



MODEL FOREST  
NETWORK



RÉSEAU DE  
FORÊTS MODÈLES



foothills

MODEL FOREST

*research growing  
into practice.*

An aerial photograph of a vast forest landscape. In the background, a large fire is burning, sending a massive, billowing plume of dark grey and brown smoke high into the sky. The smoke fills the upper half of the frame. Below the smoke, the forest is a dense, green expanse of trees, stretching towards the horizon. The lighting suggests a late afternoon or early morning setting, with a warm, orange glow on the horizon where the fire is located.

# Fuel and Behaviour Characteristics of the Chisholm Fire

Foothills Model Forest Workshop-April 27/05

# *Acknowledgements*

- **Bill Bereska and Bruce MacGregor**
- **Cliff Henderson**
- **Bruce Lawson**
- **Foothills Model Forest**
- **Research Advisory Committees**

# *Outline*

- **Chisholm fire – research opportunities**
- **CFS 1972 & 1978 fire behavior studies**
- **1968 Vega fire comparison**
- **Chisholm fire – precedent fire behavior**
- **Summary**

# Wildfire—“managed uncertainty”

## Comparison of Forest Fire Burn Area

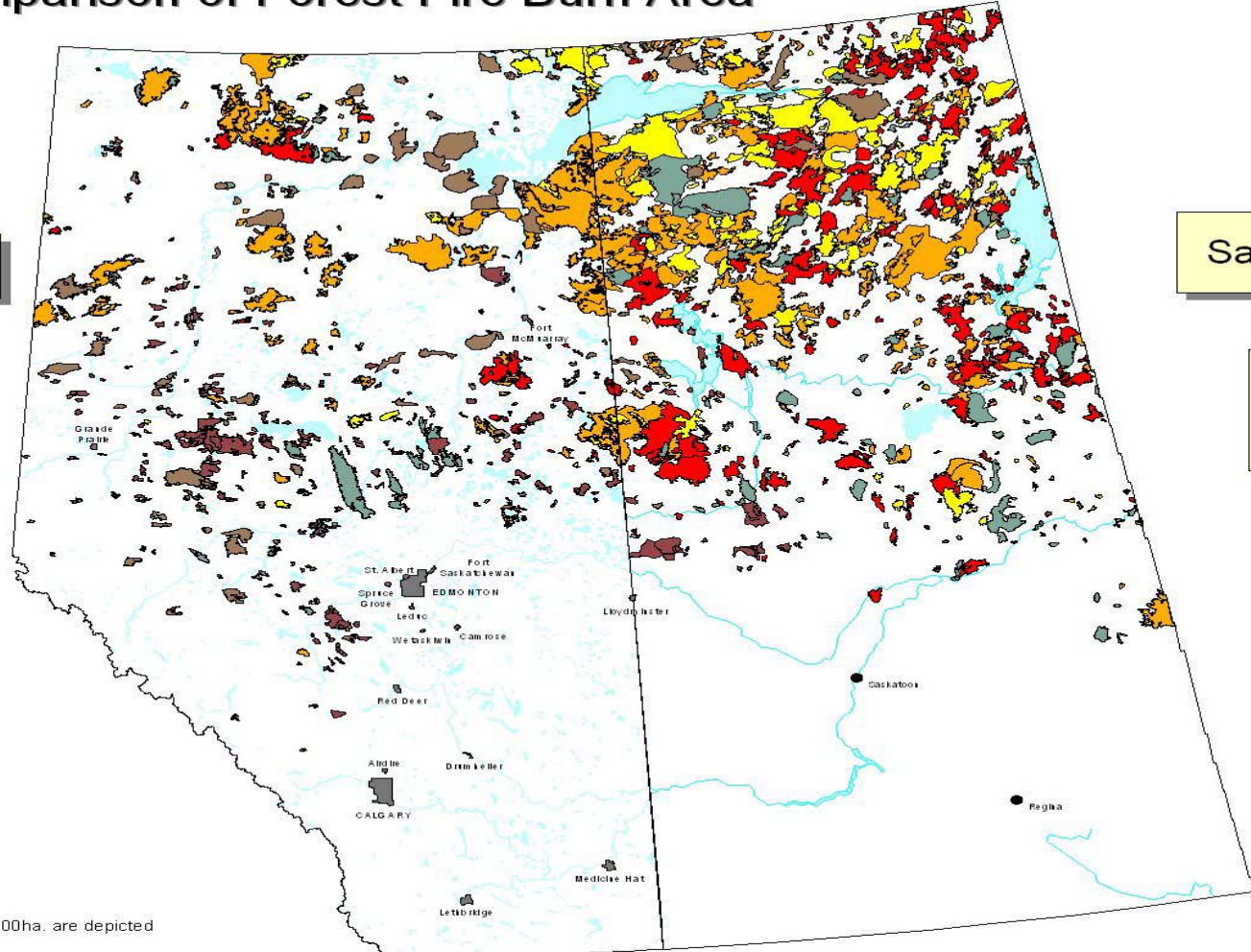
**ALBERTA**

Full Protection  
Productive Forest  
33 million ha.  
23.3 million m3 aac

**Saskatchewan**

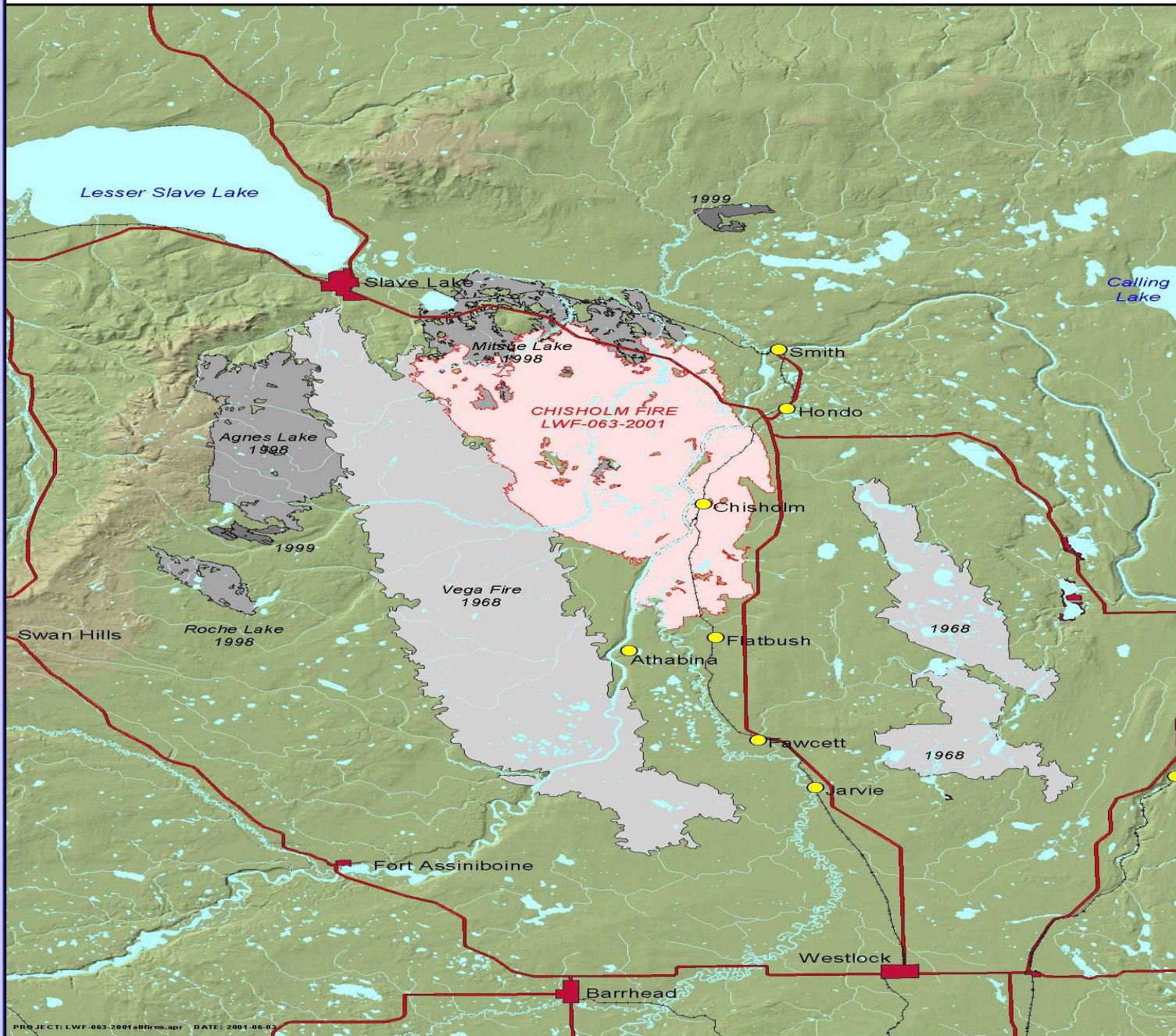
Limited Action  
Productive Forest  
28 million ha.  
7.1 million m3 aac

