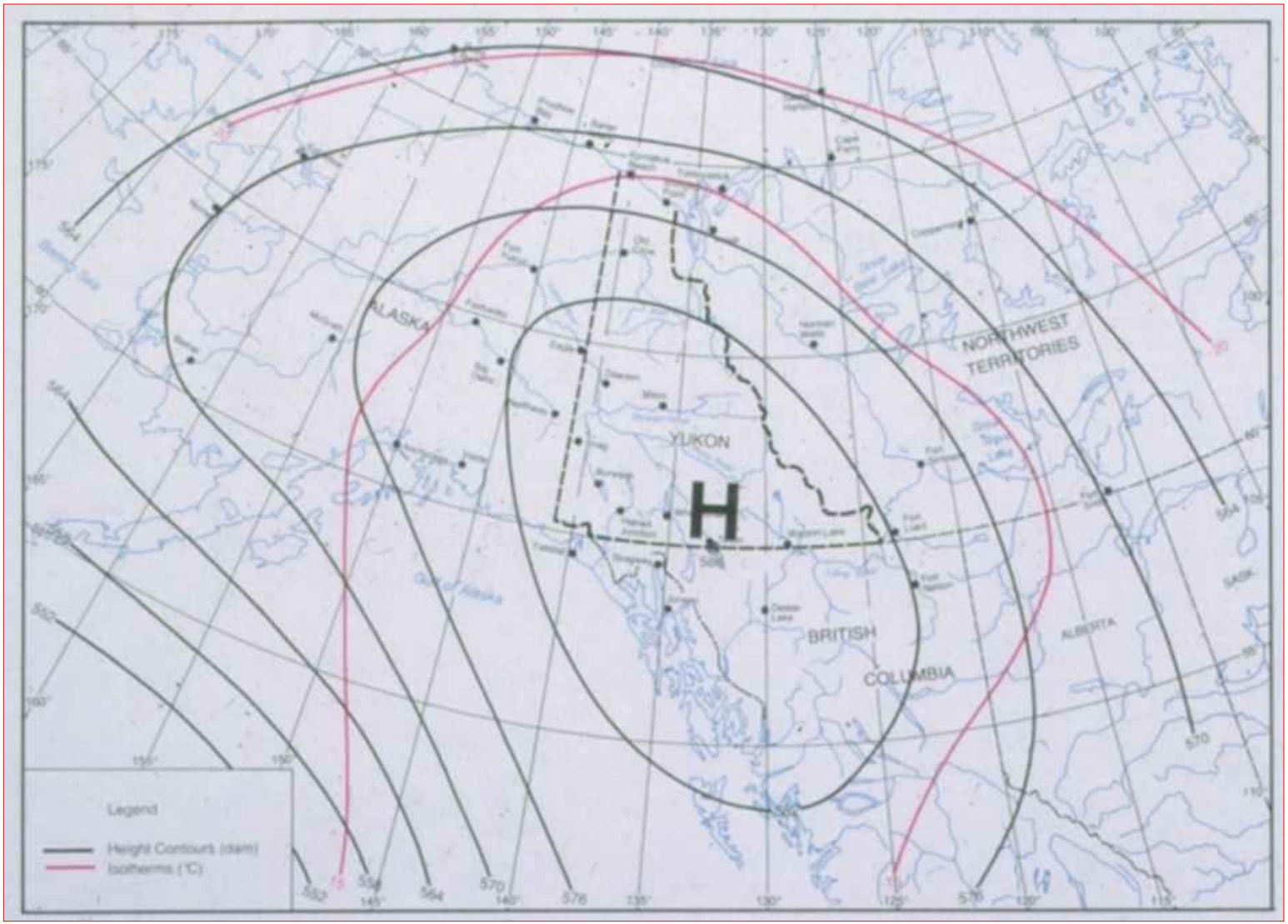
So just how can we ever hope to possibly accomplish this?

