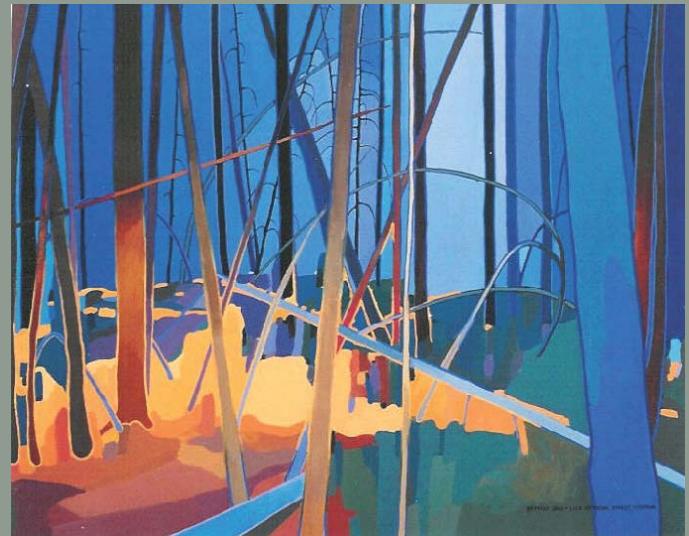


# The management of flammable forest landscapes: a hierarchical approach

David L. Martell

SFMN Knowledge Exchange Workshop  
Landscape Planning and Design:  
From Science to Implementation

Winnipeg, Manitoba  
April 15 – 16, 2008



J. Beverly

# Acknowledgements

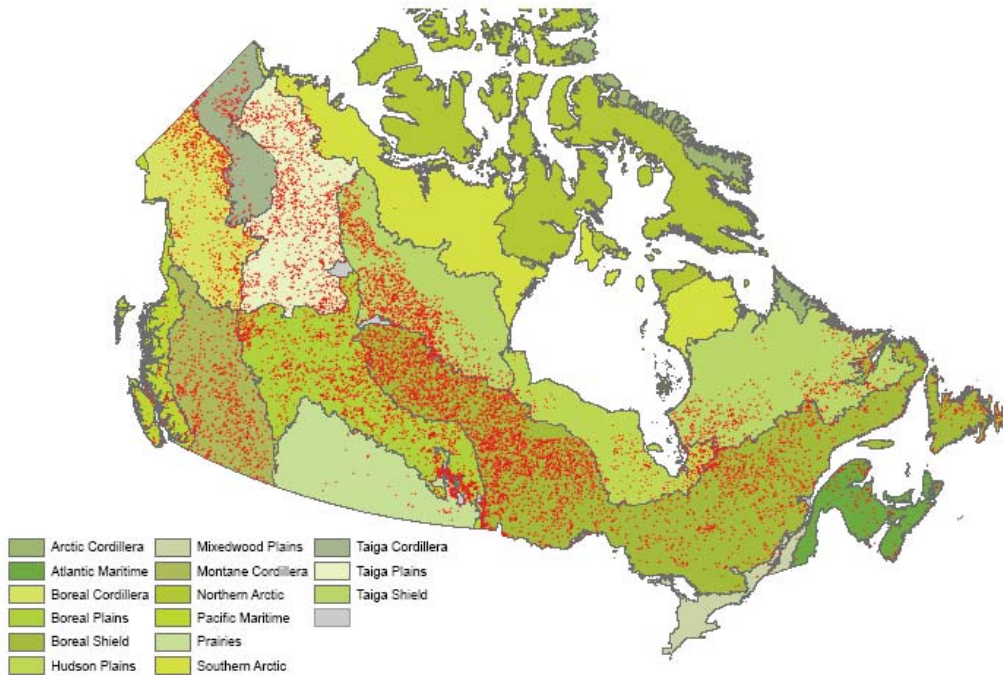
Sustainable Forest Management Network & Natural Sciences & Engineering Research Council of Canada

Alberta Sustainable Resources Development, British Columbia Ministry of Forests, and Ontario Ministry of Natural Resources

Alberta Pacific Industries Ltd., Millar Western Forest Industries, and Tembec Inc.

