Summary of Research on the Chisholm, DogRib and Lost Creek Fires

Foothills Model Forest

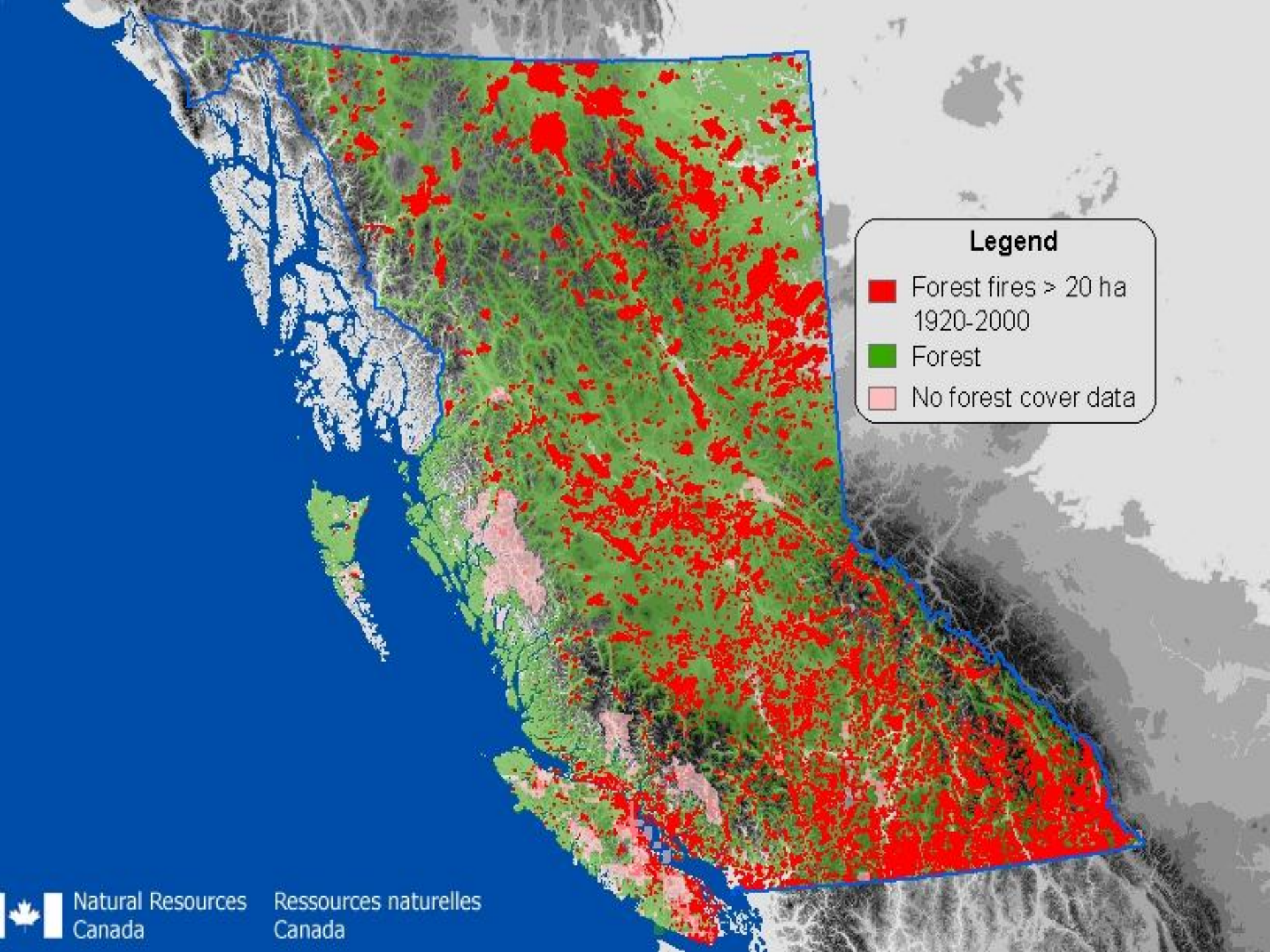
AGM

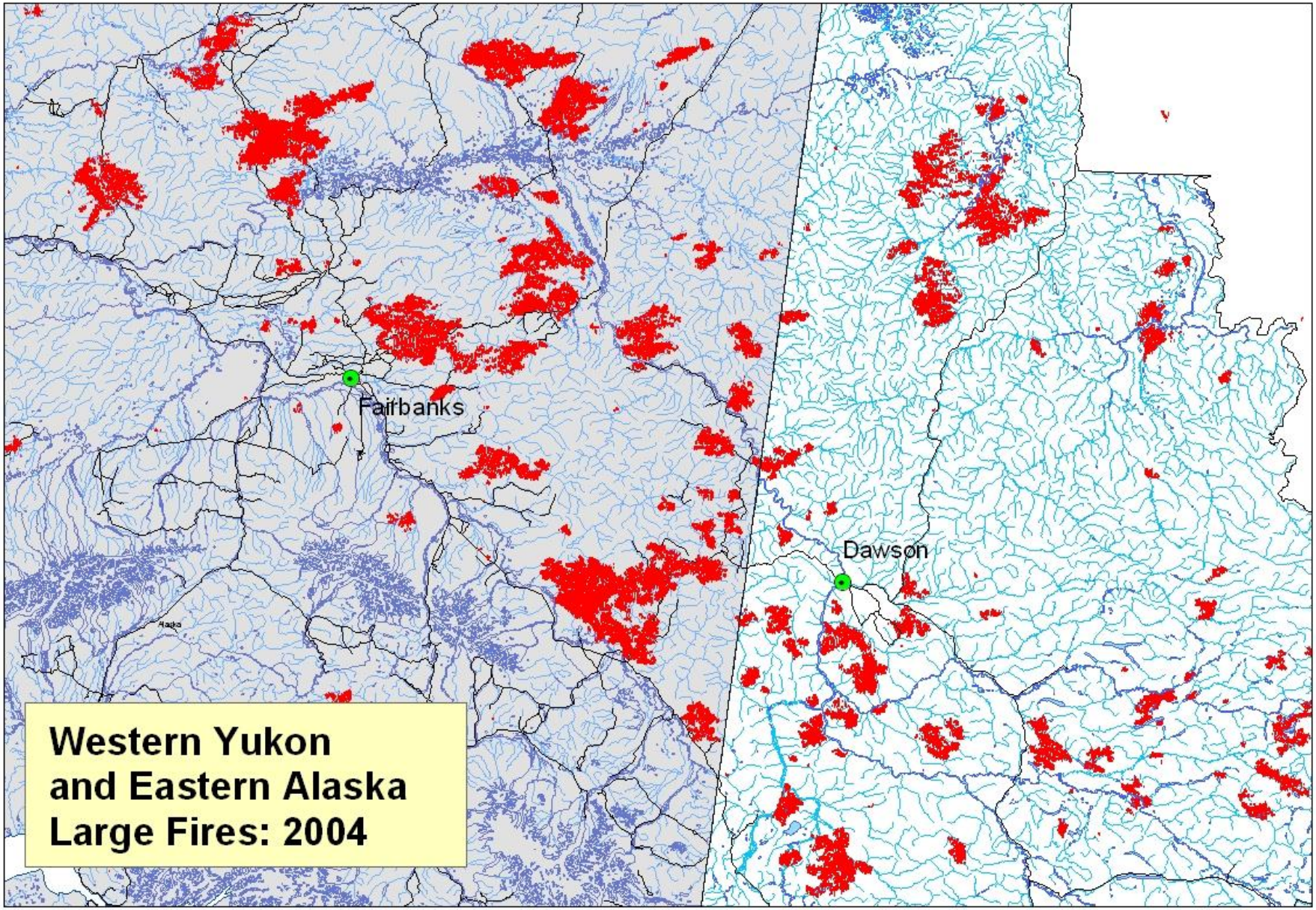
November 21, 2006

Outline

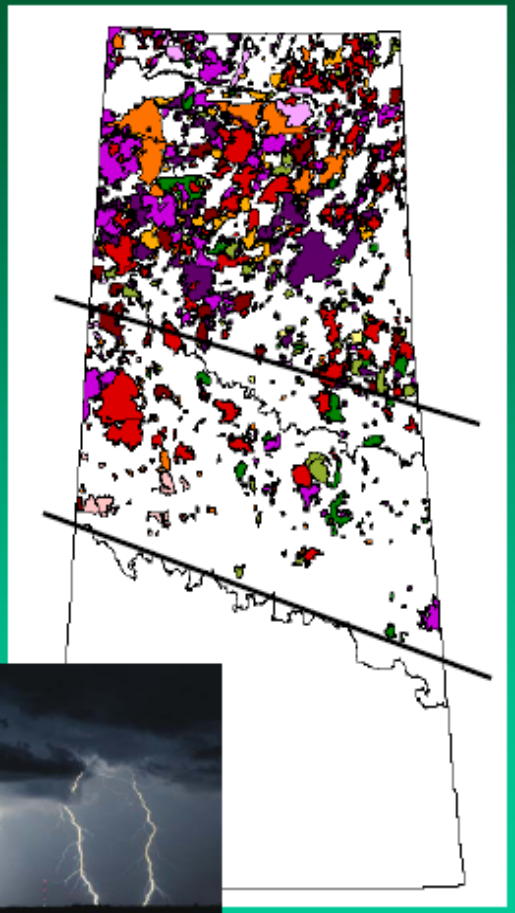
- Recent fire regime shifts
- Chisholm project
- DogRib project
- Lost Creek project
- Summary


canmore, alberta
Mount Saint Helens
Chicago River
Image © 2005 EarthSat
Google
Pointer 59°05'19.41" N 115°20'35.28" W
Streaming 100%
Eye alt 2849.24 mi