The Concept of Fuels Management

Modifying the topographic component of the fire environment is not foreseen as feasible



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



However, it has been tried

National Research Council Canada | Conseil national de recherches Canada

FOREST FIRES AND CUMULUS CLOUDS

BY

G. A. ISAAC, ATMOSPHERIC ENVIRONMENT SERVICE

J. I MacPHERSON, NATIONAL AERONAUTICAL ESTABLISHMENT

L. B. MacHATTIE, CANADIAN FORESTRY SERVICE

TO BE PRESENTED AT THE CANADIAN METEOROLOGICAL SOCIETY
NINTH ANNUAL CONGRESS, UNIVERSITY OF BRITISH COLUMBIA,
VANCOUVER, MAY 28-30, 1975

OTTAWA, CANADA

MAY, 1975

NAE MISC 51

Environment Canada | Environnement Canada
Forestry Service | Service des Forêts

PROSPECTS FOR ECONOMIC SUPPRESSION OF LARGE FOREST FIRES BY INDUCED SHOWERS

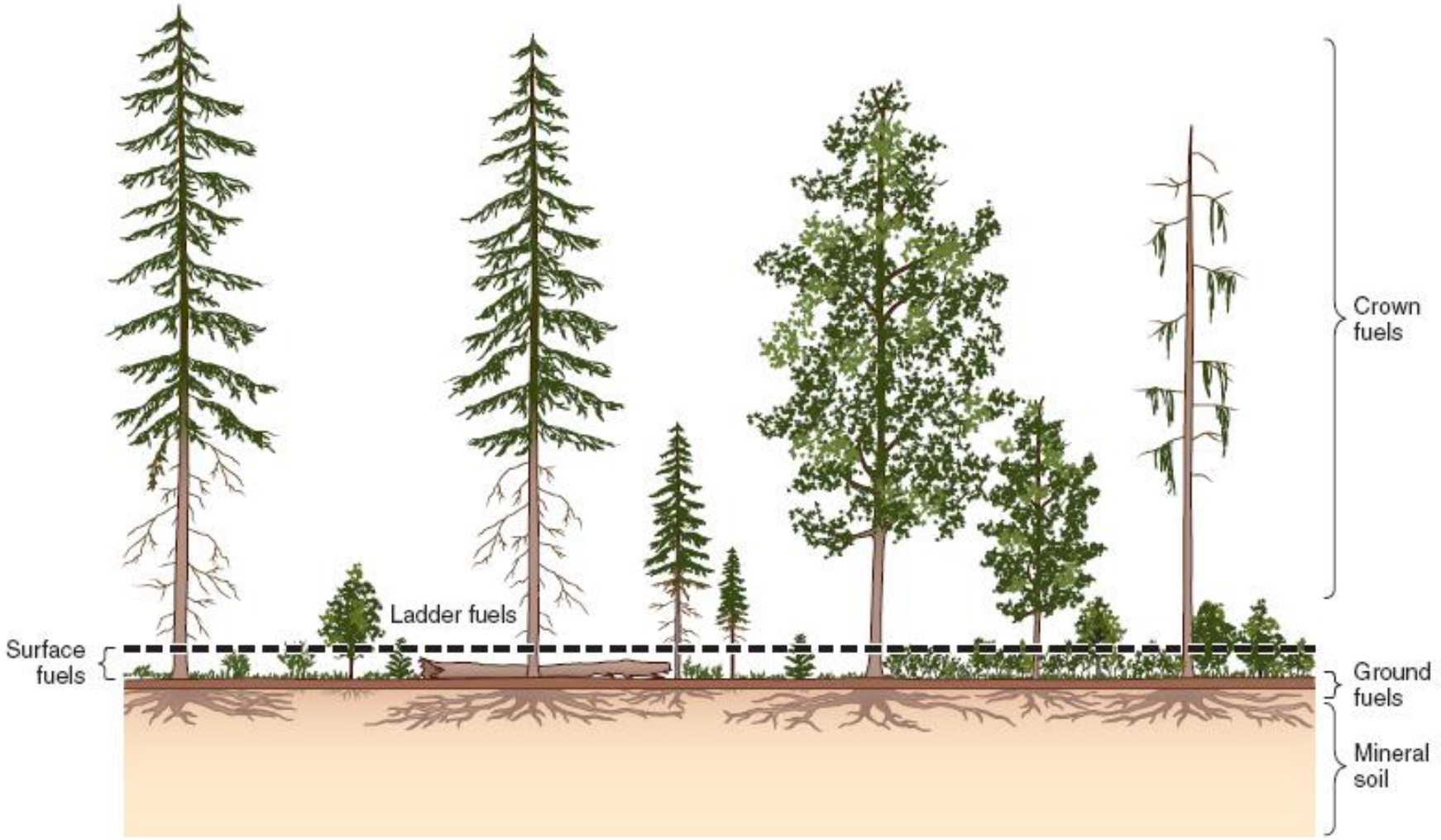
by L.B. MacHattie, G.A. Isaac and N.R. Bobbitt