# Fire Helps Shape Canada's Forest Landscapes

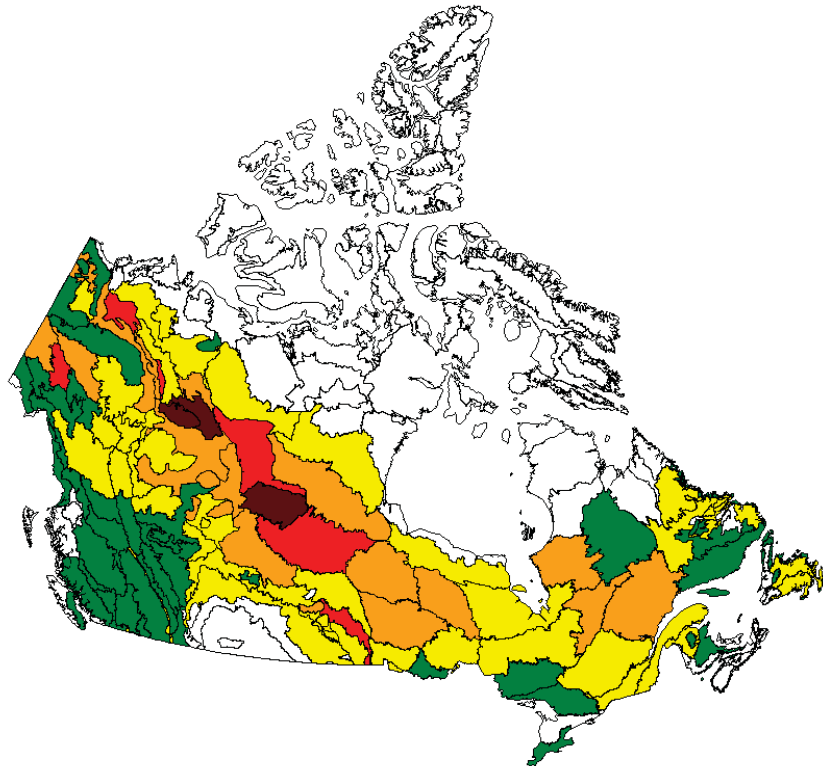
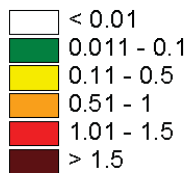
Forest Fires > 200 ha in Canada  
1959-1999



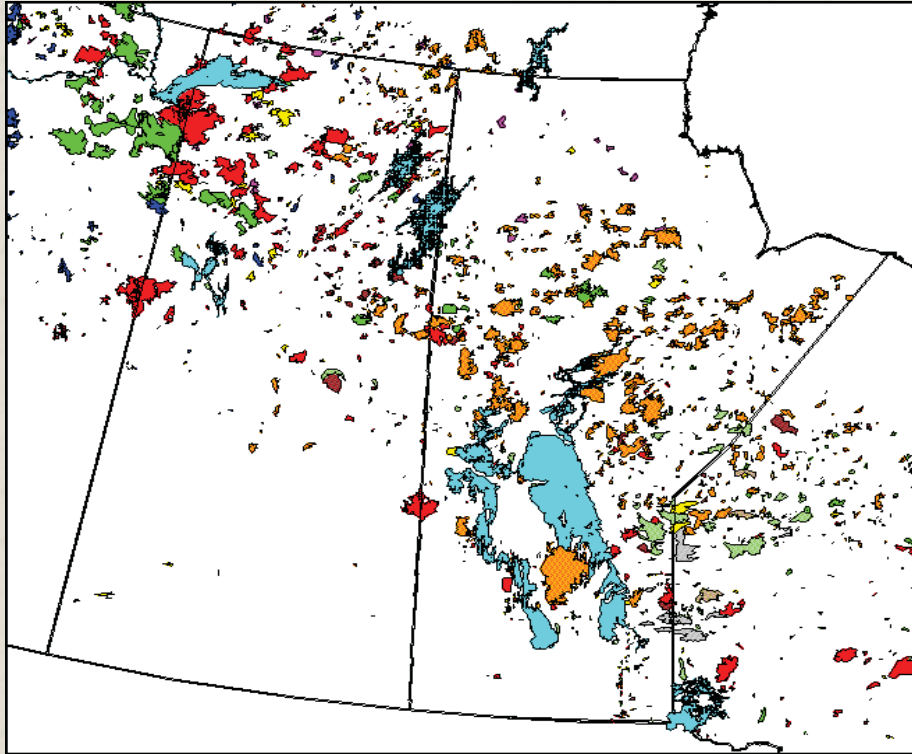
06/02/2007

# Area Burned by Ecoregion

Percent Annual Area Burned



# Fire Important in Manitoba



Fires greater than 200 ha since 1950

# Overview

Impact of fire on forest stands

Impact of fire on forest landscapes

Incorporating potential fire losses into forest management plans

Integrated fire / forest management planning at the forest management unit level

Looking beyond fire and timber supply

Truly integrated fire / forest management planning at provincial scales

# Impact of fire on forest stands

Intense crown fires destroy merchantable stands of timber that are scheduled to be harvested sometime in the future