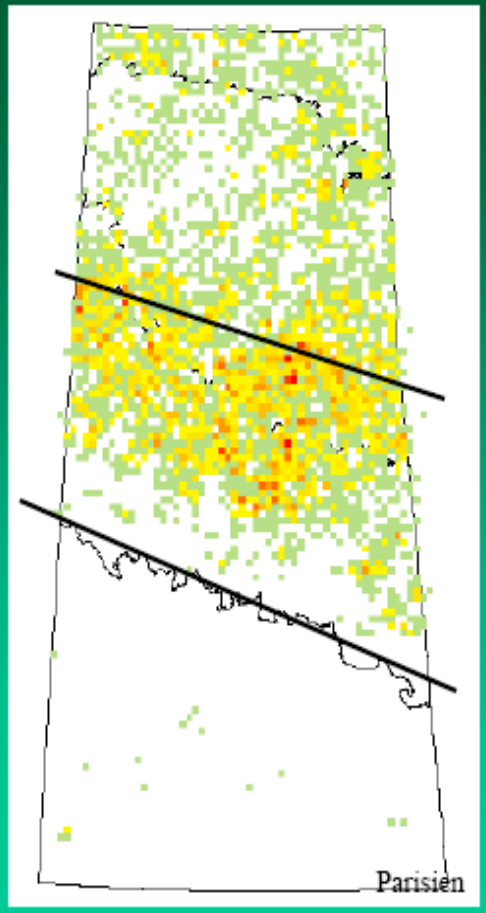

Legend
Forest fires > 20 ha
1920-2000
Forest
No forest cover data
Natural Resources
Canada
Ressources naturelles
Canada


Fairbanks
Dawson
Western Yukon
and Eastern Alaska
Large Fires: 2004

Fires > 1000 ha



Fire Occurrence



Saskatchewan Environment

Alberta Class E fires by natural subregion

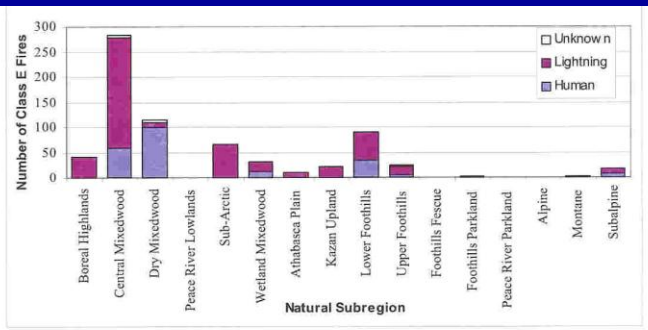


Figure 4.42 Class E wildfire frequency by general cause and by natural subregion (1961–2002)

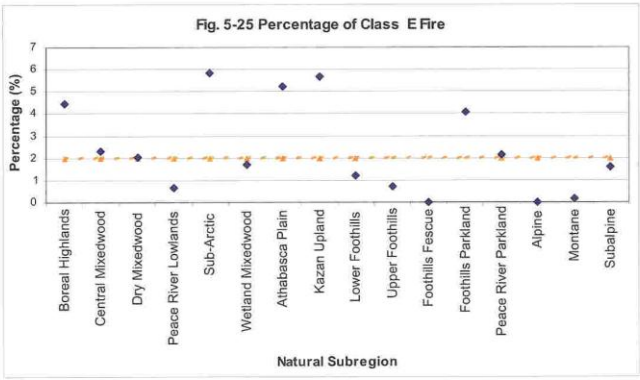


Figure 4.43 Percentage of Class E wildfires by natural subregion. The dashed line represents the mean value.

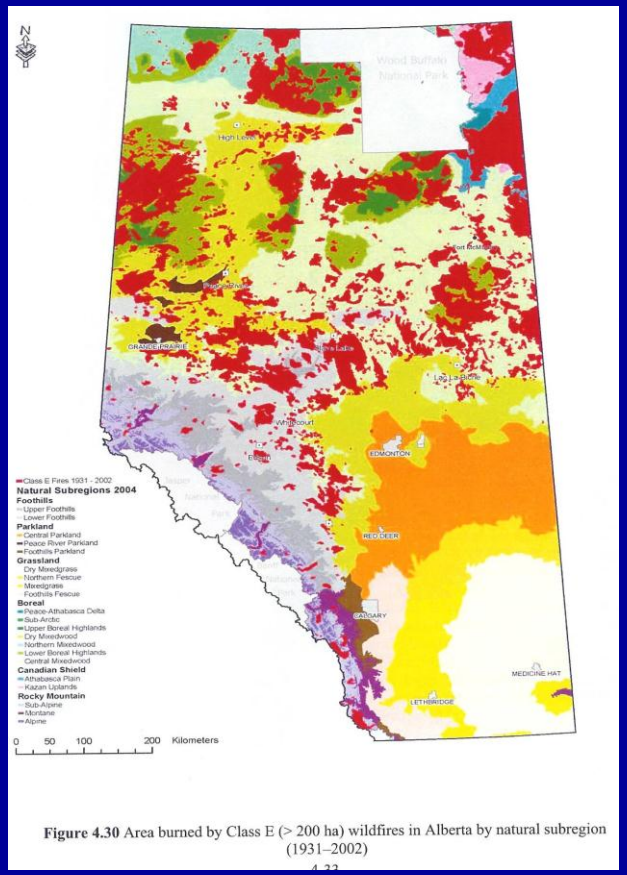


Figure 4.30 Area burned by Class E (> 200 ha) wildfires in Alberta by natural subregion (1931–2002)

Project Development

- SRD commitment to support post fire research on three high intensity/severity fires
- Chisholm fire – May,2001
- DogRib fire – October,2001
- Lost Creek fire – July,2003
- Projects to be managed through the FMF

Collaborators

- University of Alberta
- Alberta Sustainable Resource Development
- Canadian Forest Service
- Bandaloop Landscape Ecosystem Services
- Jasper National Park
- Shell Canada