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

June 1976

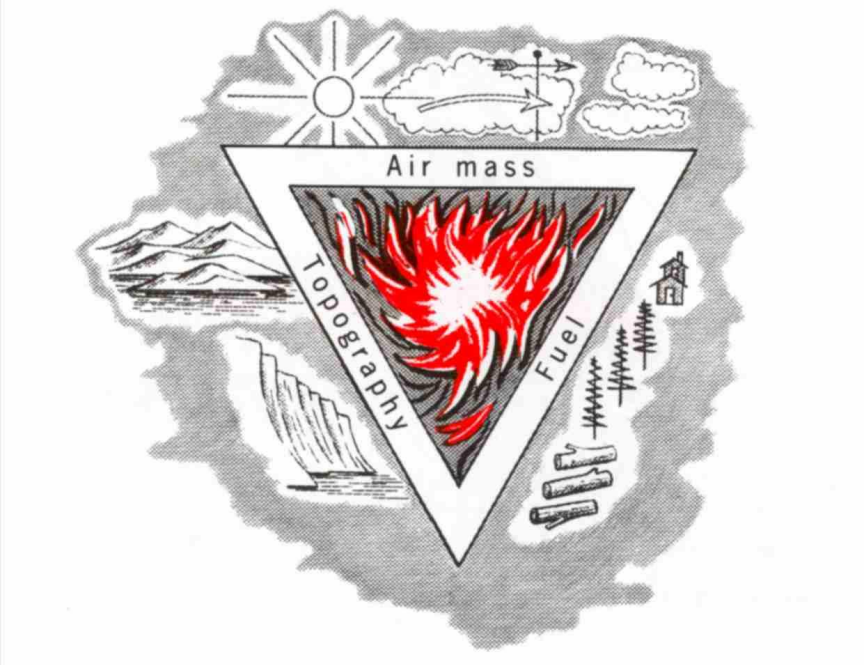
1976

What about the fuel component of the fire environment?



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 do influence the quantity and character of wildland fuels.



What is the purpose of fuels management?

The goal is to proactively lessen the potential fire behaviour 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

Fuel Reduction

Some forest types lend themselves to prescribed underburning

Fuel Manipulation

BEFORE

by thinning, pruning and dead-down woody surface fuel removal

AFTER

Fuel Conversion:

fuels are replaced by less flammable ones

Black spruce stand

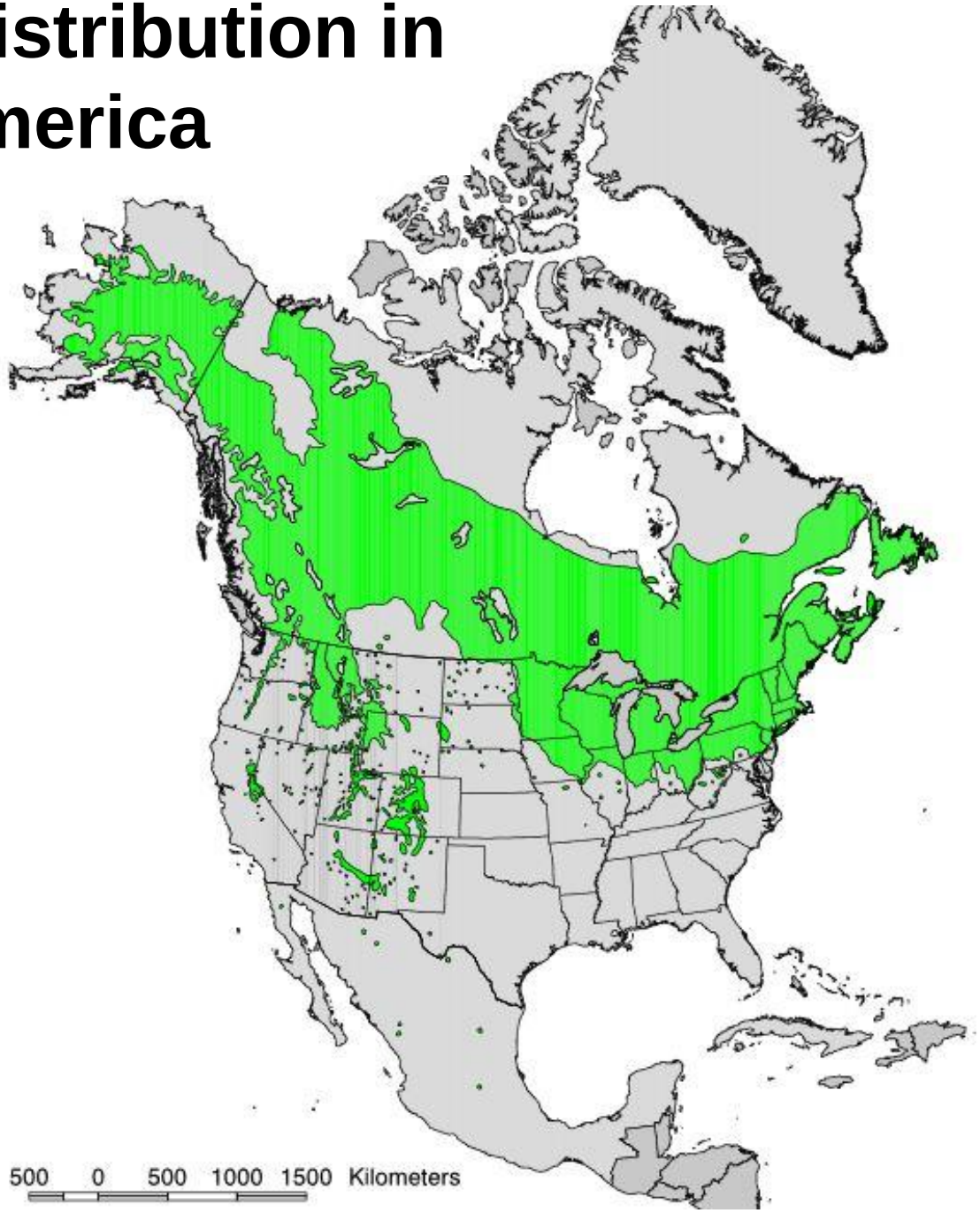
Aspen stand

Fuel Isolation:

large expanses of fuels are broken up with firebreaks and fuelbreaks

Are Aspen Fuelbreaks a Viable Solution to the WUI Fire Problem?

Aspen distribution in North America



Attractive … especially in the fall

Aspen forest after “green-up” in the spring after snow melt

Most aspen forests are susceptible to low- to moderate-intensity surface fires in the spring and fall

Fire behaviour potential comparison

(95th-percentile burning conditions)

Black spruce forest

Aspen forest

Head fire rate of spread (m/min)

14 **3**

Type of fire

Continuous crown fire

Moderately intense surface fire

Old and decadent aspen forests are not effective fuelbreaks

The fire behaviour potential of aspen has long been recognized

Seasonal Vegetation and Forest Fire Hazard

By J. G. WRIGHT, B.Sc., and H. W. BEALL, B.Sc.F.

Division of Forest Protection, Forest Service, Department of Interior, Ottawa

THE MONTH of May is recognized by foresters in eastern Canada as constituting a particularly dangerous period from the standpoint of fire hazard. It comprises the greater part of that critical stage between the melting of snow in the woods and the development of herbaceous plants, ground vegetation, and the foliage of shrubs and trees. A somewhat similar situation occurs in the late fore, that the development of foliage in a hardwood forest will be accompanied by an increase in relative humidity and a decrease in fire hazard within and in the vicinity of the stand.

Effect of Leaf Growth on Humidity

While this indirect reduction of the hazard at the time of plant development has been generally recognized by foresters, no attempt has hitherto been made in Can-

placed in a large clearing, a second in an adjacent mixed hardwood stand with full canopy, and a third in a mixed red and white pine stand of approximately equal density.