- 1988 - 1996 fires
- 1980 - 1988 fires
- 1970 - 1979 fires
- 1960 - 1969 fires
- 1950 - 1959 fires
- 1945 - 1949 fires

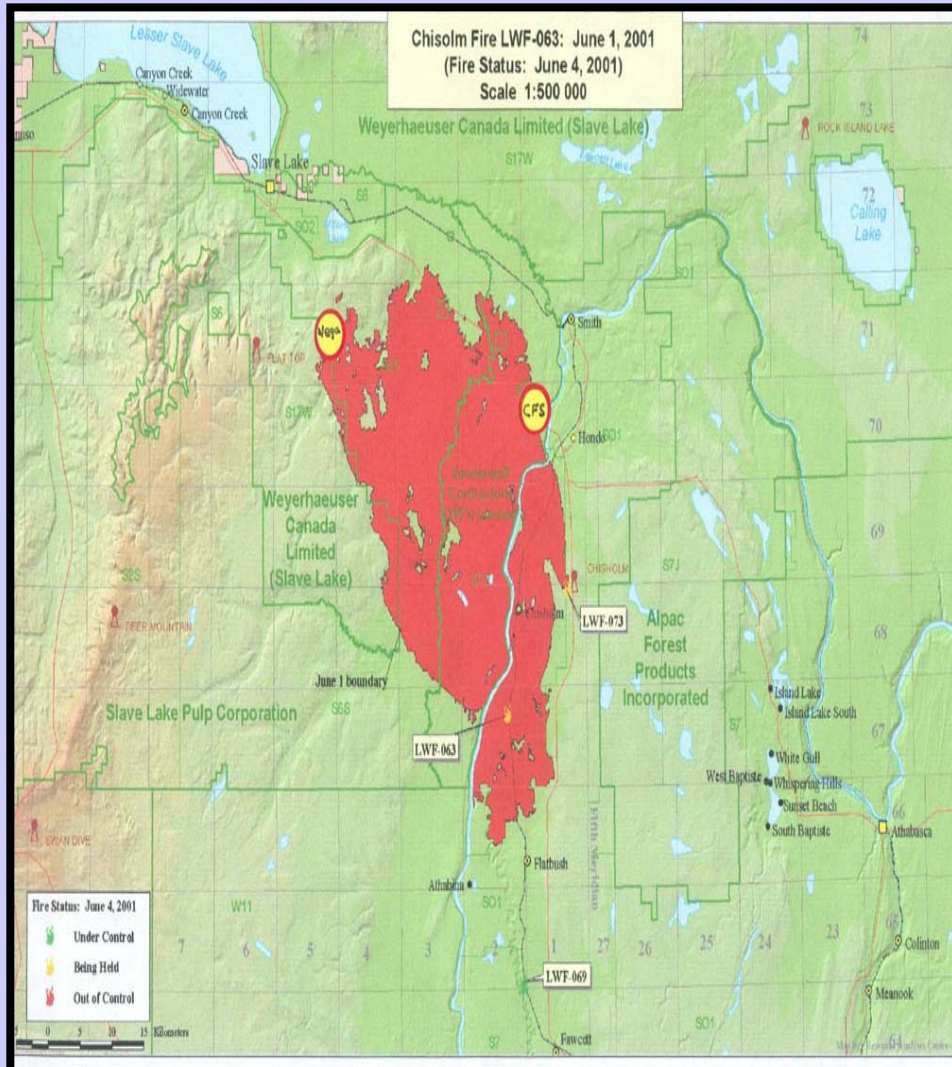


Note: Only fires greater than 1000ha. are depicted

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

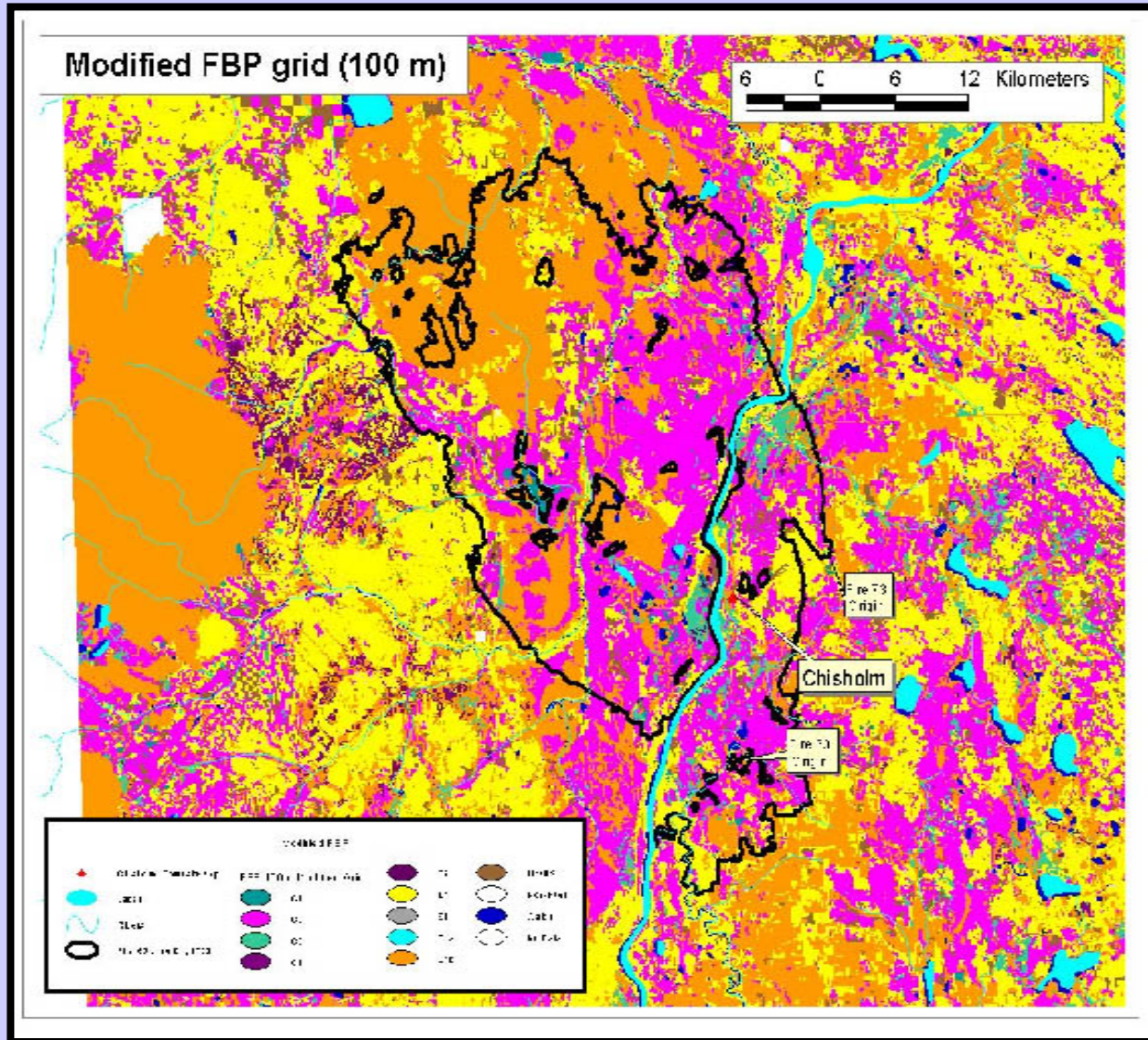


# Chisholm Fire Behavior and Effects in Aspen

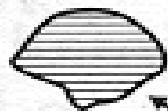
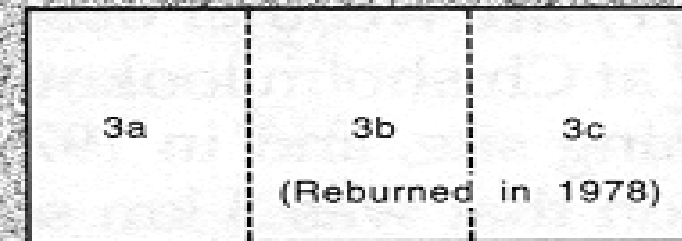
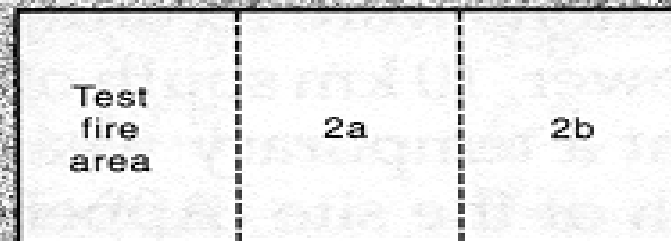
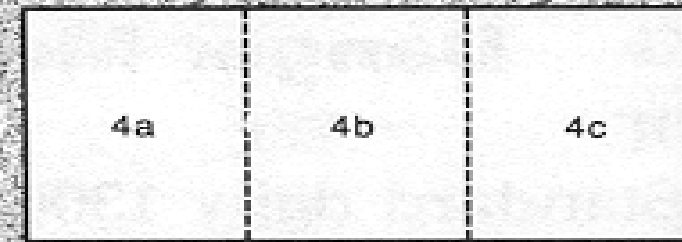
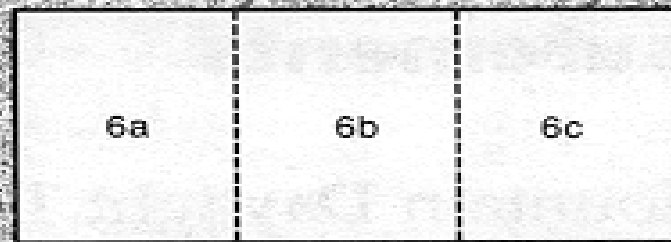
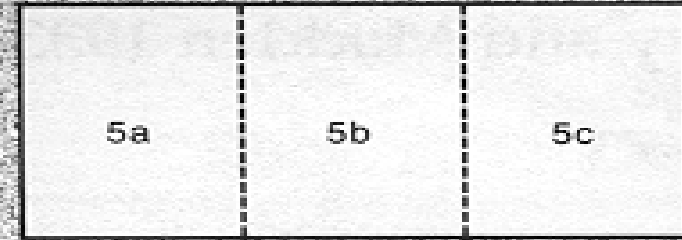
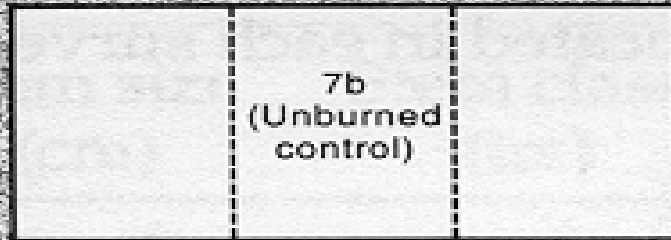


- All overstory trees killed, all plots
- Vigorous aspen suckers, all plots
- Herb and shrub response vigorous, all plots
- Grass sparse on CFS plots, significant on Vega plots

# Chisholm Fire, FBP Fuel Type Map







Water dugout



Scale









# Chisholm vs Vega

- Temp 26
  - RH 26
  - *Wind 49(77)*
  - DC 387
  - *BUI 121*
  - ISI 55
  - *FWI 98*
  - Fire Intensity-  
225,000kW/m
  - RoS - 2.2 to 5.4 km/h
- Temp 21
  - RH 28
  - *Wind 35(54)*
  - DC 284
  - *BUI 77*
  - ISI 41
  - *FWI 67*