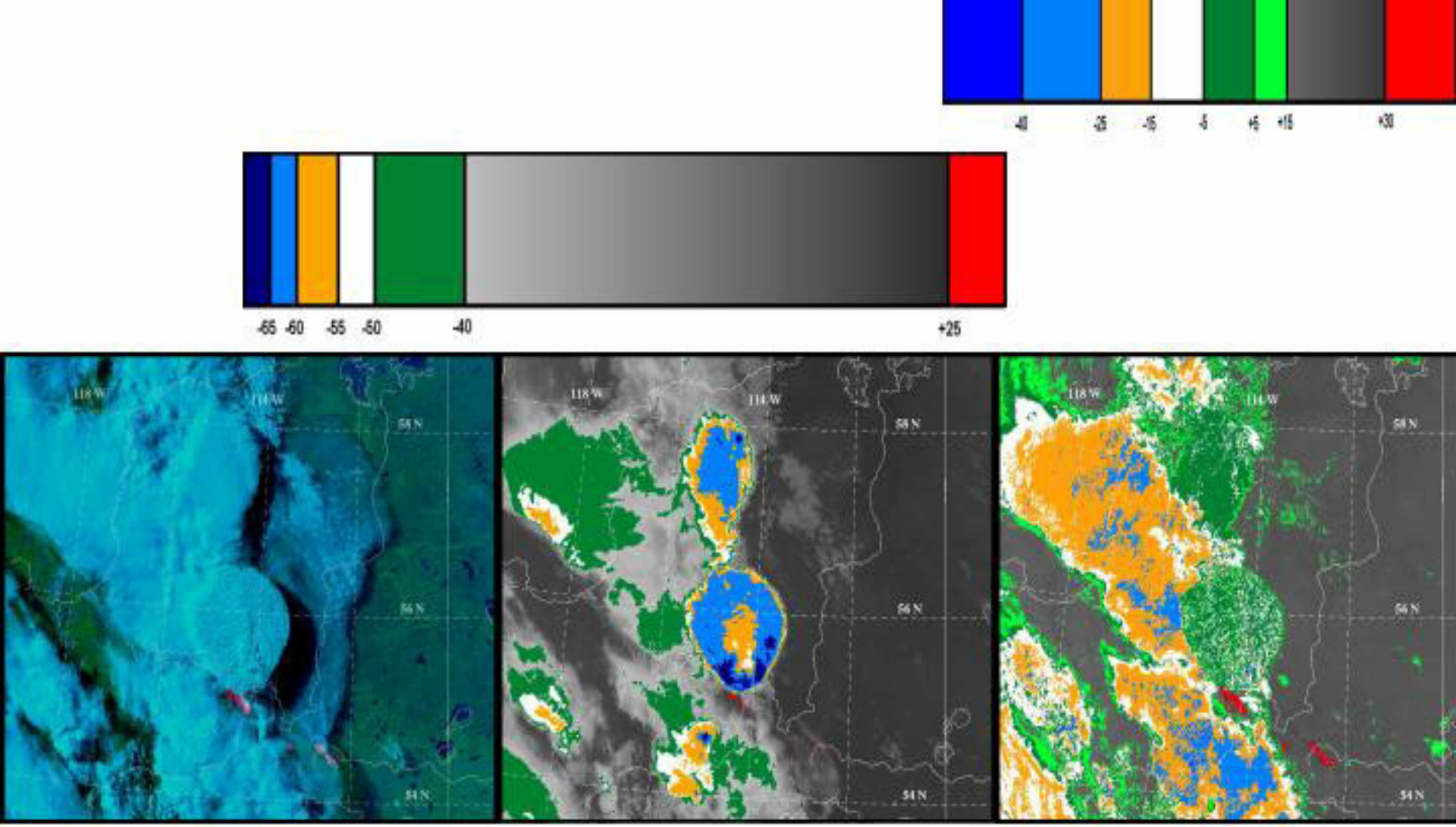
Overview of Projects

- Firesmart communities
- Disturbance dynamics in riparian zones
- Effects of fire and harvesting on CWD, beetle populations, plant succession
- Elk foraging patterns
- Fire growth modeling
- Fire behavior in aspen under severe spring burning conditions
- Fire regime of the C5 management unit
- Community attitudes – Crowsnest Pass
- Shell Canada reclamation study of fireguards
- FERIC fuel management study

Chisholm Fire

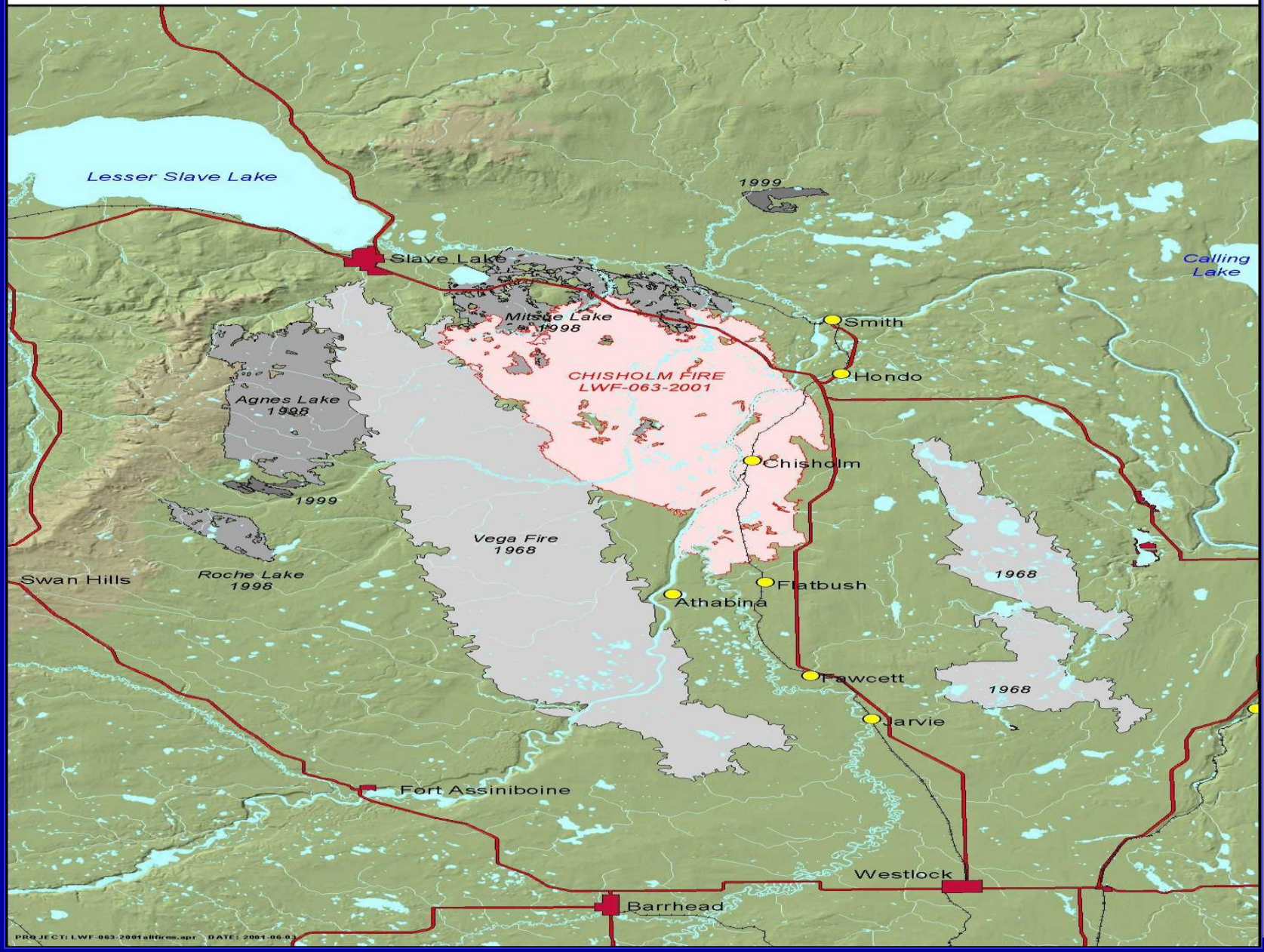
- Precedent fire behavior in Canada
- provided an outstanding opportunity for fire and forest management research.
- recognized immediately by Alberta government-committed funding through the Foothills Model Forest.

Chisholm convection Column at 1930 hrs on May 28, 2001



(a) (b) (c)