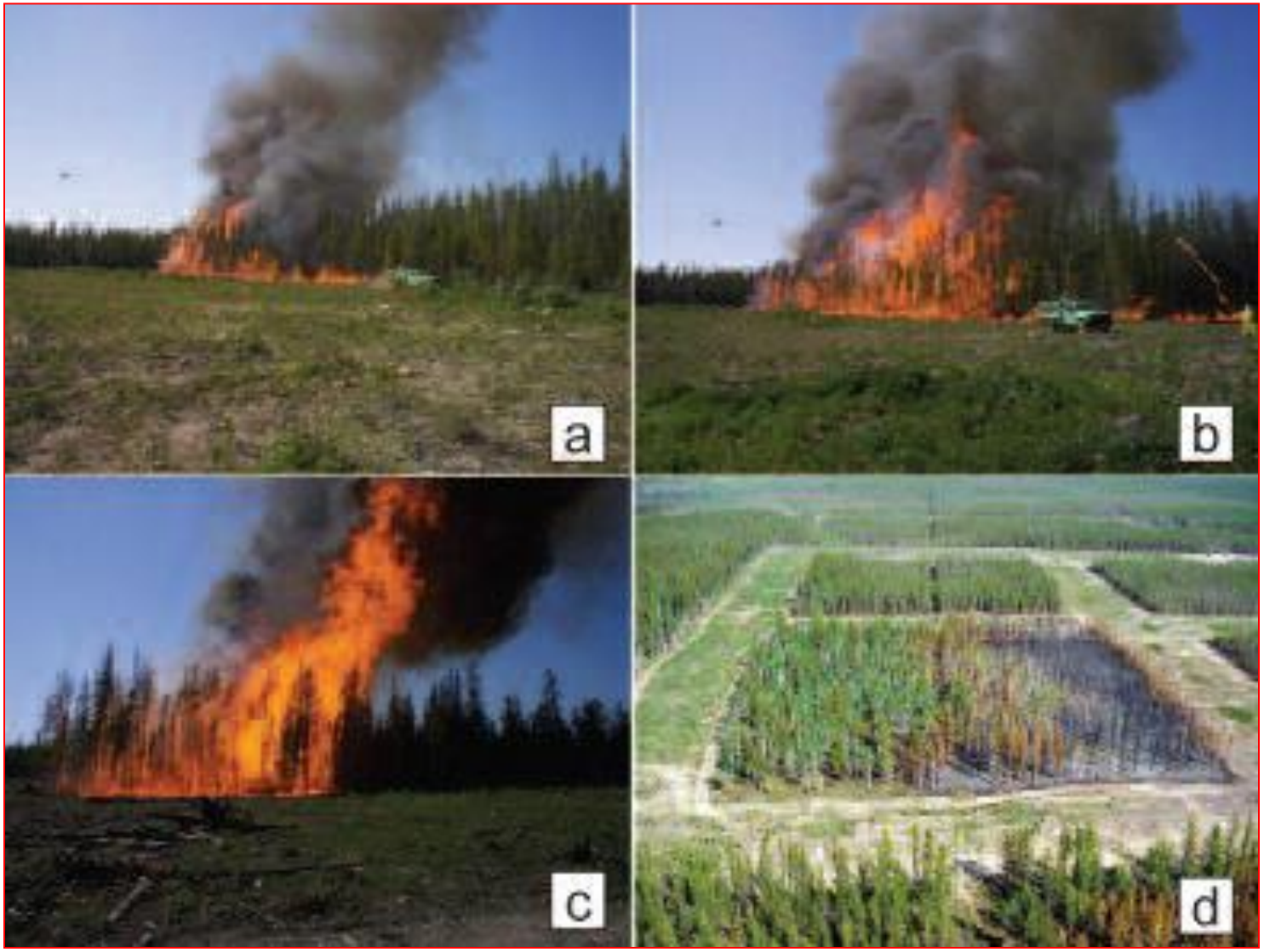
In Figure I is shown the effect of the development of leaves in the hardwood forest on relative humidity within the forest. Before the foliage began to come out at all (that is, prior to May 10) the mini-

1934. *Pulp and Paper Magazine of Canada* 35(5): 259-261.