  - Fire Intensity-  
137,000kW/m
  - RoS -6.5 km/h

# Chisholm Fire Study

## Weather Conditions & Fuel Moisture

### Weather Conditions

- Three year moisture deficit, Slave Lake area
- Dry spring followed light snow pack
- Heavy fuels and forest floor drier than normal
- Fine fuels dry, warm temp, low RH, windy
- Conifer foliar moisture near its annual minimum
- Greenup of grass and herbaceous vegetation delayed by drought

# Chisholm/Vega Similarities

- Drought conditions
  - Below normal winter precipitation
  - Delayed green-up
  - May 23/01 –man-caused ignition of Chisholm fire
  - Low level jet wind
  - Slowed south of Slave Lake due to a weather change
- Drought conditions
  - Below normal winter precipitation
  - Delayed green-up
  - May 23/68- holdover from windrow burning runs 60 km in 10hrs
  - Low level jet wind
  - Slowed south of Slave Lake due to a weather change

# 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



- Fire severity in aspen as a function of stand age

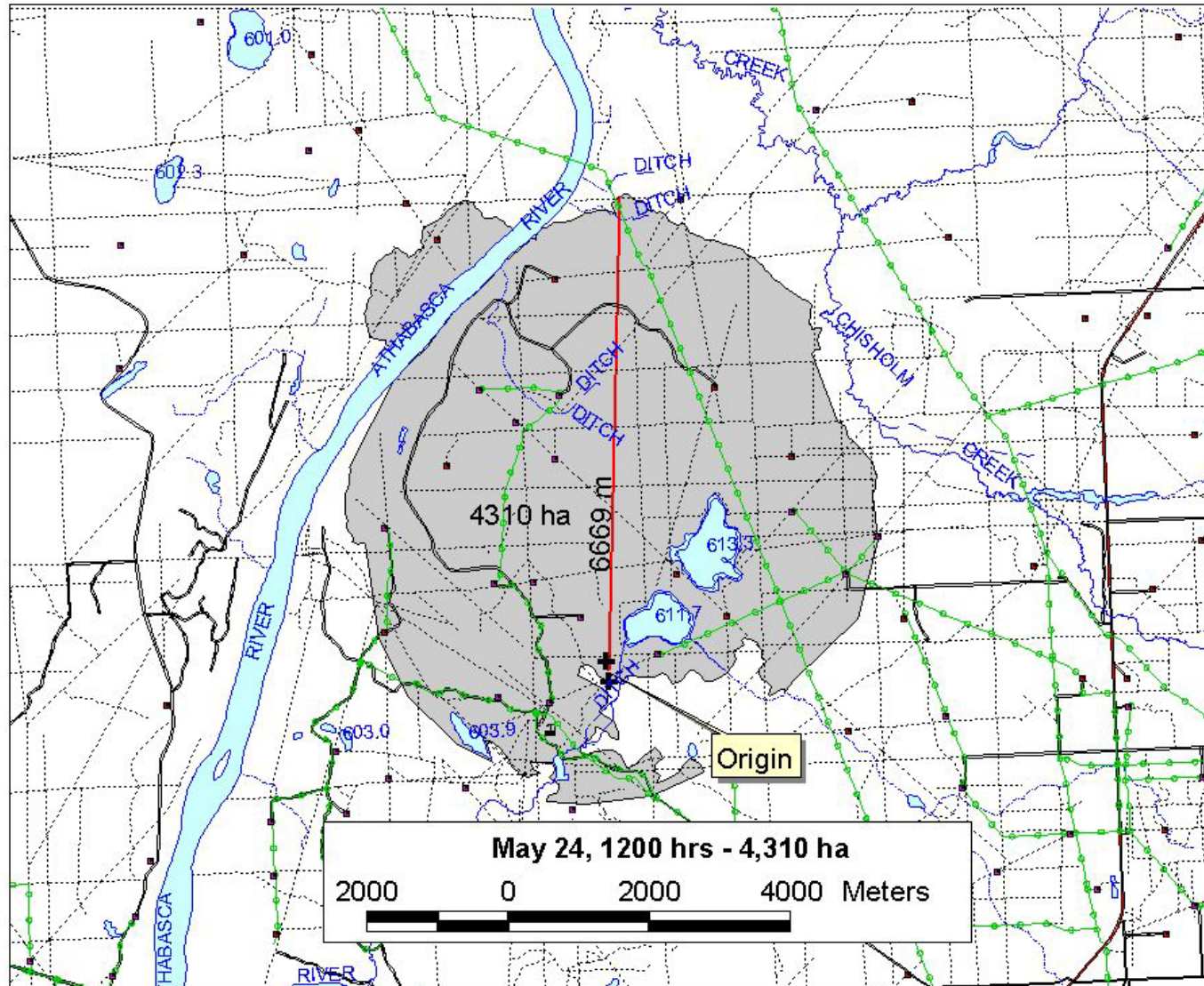
	<b>CFS Plots</b>	<b>Vega Fire Plots</b>
Mineral soil exposure (average %)	30	0
Tree bole-scorch height (m)	3.6	0.5