Fire burns conifer needles, small branchwood, outer layer of bark, and some of the duff layer on the forest floor

Kills most, if not all trees



# Economic Impact of Fire

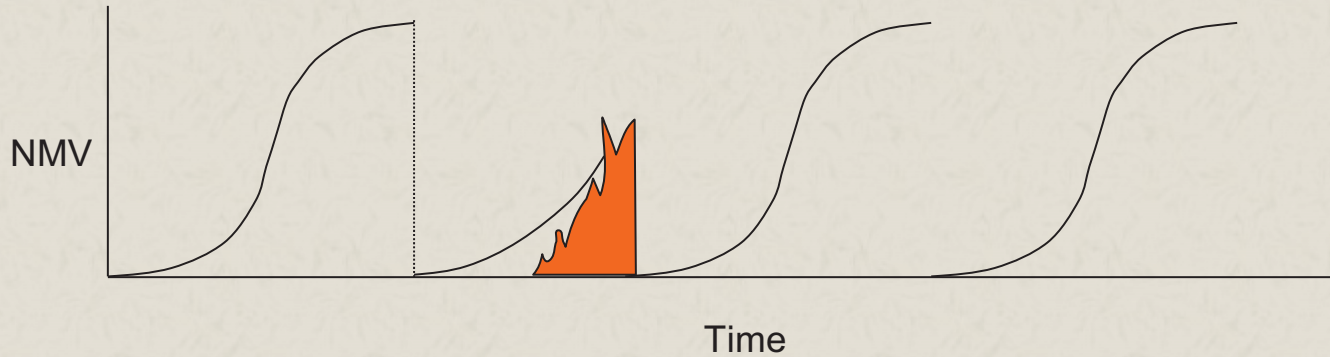
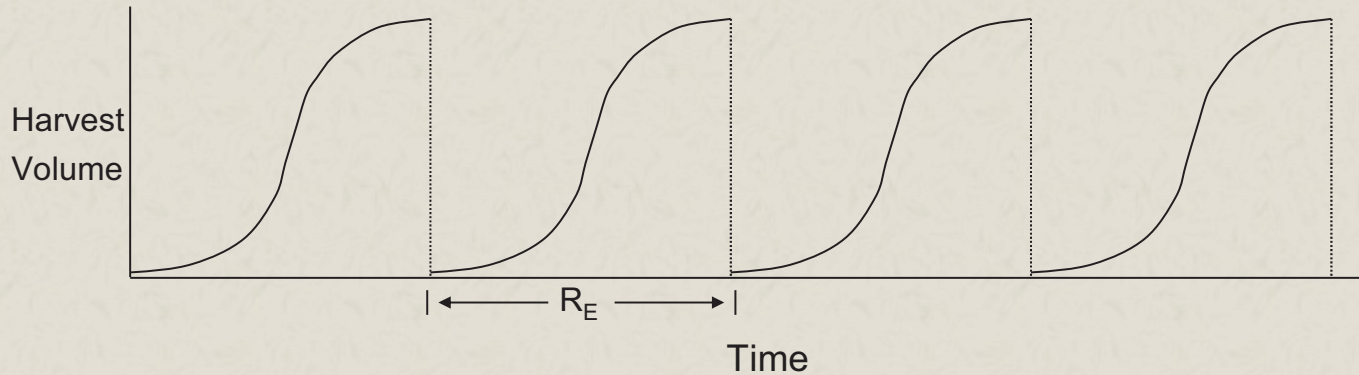
Burned trees may or may not be salvaged

Burned stands are regenerated and (hopefully), harvested at the end of the next planned rotation interval