Chisholm Fire (LWF-063-2001)
June 3, 2001

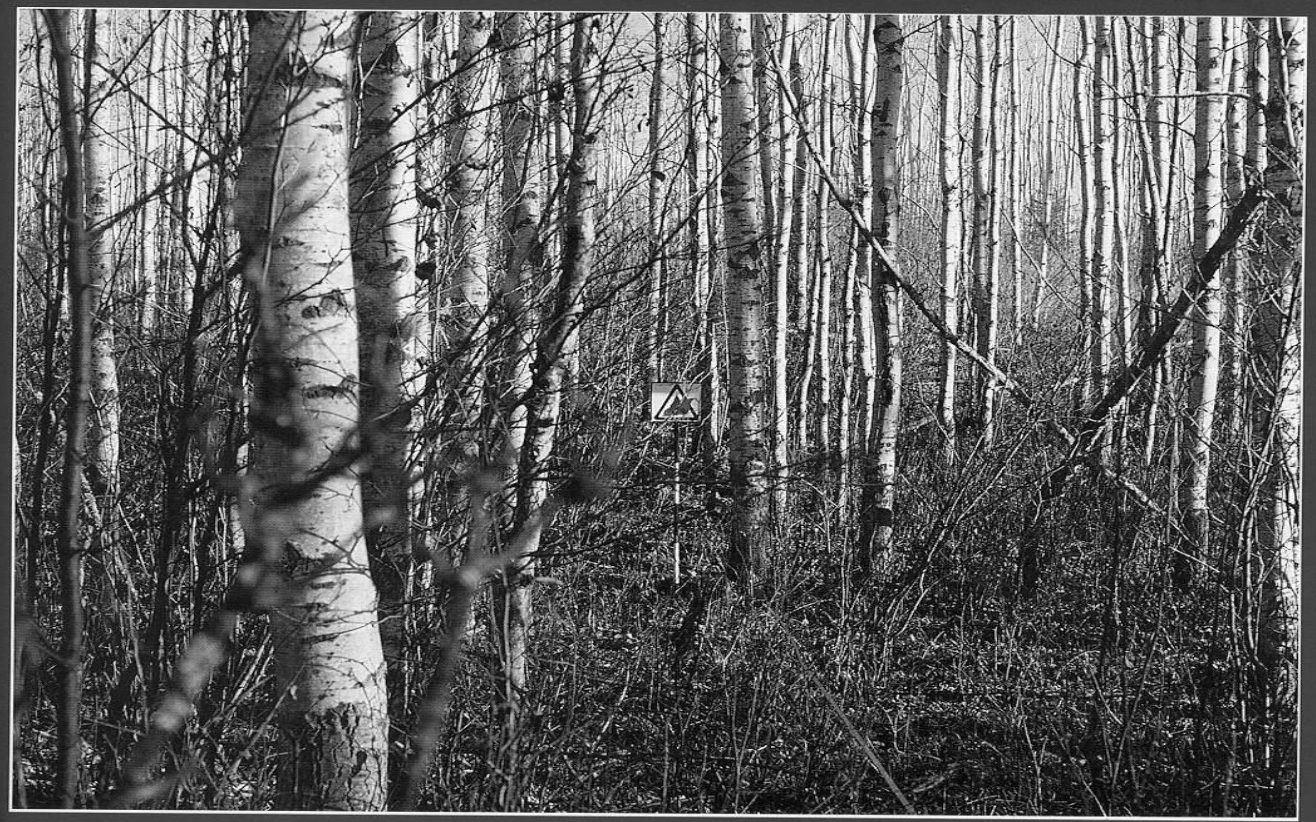


Forest Fire Behavior Prediction (FBP) System

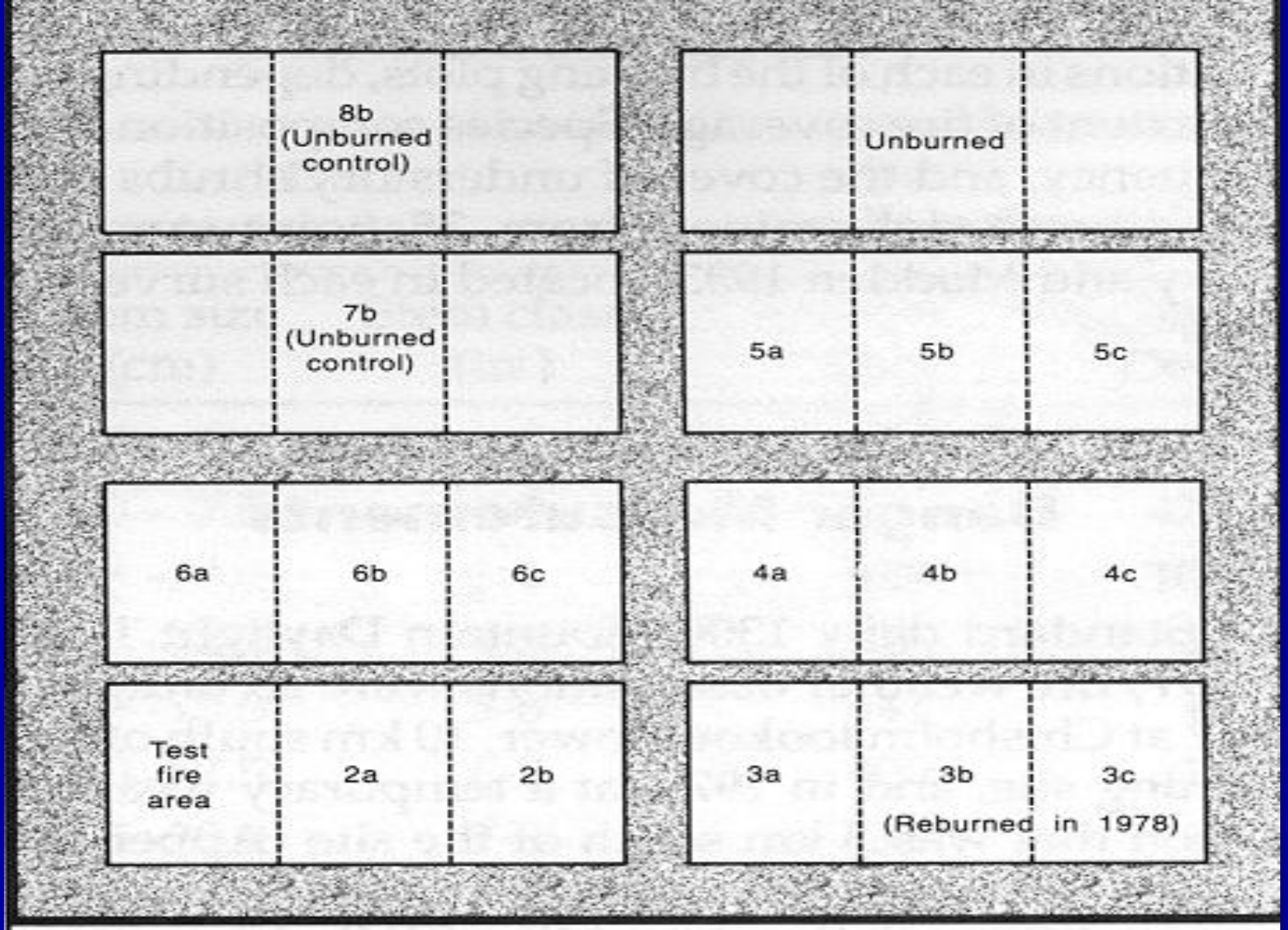
Spring fires in a semimature trembling aspen stand in central Alberta

D. Quintilio, M.E. Alexander, and R.L. Ponto

Northwest Region • Information Report NOR-X-323



Forestry Canada Forêts Canada


8b
(Unburned
control)
Unburned
7b
(Unburned
control)
5a
5b
5c
6a
6b
6c
4a
4b
4c
Test
fire
area
2a
2b
3a
3b
3c
(Reburned in 1978)
Water dugout
20 10 0 20 40 60 m
Scale
N
S






Chisholm Fire May 28th

Fire Behavior on Chisholm East

Flammability of fuels from aerial ignition line 1247 east side

Flammability of fuels from hand ignition line 1200 SE corner

Flammability of fuels from aerial ignition line 1356 east of Chisholm

Convection column to 45,000 Ft Edmonton radar 1930

East flank SE of Chisholm C2 fuels 1652

East flank of highway near Hondo 2110

Fire Intensity Equation

$I = H \times W \times R$

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)

Fire Intensity Spectrum

10 kW/m – Lower limit of surface fire spread

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

Fire intensity comparisons – 1968,1972, 1978, 2001

- 1968 Vega fire – 137,000 kW/m
- 1972 CFS plots – 15 to 390 kW/m
- 1978 CFS re-burn - 4,392 kW/m
- 2001 Vega re-burn – 27,000 kW/m
- 2001 Chisholm re-burn – 261,000 kW/m

- Drought conditions in 1968 and 2001 contributed to high consumption of downed-woody fuel and forest floor

	CFS Plots (kg/m^2)	**Vega Fire Plots** (kg/m^2)
Forest floor consumption	1.5	0.9 - 3.7
Downed-woody consumption	6.1	0.5
Total Fuel consumption	7.6	1.4 - 4.3
Predicted TFC (FBP System)	1.3	1.3

	CFS Plots	**Vega Fire Plots**
Mineral soil exposure (average %)	30	0
Tree bole-scorch height (m)	3.6	0.5

Prometheus Fire Growth Model Update

Design and Incorporation of Spotting and Breaching of Fire Break Functionality

Chisholm, DogRib, and Lost Creek Fires
Post-Fire Research Workshop
April 27, 2005
Kurt Frederick