# Chisholm Precedent Fire Behavior

- Field documentation
- Satellite confirmation

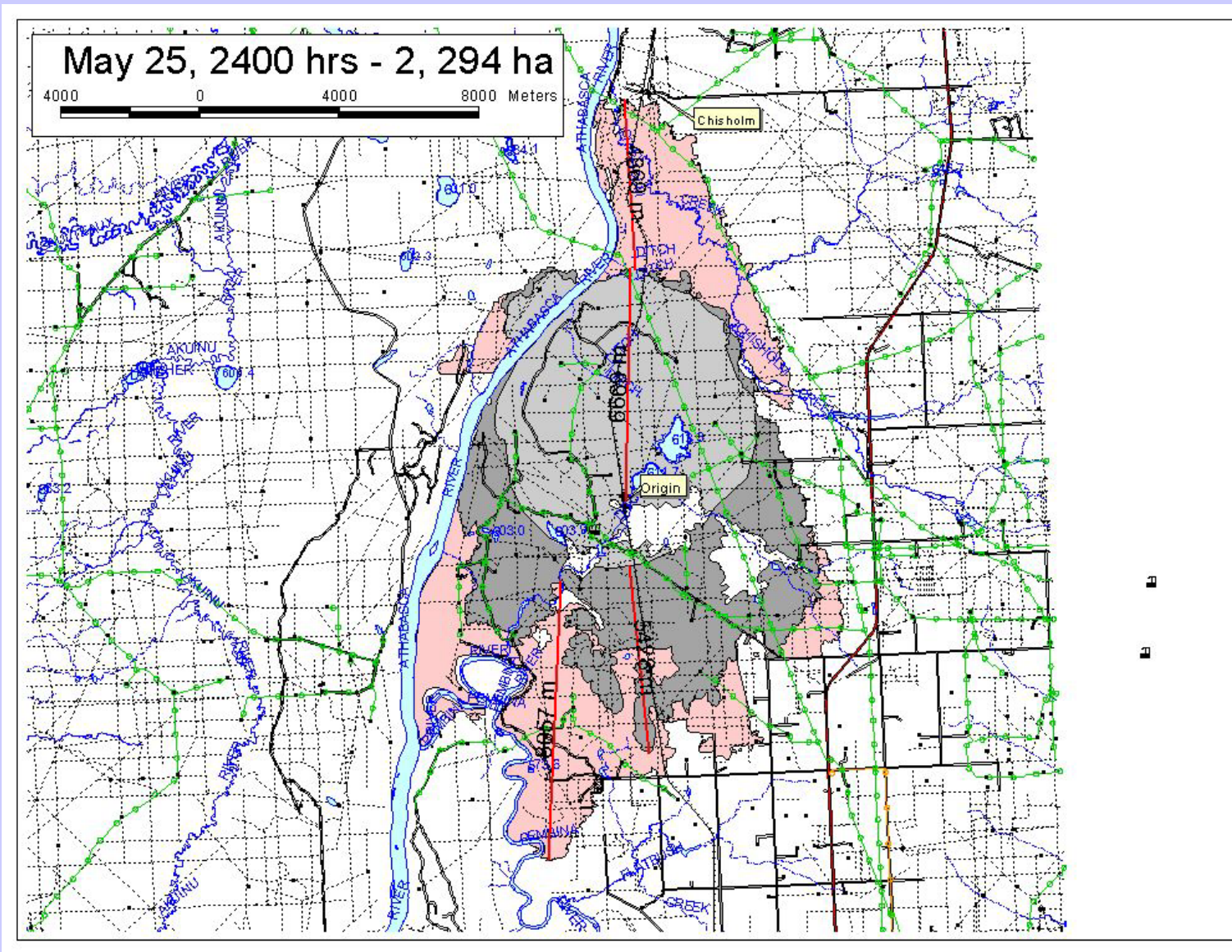
# Chisholm Fire Perimeter

## MAY 24<sup>TH</sup> 1200 Hrs



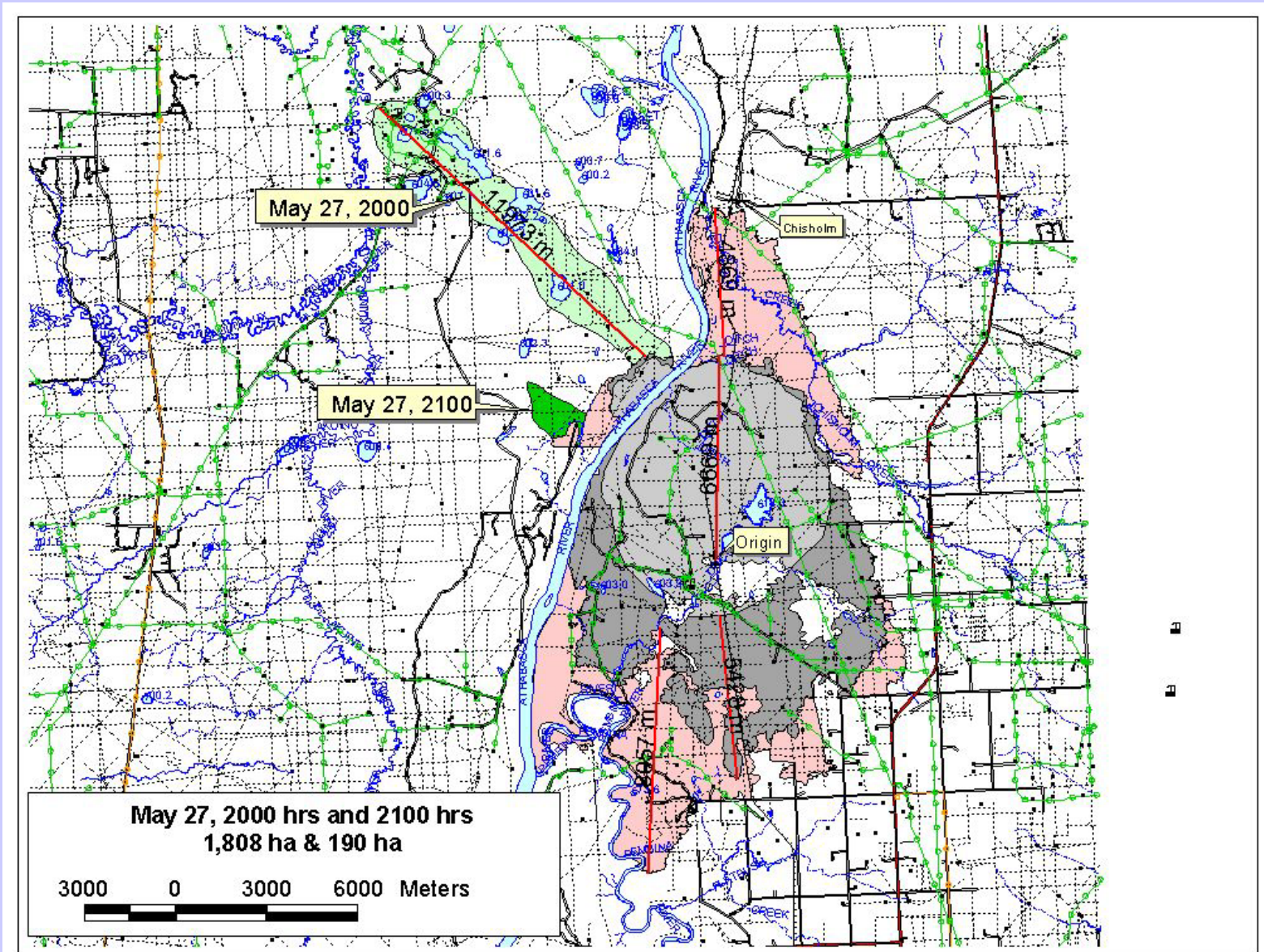
# Chisholm Fire Perimeter

**MAY 26<sup>th</sup> 2400 Hrs no Change From May 25<sup>th</sup>**



# Chisholm Fire Perimeter

## MAY 27<sup>th</sup> 2000 Hrs and 2100 Hrs



# Chisholm Fire May 27<sup>th</sup> PM