Wildfire evidence of aspen effectiveness

Willow River, Northwest Territories, 1979
Photo by Rick Lanoville, GNWT

Experimental fire demonstration of aspen effectiveness



International Crown Fire Modelling Experiment, NWT - 1999

The earliest reported notion of creating aspen fuelbreaks

Bickford, N.K. 1972. Burnett's disaster stoppers. *Wisconsin Conservation Bulletin* 37(6): 22-23.

1969 Faro Fire, Yukon

Unfortunately most communities under go a "fuel conversion" from unplanned fire events!

2016 Fort McMurray Fire

Pre-burn view of 2016 Fort McMurray Fire area

Photo by Mark Newman, AAF

Post-burn view of 2016 Fort McMurray Fire
September 27, 2019

Looking Ahead

Things to ponder:

- Review & support of *Canadian Council of Forest Ministers* (national fire strategy)
- Interest of *Canadian Forest Service* ("blueprint" for fire research; wood fibre centre)
- Consideration of *FireSmart Canada* (promotional materials; champion cause?)
- Insurance industry (break on homeowner premiums?)
- Other interest groups (e.g., *Tree Canada*, *Canadian Institute of Forestry*, *Federation of Canadian Municipalities*)
- General public (opinion survey)

Acknowledgements

- Rick Lanoville, NT
- Al Beaver, YT
- Dana Hicks, BC
- Stan Harvey, BC
- Terry Van Nest, AB
- Dennis Quintilio, AB
- Dave Finn, AB
- Brian Stocks, CFS
- Mark Heathcott, formerly with Parks Canada
- Dave Thomas, USFS
- Dale Wade. USFS

Thank you for your attention!
Questions/Comments?

mea2@telus.net

Background information

Alexander, M.E. 2000. Fire behaviour as a factor in forest and rural fire suppression. For. Res., Rotorua in assoc. N.Z. Fire Serv. Comm. and Natl. Rural Fire Authority, Wellington, New Zealand. For. Res. Bull. No. 197, For. Rural Fire Sci. Tech. Ser. Rep. No. 5. 28 p. http://www.fire.org.nz/Research/Published-Reports/Documents/4d0cfd8b2c9476a48039c43edc4c550f.pdf

Alexander, M.E. 2003. Understanding fire behavior — the key to effective fuels management. Invited Keynote Address presented at the Forest Engineering Research Institute of Canada–Wildland Fire Operations Research Group Sponsored Fuel Management Workshop, October 6–8, 2003, Hinton, AB. http://wildfire.fpinnovations.ca/91/WorkshopPresentation1.htm

Alexander, M.E. 2010. 'Lest we forget': Canada's major wildland fire disasters of the past, 1825-1938. *in* Wade, D.D; Robinson, M.L., eds. Proceedings of 3rd Fire Behavior and Fuels Conference, 25-29 October 2010, Spokane, WA. Birmingham, AL: International Association of Wildland Fire. 21 p. https://firesmartcanada.ca/wp-content/uploads/2019/10/Alexander-Lest-We-Forget.pdf

Alexander, M.E. 2010. Surface fire spread potential in trembling aspen during the summer in the boreal forest region of Canada. Forestry Chronicle 86: 200-212. https://cfs.nrcan.gc.ca/publications?id=31539

Alexander, M.E. 2012. Slave Lake Fire another incident in a long line of wakeup calls for Alberta (and Canada). Forestry Chronicle 88: 107-108. https://pubs.cif-ifc.org/doi/pdf/10.5558/tfc2012-024

Alexander, M.E. 2019. Are shaded fuelbreaks the answer to Canada's community wildfire protection problem? For. Chron. 95: 2-4. https://pubs.cif-ifc.org/doi/pdf/10.5558/tfc2019-001

Alexander, M.E.; Mutch, R.W.; Davis, K.M.; Bucks, C.M. 2017. Wildland fires: Dangers and survival. Pages 276-318 *in* P.S. Auerbach, ed. Auerbach's Wilderness Medicine, Volume 1. 7th ed. Elsevier, Philadelphia, PA. available upon request