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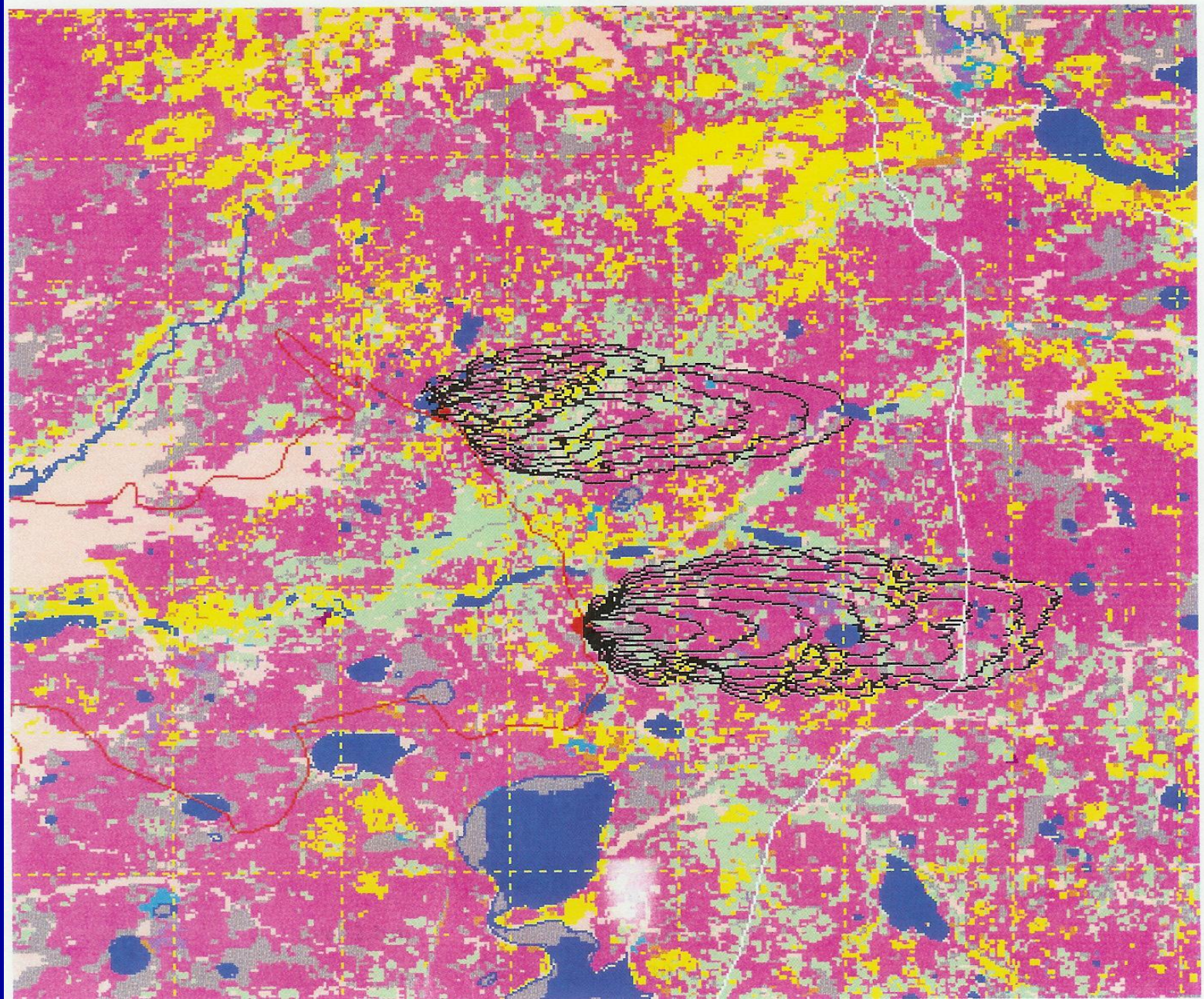
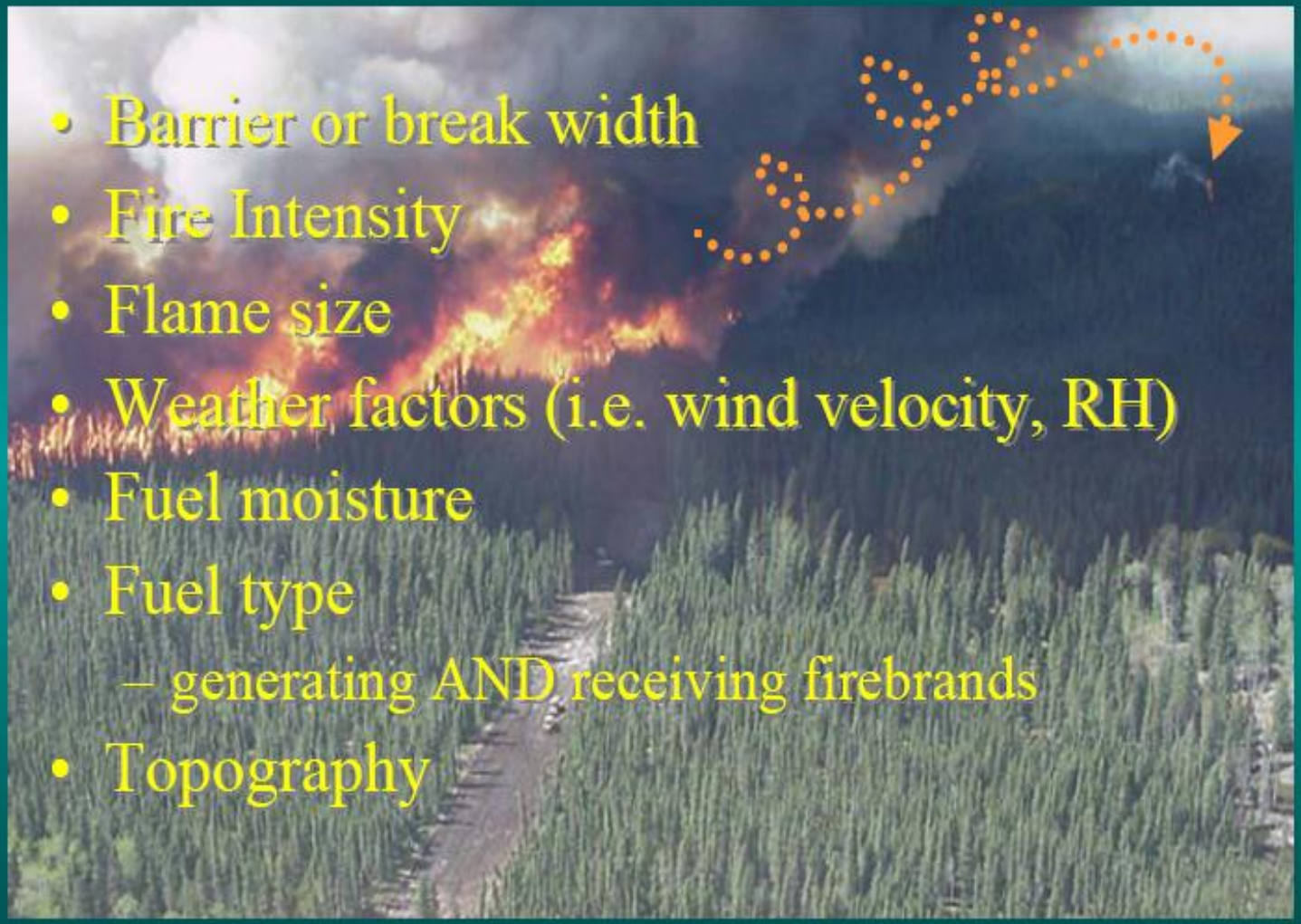
research growing into practice.

RoundHillcapture33.bmp File Date: May 30, 2002 1400 hrs

Scenario: May 30, 1300 hrs to May 30 2300 hrs



Wildfire Breaching of Barriers - Variables



- Barrier or break width
- Fire Intensity
- Flame size
- Weather factors (i.e. wind velocity, RH)
- Fuel moisture
- Fuel type
  - – generating AND receiving firebrands
- Topography

Wildfire Breaching of Barriers - Mechanisms

- Fire Whirls

Wildfire Breaching of Barriers - Mechanisms

- Spotting
  - Mass transport of embers ahead of fire front

Prometheus Breaching of Barriers - Workshop

September 23, 2004, Provincial Forest Fire Centre, Edmonton, AB

PARTICIPANTS

Marty Alexander

Greg Baxter

Jen Beverly

Don Cousins

Kurt Frederick

Dennis Quintilio

Cordy Tymstra

Terry Van Nest

Dennis Yuan

INVOLVING THE PUBLIC IN COMMUNITY WILDFIRE PROTECTION

Foothills Model Forest:

FireSmart - *ForestWise* Communities Project

Presented by:

Alan Westhaver,
Project Manager, (Jasper National Park)

B.C. INTERFACE FIRES –

- 1994 Garnet Fire
  - Penticton, 18 homes
  - 3,500 evacuated, $5 million
- 1998 Silver Creek
  - Salmon Arm, 40 buildings
  - 7000 evacuated, $15 million
- 2003 Firestorm
  - Kelowna and others
  - 45,000 evacuated
  - $700 million