## Fire Behavior on Chisholm West



Head of fire at 1736



Spot fire with 200 m of head 1744



E Flank C2 & C3 1755



W Flank C2 & C3 2004



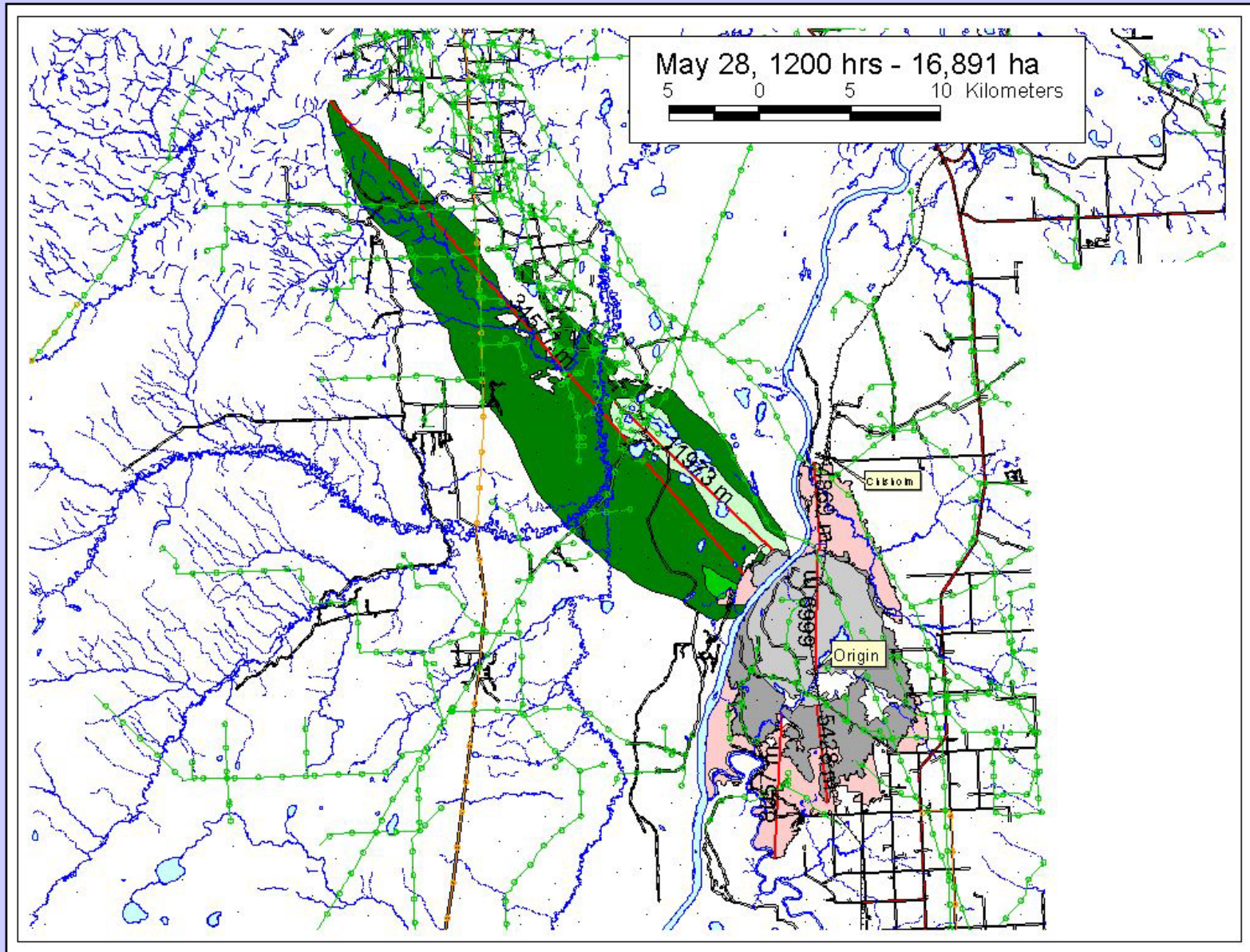
W Flank C2 2059



W Flank C2 beside lake 2110

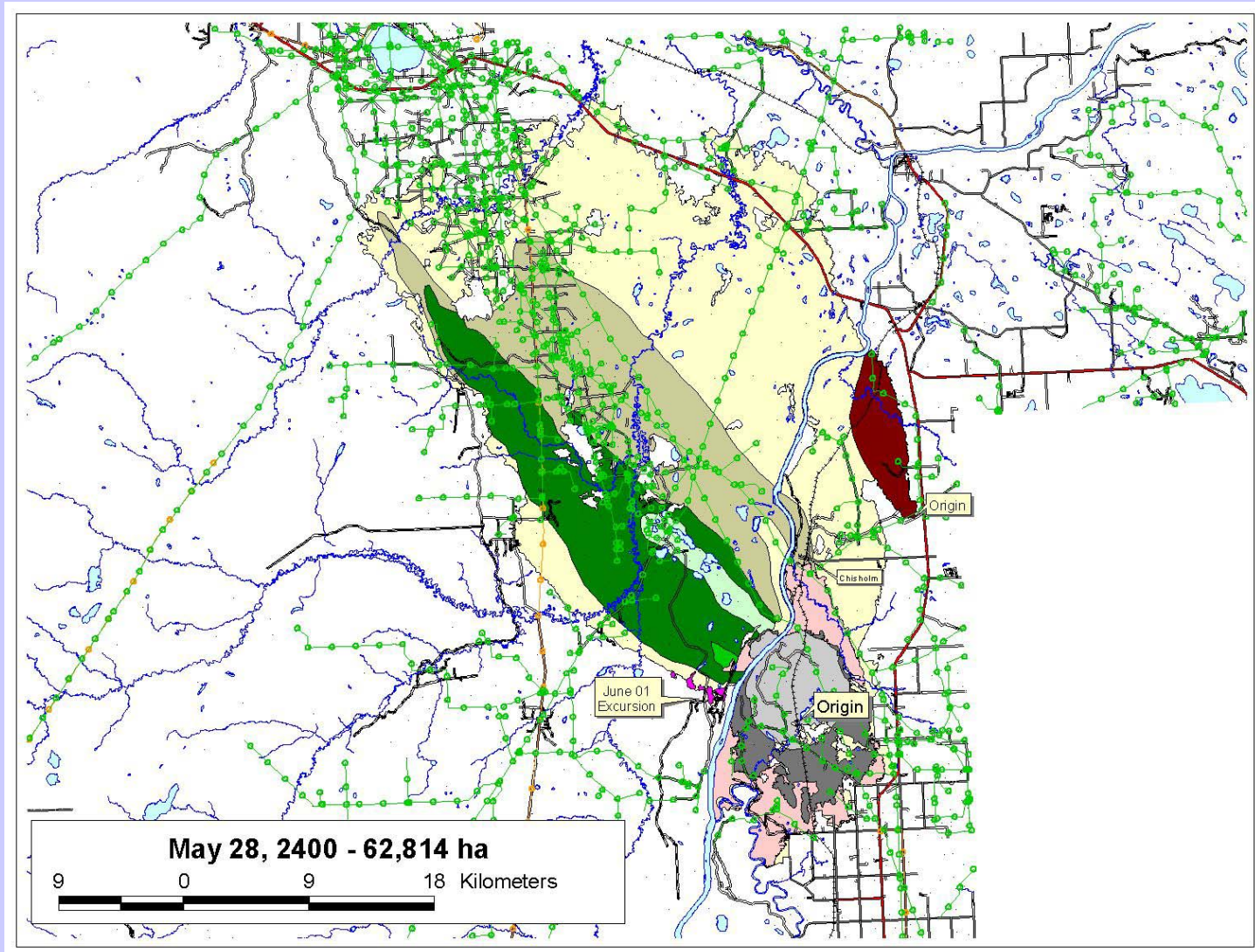
# Chisholm Fire Perimeter

## MAY 28<sup>th</sup> 1200 Hrs



# Chisholm Fire Perimeter

## MAY 28<sup>th</sup> 2400 Hrs





# Chisholm Fire May 28<sup>th</sup>