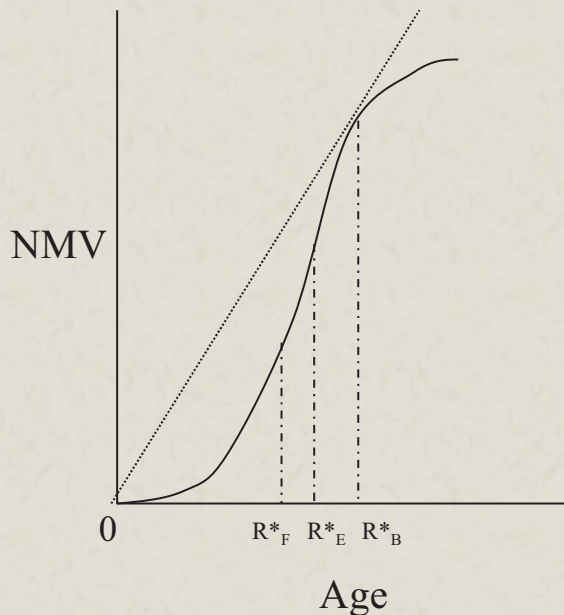
Economic impact is a reduction in ***future timber revenues***

How should a manager deal with the chance that a stand might burn before it is harvested?

# Economic impact of fire at the stand level



# Incorporating potential fire losses at the stand level



Consider how much the stand volume will increase in one year

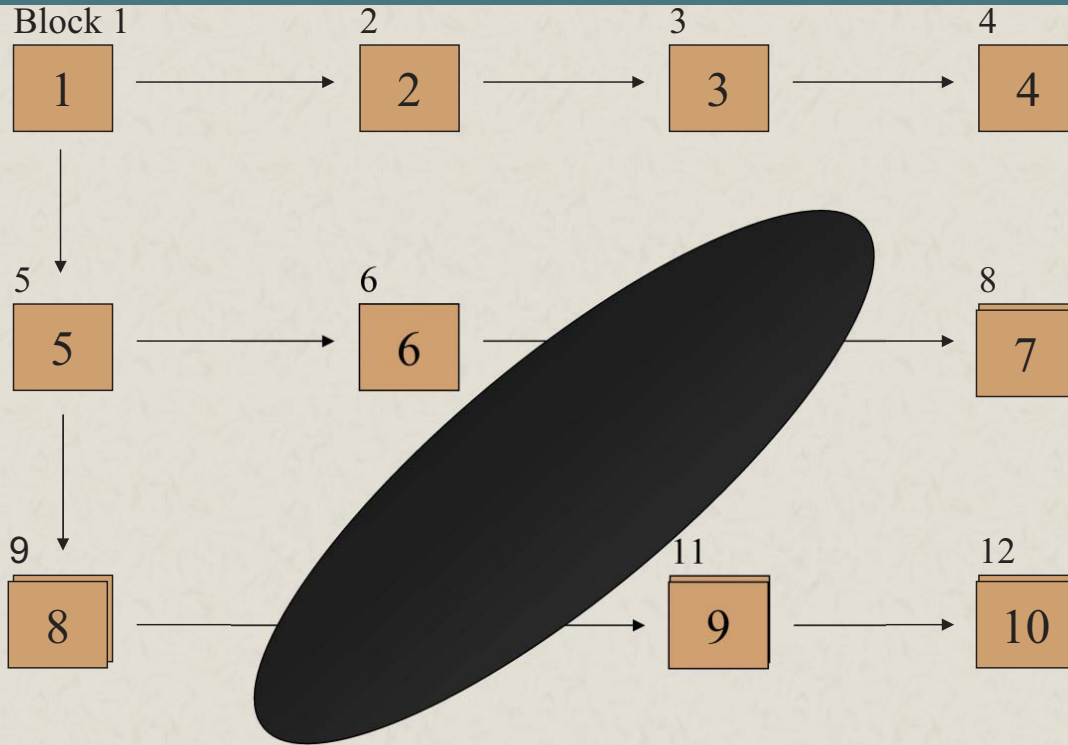
What is the chance that stand will burn before it is harvested?