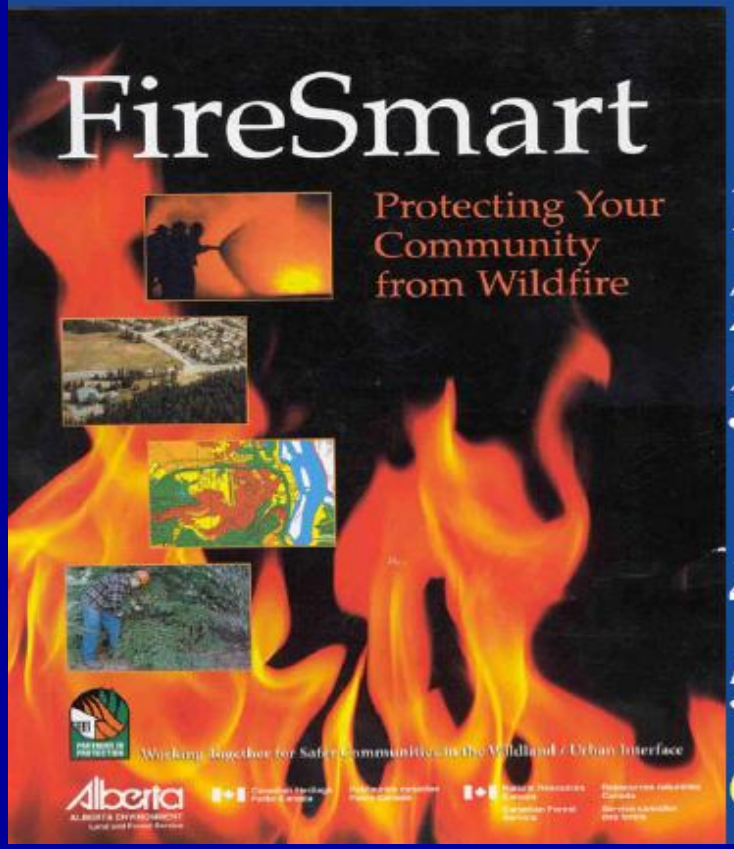
WUI FIRE - AN UPWARD TREND

- Increasing development in wildland areas;
- Migration from cities;
- Climatic warming,
- Upward trend in area burned;
- Increasing fuel loads.

PRINCIPLES

- Reduce probability of crown fire and mass ember transport.
- Restore historical (open) canopy structure in fire-maintained stands (Southern Interior!).
- Favor long-lived, fire resistant or fire dependent species.
- Accelerate successional development in fire-replaced stands (e.g. lodgepole).
- Thin, then burn wherever possible.
- Convert stands to less flammable types (mixed-wood to deciduous).

PREVENTIVE SOLUTIONS TO REDUCE RISK ARE KNOWN:

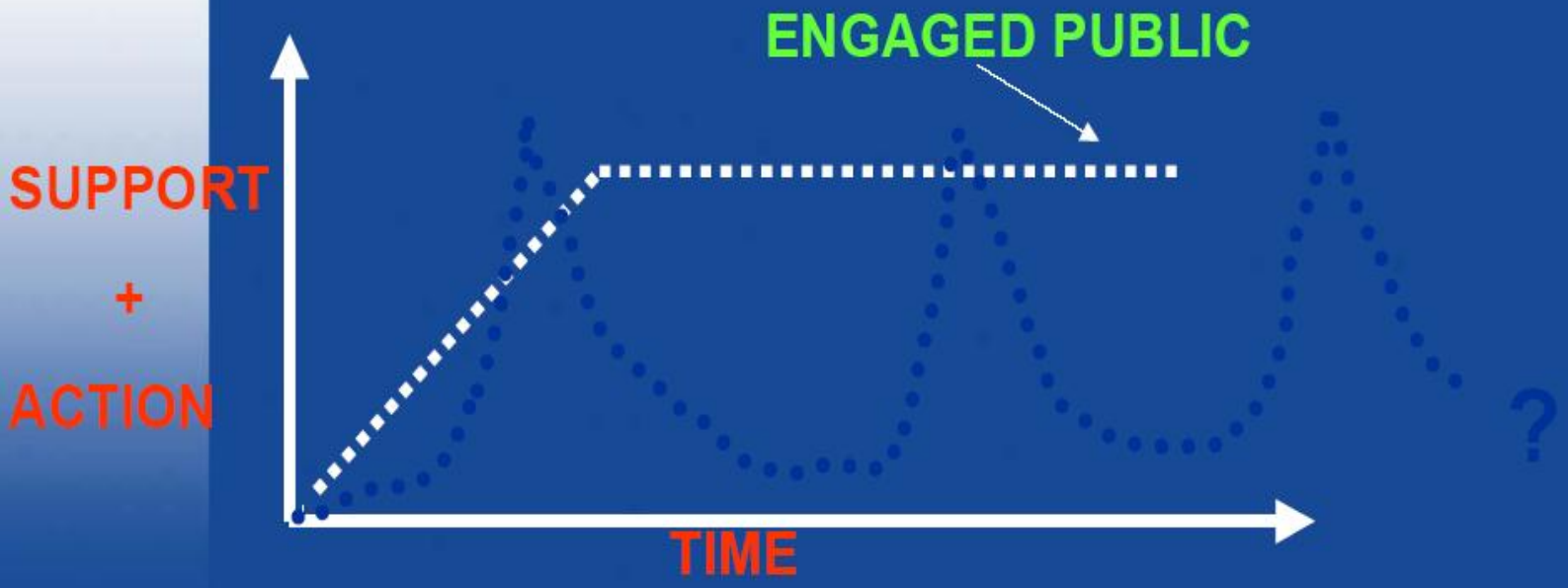


1. Raise Awareness
2. Improve Infrastructure
3. Modify Building Standards
4. Better Emergency Plans
5. Land Use Planning
6. Fuel Management ***

MODEL FOREST NETWORK
RÉSEAU DE FORÊTS MODÈLES

A WORD ON PUBLIC ATTITUDES

- Lack of Public Support is a Major Obstacle
- Varies from Apathy to Outrage to Resistance



Wildfire Risk Reduction in the Communities Affected by the 2003 Lost Creek Fire

Tara McGee, University of Alberta
Bonnie McFarlane, Natural Resources Canada
Jeji Varghese, University of Alberta

Wednesday, April 27, 2005
Edmonton, AB

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

Canada

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research growing into practice.

Resident Comments on Community-Level Risk Reduction Activities

- Vegetation Management
  - High level of support
  - Some talked more broadly about better forest management, as well
- Public Education
  - High level of support
- Structural Controls
  - Mixed support; some say anything to help is good, others say this infringes of people's "choice" of how to build their homes
- Legislation
  - Limited support, most say this infringes of people's "rights" to determine where to build their homes

Conclusions

- Not all residents will become "FireSmart" post-fire
- Adoption of risk reduction activities is based on a complex suite of factors
- Responsibility for risk management should be integrated at landscape, community and residential levels, and shared amongst residents and local governments

Soil Nutrient and Organic Matter Responses to Fire, Harvesting, and Salvage logging in the Chisholm Fire

L. Nadeau for B. Kishchuk

Canadian Forest Service

Natural Resources Canada | Ressources naturelles Canada

Canadian Forest Service | Service canadien des forêts

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Four Studies

Forest floor, mineral soil, and foliage properties

Fine woody debris decomposition

Bryophytes and fine woody debris decomposition

Saproxylic beetles and coarse woody debris decomposition

Control

Burned

Forest Floor Properties

Harvested site

Salvage logged


Dog Rib Creek Fire
October 2001

Effects of Salvage Logging on Elk Habitat During the First 3-years

Mark Hebblewhite, Robin Munro, Evelyn Merrill
Department of Biological Sciences
University of Alberta

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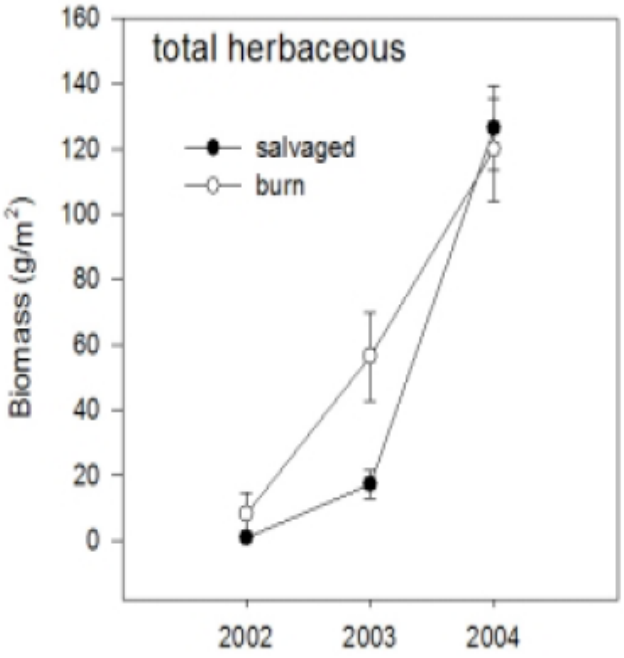
Effects of Salvage Logging on Elk