## 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



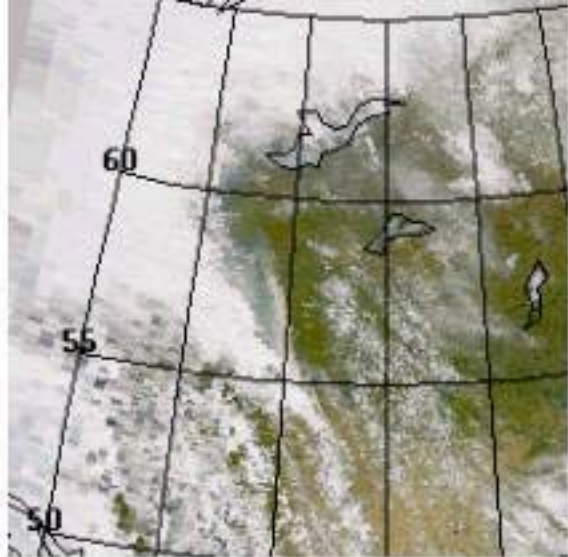
Convection column to 45,000 Ft  
Edmonton radar 1930



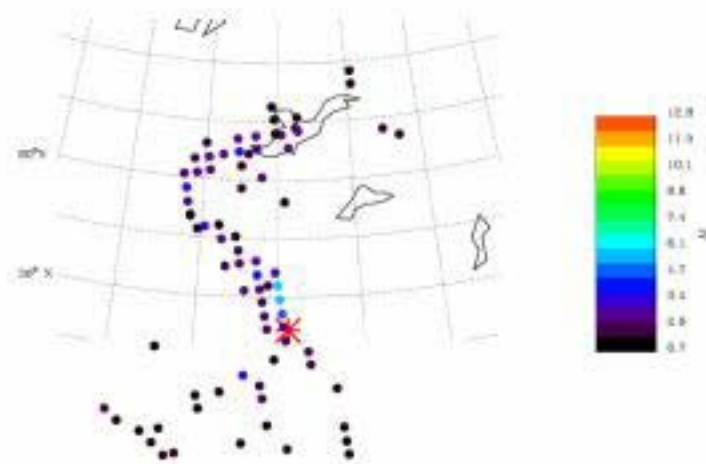
East flank SE of Chisholm C2  
fuels 1652



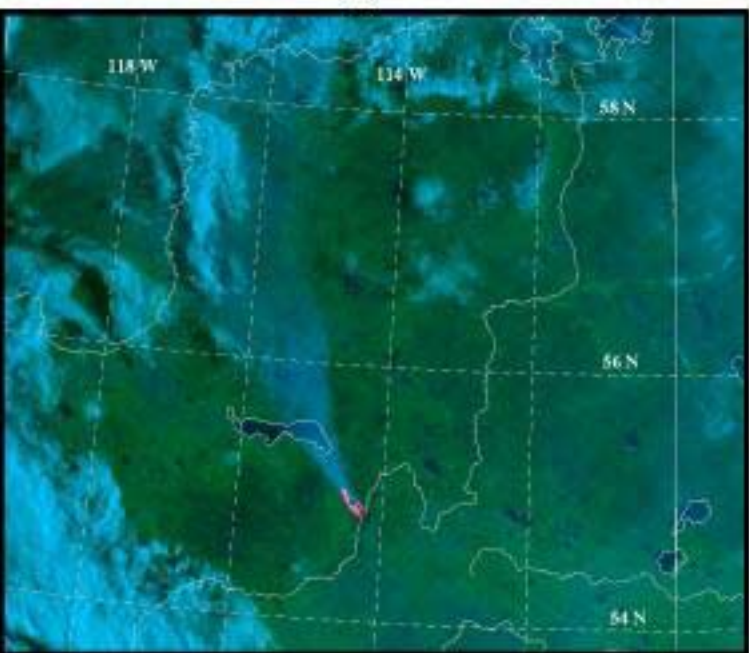
East flank of highway near  
Hondo 2110



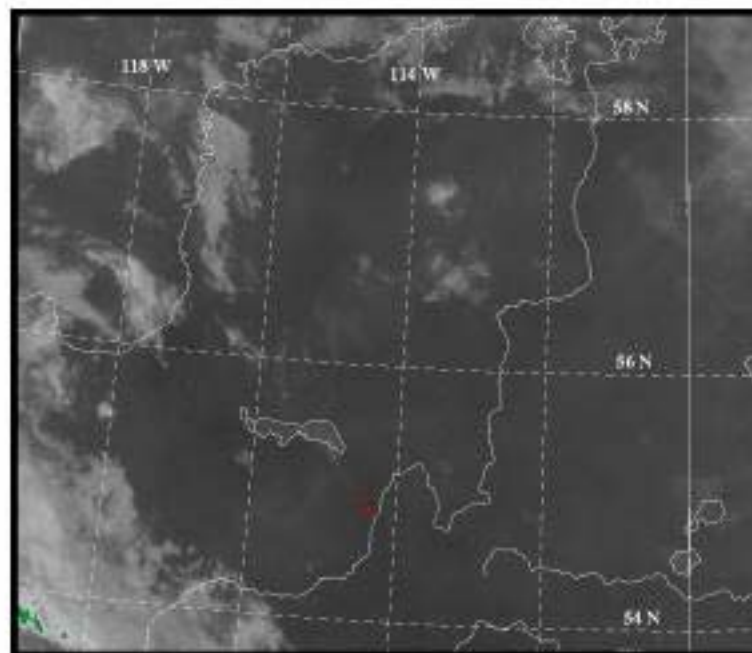
(a)



(b)

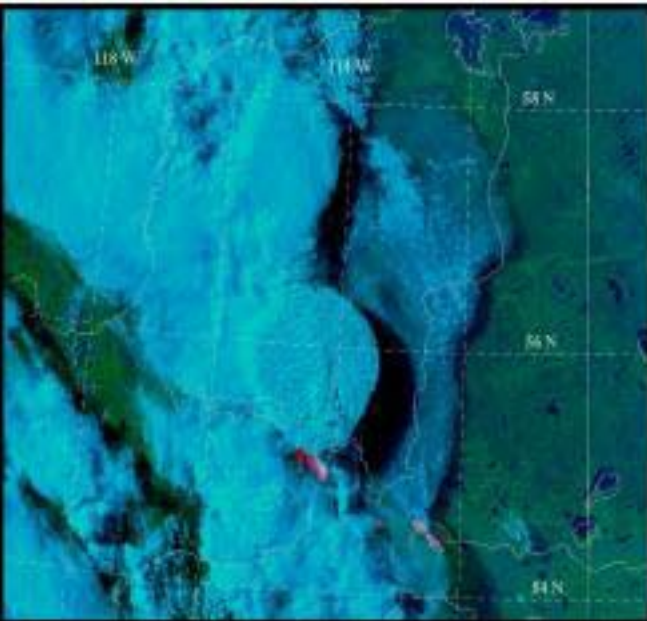


(c)