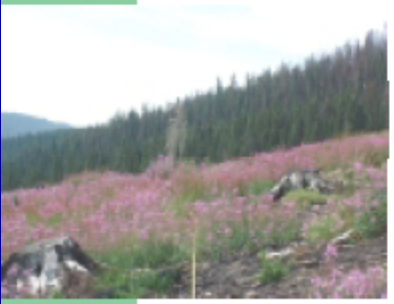
Salvage Logging

- Reduced Forb and Graminoid Biomass in Years 1 & 2
- Salvage = Burned in Year 3, effects of salvage transient
- Salvage reduced conifer regen
- Minimal effects on diversity
- Salvage logging woody debris higher than burned, competition for space

Recommendations

Salvaged

Burned

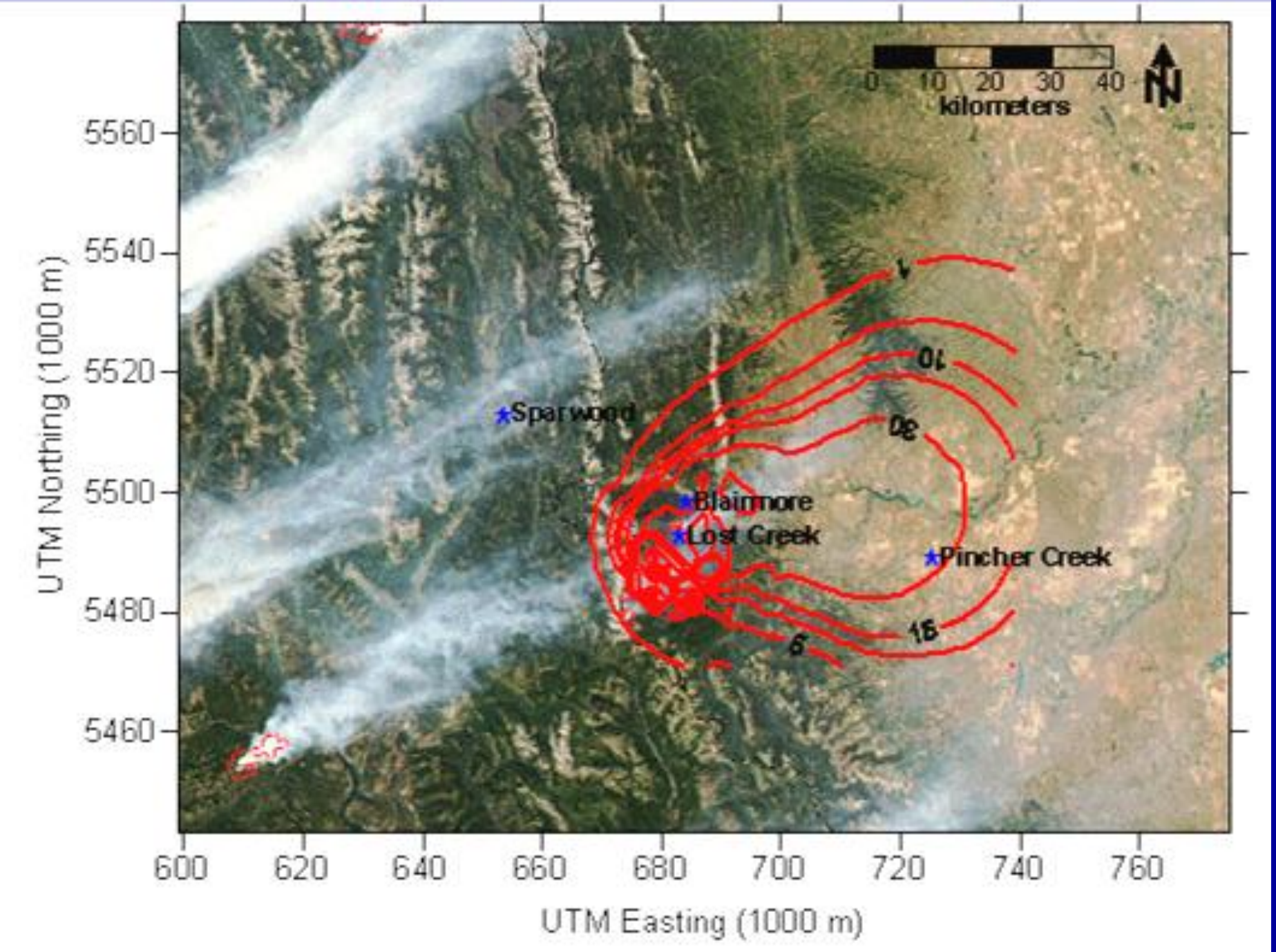


Cut then Burned

1. **POST-FIRE TREATMENTS** - Effects of salvage on forage linked to woody debris– implement post-harvest treatments to reduce competition.
2. **CATTLE GRAZING** should be delayed until at least 3-years post-fire to allow forage biomass to recover to levels comparable to other grazing allotments.
3. **ROAD MANAGEMENT** will dictate usefulness of salvage for ungulates because of mortality risks associated with roads from human and animal predators – ACCESS management key.
4. **CUTBLOCK DESIGN** – salvage may benefit wildlife more if similar mitigations of conventional cutblocks were implemented, e.g., leave areas, more cover, variable boundaries, etc.


Lost Creek Fire
AUG 19 2003


'94 8 8


0 10 20 30 40
kilometers
N
5560
5540
5520
5500
5480
5460
UTM Northing (1000 m)
600 620 640 660 680 700 720 740 760
UTM Easting (1000 m)
Sparwood
Blairmore
Lost Creek
Pincher Creek
1
10
30
15
6

Repeat Photograhpy

- 1913/14 Bridgeland Survey Photography
- 2006 Repeat Photgraphy

1934 Castle River Fire Area

1917 – Mclaren fire, Crowsnest Mountain in background

Fernie in flames

Thousands fled screaming from the wind-whipped inferno of 1908.

by **ROSEMARY NEERING**

"Scores of whirlwinds, generated between the tracks of fire tore across the townsite carrying blazing materials of all descriptions in their hug. . . . The roof of the opera house was torn off before the building had burned. The roof of the Fernie hotel was sucked up by a cyclone and distributed over the townsite. The Waldorf hotel was burst open and the entire front came diagonally across the street and through the windows of the opposite building. The corrugate roof of the new skating rink was torn into sheets as big as the walls of ordinary houses, and red hot sections rose into the air and were carried for several blocks. . . . Trees 18 inches in diameter were torn up by the roots or snapped off like so many toothpicks."

— *The Prospector*, Cranbrook, August 8, 1908

In the last days of July 1908, smoke drifted lazily across the coal town of Fernie in the southern Rocky Mountains. Though the weather was hot and dry, no one was much perturbed: bush fires often burned for days in logging slash around the town. Fernie's 6,000 residents had no inkling of the hellish chaos about to engulf their community.

Just before noon on August 1, a fierce wind kicked up, propelling two tongues of flame in a pincer movement toward town. West Fernie residents ran screaming across the railway bridge to the downtown. In no time at all, the fires leapt across the Elk River, racing faster than a horse could run. Locals took to their heels, desperately seeking refuge. *The Fernie Free Press* recounted their terror in a special edition printed in Cranbrook on August 7:

> Scorched and blasted by whirling fumes, blinded by smoke, dust and heat, crazed by separation from loved ones and fleeing they knew not where to, checked by walls of fire just as safety seemed at hand, confused by the suddenness of the catastrophy and faint with seeming futile exertion, the people of Fernie and suburbs went through an experience last Saturday that will be remembered with horror as long as they live. . . .
>
> Caught like rats in a trap, the whole country for miles around was one blazing furnace, with no certainty of escape, no matter in what direction of flight, baffled by turns on one hand and on the other, it was not so much the physical suffering, intense though it was, not the imminence of death that told on the nerves of the people but their helplessness . . . and the diabolical ingenuity with which the flames sought out every point of supposed refuge, as if animated by a fiendish personality.