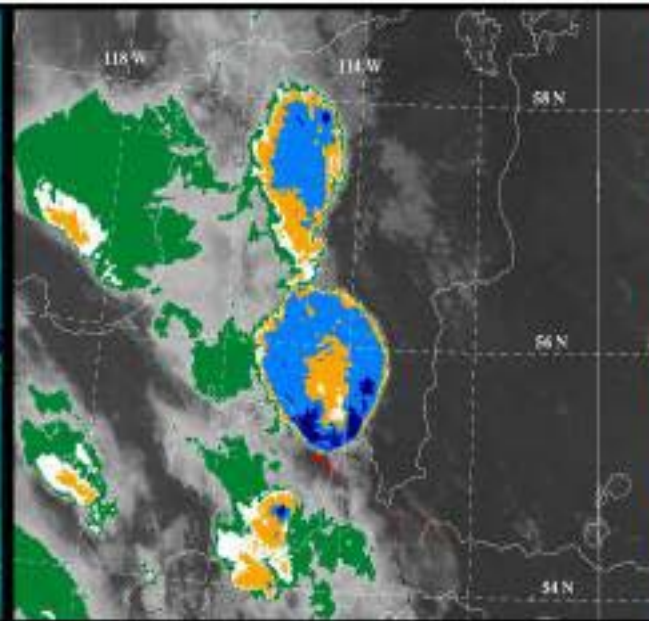


(d)

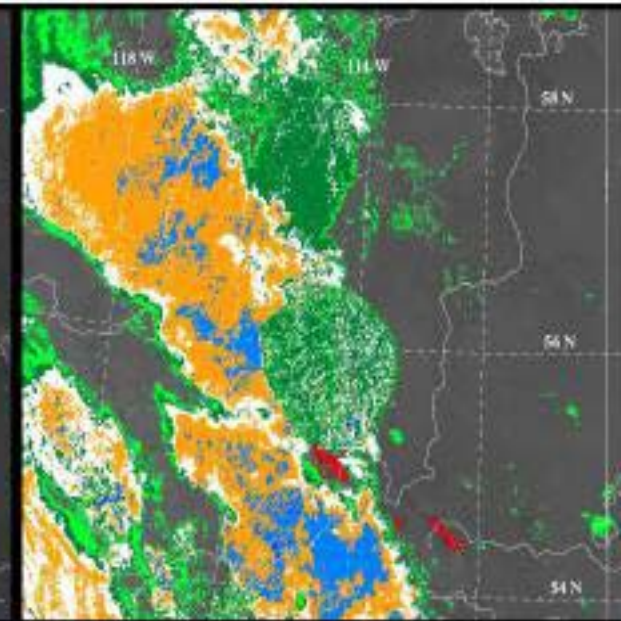
Figure 1



(a)



(b)



(c)

# Chisholm Fire Fire Effects



Wind damage in coniferous stand



Depth of burn in Sb Sphagnum  
moss 8 - 10 cm



Depth of burn in Mixed wood  
stand 12 - 15 cm



Evidence of very strong winds  
in willow stand



Evidence of strong wind & wind  
damage in Aspen stand

# Chisholm Fire

## Fire Effects

Evidence of horizontal roll



Ground fire depth re-burn of  
Mitsue 1998 burn



Depth of burn in C2 stand

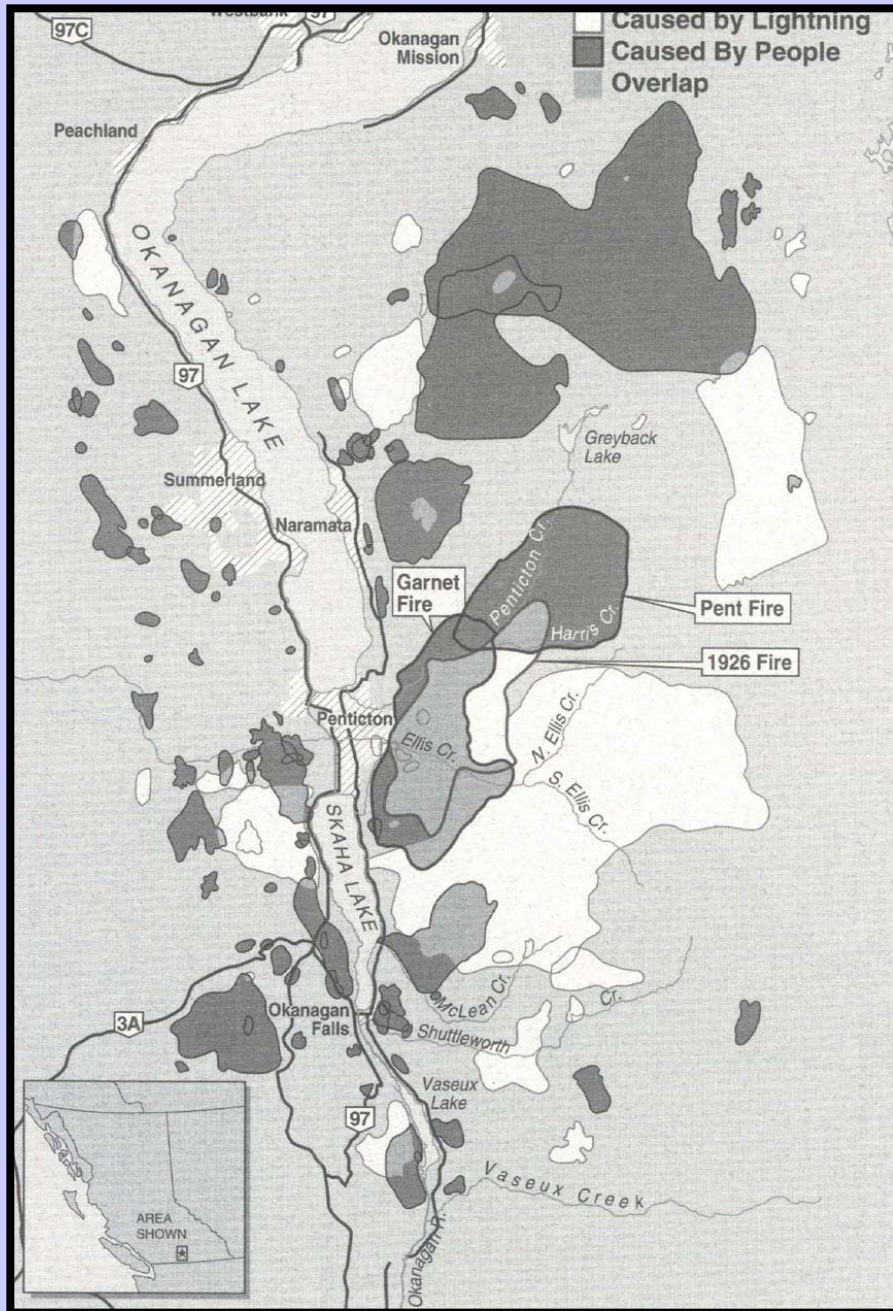


Evidence of fuel consumption

# Fire Behaviour In Immature vs. Mature Aspen Stands Under Severe Burning Conditions

Does Fire History Make a  
Difference?