Some ran frantically for the coal company's stone offices and Western Canada Wholesale's concrete building. Two nurses helped transfer patients from the hospital, crowded with 30 men injured in a mine cave-in the day before. But as fire roared toward the wholesale building, the sick and injured were wrapped in wet blankets and carried to the Canadian Pacific Railway train station on the town's south edge. They and hundreds of others crowded aboard a train; the engineer delayed until everyone in sight was aboard, then steamed away west to Cranbrook.

This quaint church, along with virtually all the homes and businesses of Fernie's 6,000 residents, perished in the 1908 Great Fire. Residents were shockingly unprepared for the disaster given that a fire in 1904 — when archivists believe this image was captured — had levelled the town's business district once before.

Crowsnest Pass/Lost Creek fire research project

Research proposal

- **Proposal for fuel treatments submitted to SRD (White zone):**
  - **Individual stem thinning (2 m crown spacing)**
  - **Cluster thinning**
  - **Open Douglas Fir (> 3 m crown spacing)**
  - **Juvenile spacing**
  - **Debris disposal**
  - **Cut to length versus full tree**
  - **Pile and burn versus chip and spread**

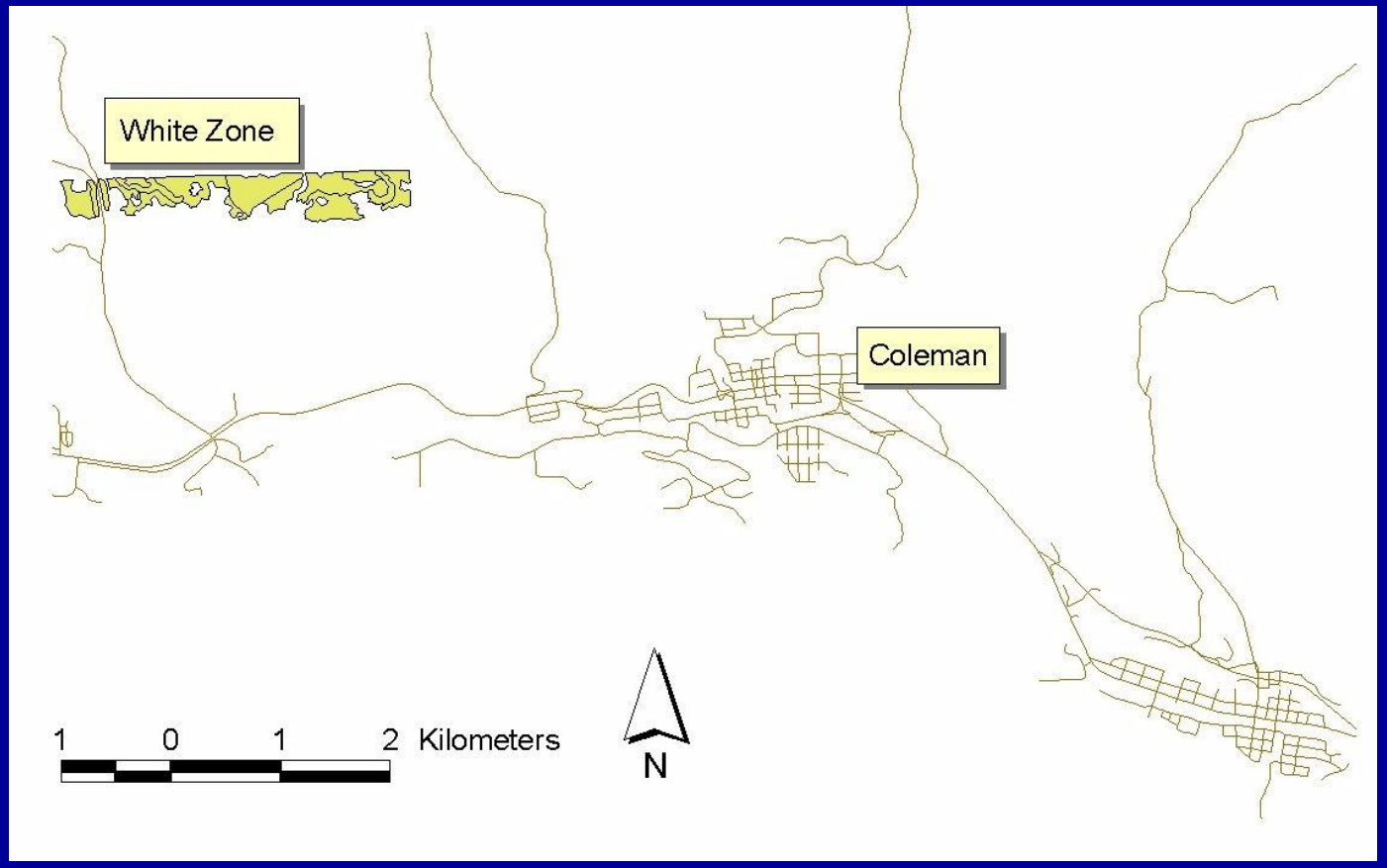
Crowsnest Pass - Background

- Project funded by Lost Creek Research fund (Foothills Model Forest)
- The research fits within the existing Crowsnest Pass FireSmart plan
- Research is guided by committee from the Crowsnest Pass

CNP related projects: NWT – 3 plots ready

CNP related projects: NWT – 3 plots ready

Crowsnest Pass – research sites



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Crowsnest Pass – 2006 data collection

- 6 weeks at ASRD's Gap fire base
- 4-5 person crew (FERIC technician and international forestry students on internships)
- 80 line transects at two sites
- Average of 4 transects per day

Lost Creek Fire Revegetation Monitoring Project

Revegetation Monitoring and Assessment of Reclaimed Dozer Guard Sites Under Different Seeding Treatments

Report Prepared for Shell Canada Ltd. and Alberta Sustainable Resource Development Public Lands and Forest Division
2006

Lost Creek Fire Revegetation Monitoring Project

- Greater than 360 km of dozer guard constructed
- Rollback reclamation / no topsoil salvage
- Four seed mixes with paired unseeded treatments
- Forest and grassland sites monitored

Lost Fire Dozer Guard and Treatment Sites

Treatment Comparisons

Site: Lost Fire 1

Seed Treatment: Erosion Mix for Steep Slopes
Location: Steep Subalpine Slope
Aspect: South Southeast
Slope: 20 – 35%
Moisture: Submesic
Nutrients: Mesotrophic
Soil Drainage: Rapidly Drained
Site Position: Middle slope

Site Information: The dozer guard on this steep slope near the southwest end of the burn was unburned. Erosion impacts on this guard are very significant. Reclamation allowed an ephemeral creek to flow over part of the site removing the fine soils from the west part of dozer guard. Although the creek has returned to its historic channel a significant of the fine soils has been lost. The revegetation is better on the unseeded site because less fines were removed by flooding.

Surface Substrates (% Cover)

Decaying Wood (%)	Bedrock (%)	Cobbles & Stones (%)	Mineral Soil (%)
20	2	10	65

Site 1 Treatment Photos:

Unseeded	Seeded
	
	

Quicknotes

Quicknote 1: Fire, soils and site productivity.

Quicknote 2: Is Woody Debris Important for Biodiversity?

Qicknote 3: Aspen Stands Stop Fires, Don't They?

Quicknote 4: Dead mosses don't lie down.

Quicknote 5: Below the surface of fire and harvesting effects.

Quicknote 6: Incorporating Spotting and Breaching Considerations into *Prometheus*-the Canadian Wildfire Growth Model.

Reports and papers

- Lawson, Bruce.. Fuel management implications for aspen types: Chisholm fire analysis. FERIC Fuel Management Workshop. September,2003.

- Quintilio,Dennis..Fuel and fire behavior characteristics of the Chisholm and Vega fires. CIF Technical Session. March,2003.

- Lawson, Bruce. Fire behavior in immature aspen stands under severe spring burning conditions: does fire history matter. Final report to Foothills Model Forest. January, 2004.

CIF/SAF Field Tour

- October 6th, 2004
- 1 hour stop at the Chisholm fire
- Poster boards describing boreal fire ecology,Chisholm fire chronology, and research projects and results

Phase 111 Accomplishments

- Beyond the borders
- Three PhD graduates
- Industry sponsorship
- Improved community safety in Alberta

Summary

- FMF is an appropriate home for this type of project
  - ✓Peer management guidance and review
  - ✓collaborative research agreements with many agencies
  - ✓administrative support
  - ✓Excellent technology transfer
  - ✓www.fmf.ab.ca

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research growing into practice.