Foothills Model Forest

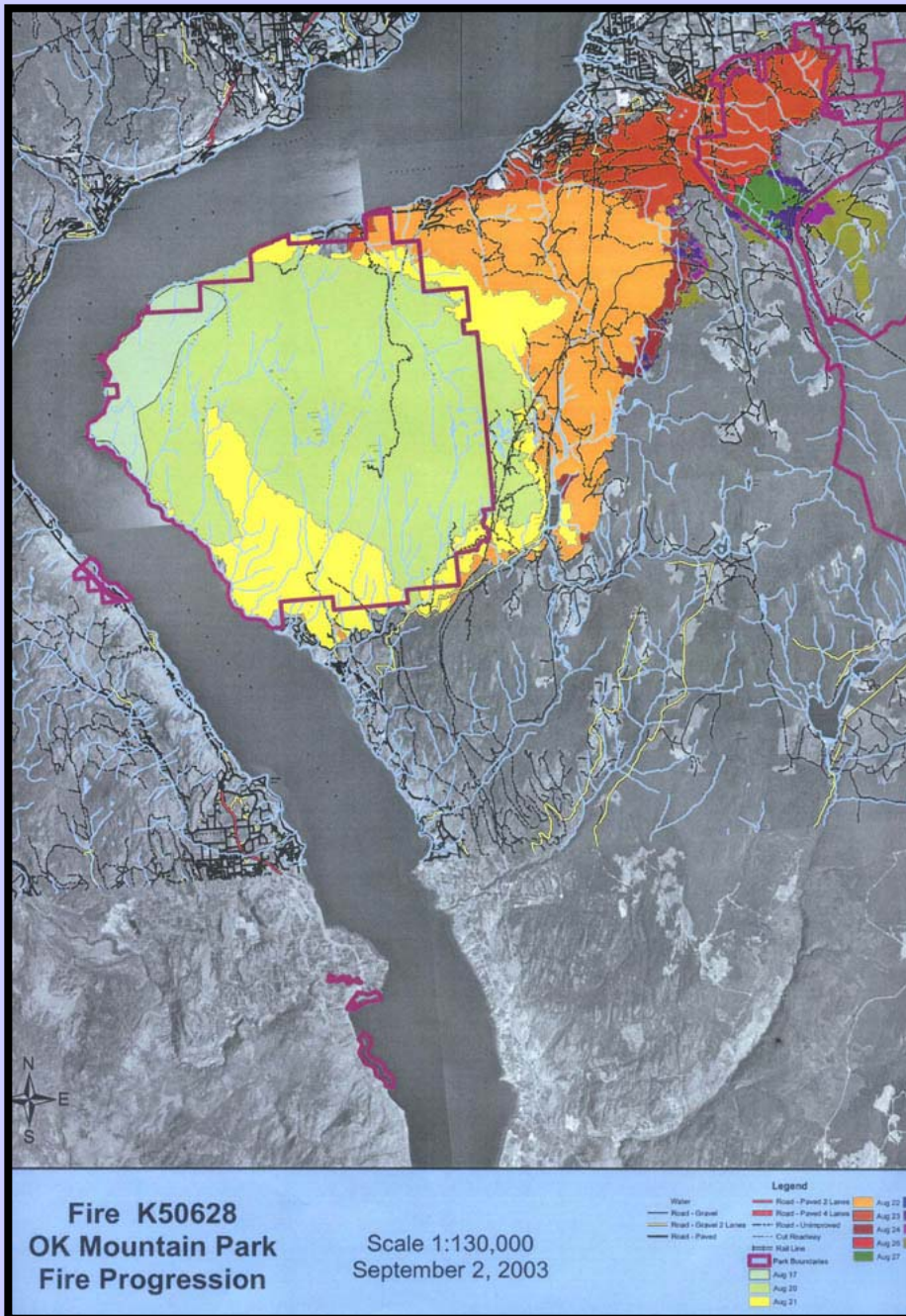


## 75 year Okanagan fire history map shows:

- 1/2 the area burned at least once
- Significant areas re-burned
- 90% of lightning fires suppressed at <0.1 ha
- Large fires in 1920s, 1930s, 1990s, 2003
- No large fires in Okanagan Mountain Park

# Okanagan Mountain Park Fire, 2003

- Severe drought and wind
- Entire 10,000 ha park burned in 25,000 ha fire
- East half of fire burned before (1920s, 1930s)
- No landscape-scale fuelbreaks

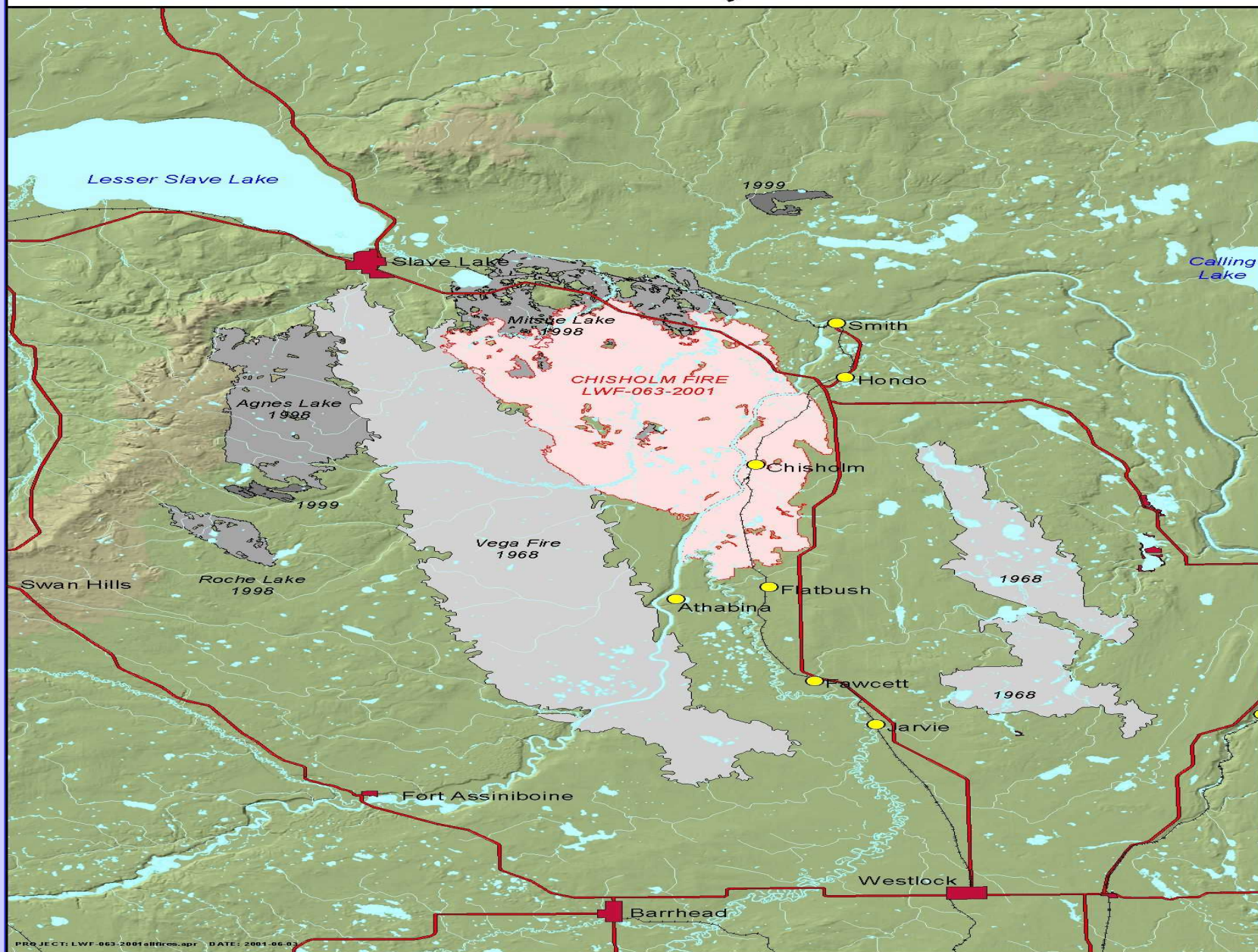




Aspen stands:  
Fuel or Fuelbreak  
at a Landscape  
Scale?

Plo 6 S  
30/10/11

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



# Summary

- Precedent fire behavior
- Demonstrates the effect of an aging forest
- Confirms the authenticity of the drought code and build-up index
- Makes the case for future fire research
- Precedent community and resource impact emphasizes fire-smart programs as proactive solution



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