Eventually decide to cut a slow growing stand **early** rather than take the chance that it will burn before you harvest it

Cut trees before they burn

Shorten the **planned** rotation

# Landscape Perspective



Build roads to blocks 8,9,11, and 12 earlier than planned (more expensive)  
Cut blocks 8, 9, 11 and 12 earlier than planned (less volume/ha)

# Incorporating potential fire losses into forest management plans

Aspatial timber harvest scheduling model with estimated average annual burn fraction to estimate AAC with fire (e.g., SFMM)

Spatially explicit operational plans with / without potential fire loss estimates (e.g., Patchworks)

Re-plan every 5 or 10 years or after “significant” events

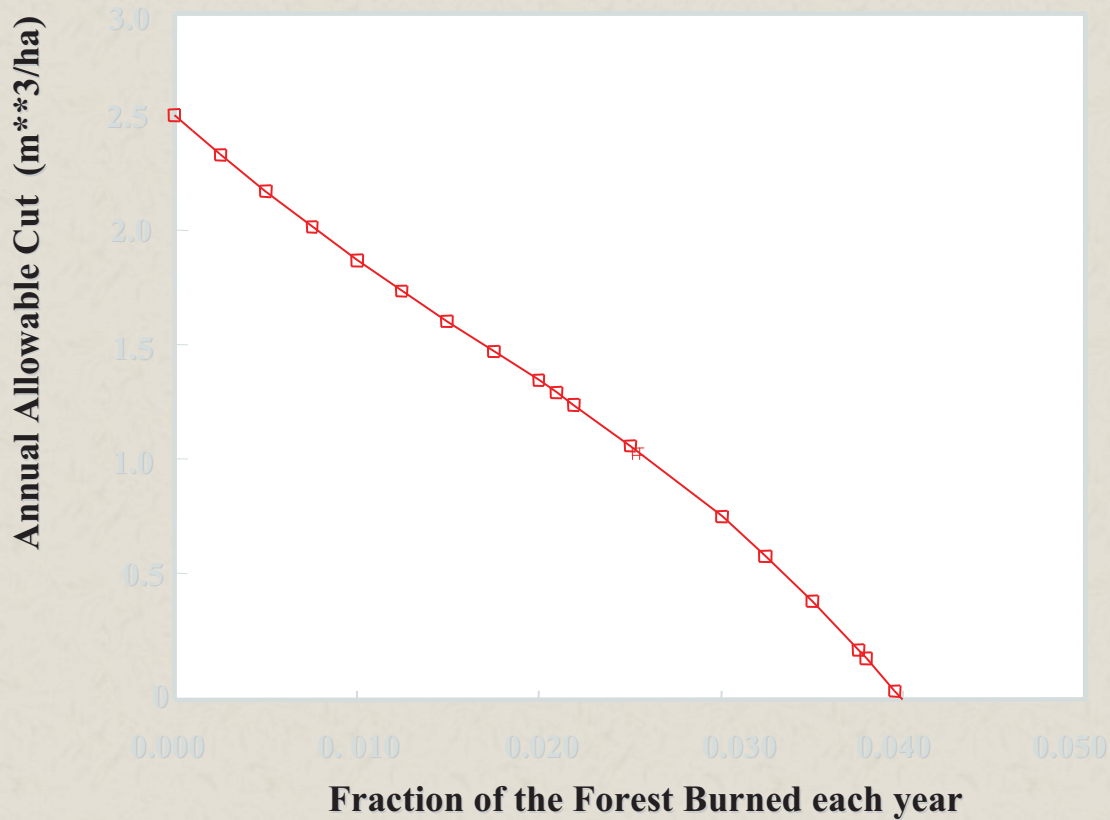
# A Simple Hypothetical Flammable Forest

100,000 ha of site class II Jack Pine

Complete road access already established

Cut and burned areas regenerate naturally at  
no cost with a 5 year delay

# Impact of Burn Fraction on Harvest



# Integrated Fire / Forest Management Planning in an FMU

Fire is not an exogenous variable

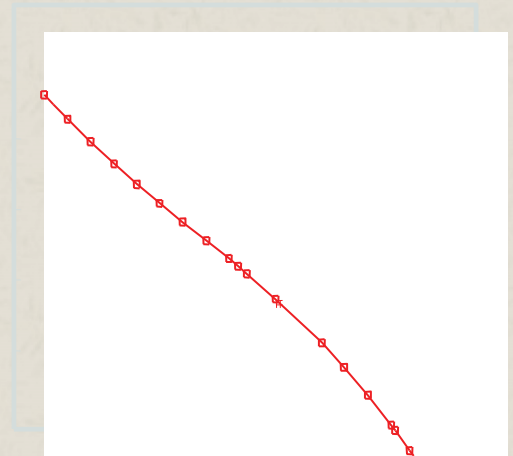
Spend money on fire protection to reduce ABF

Reduced ABF leads to increased AAC

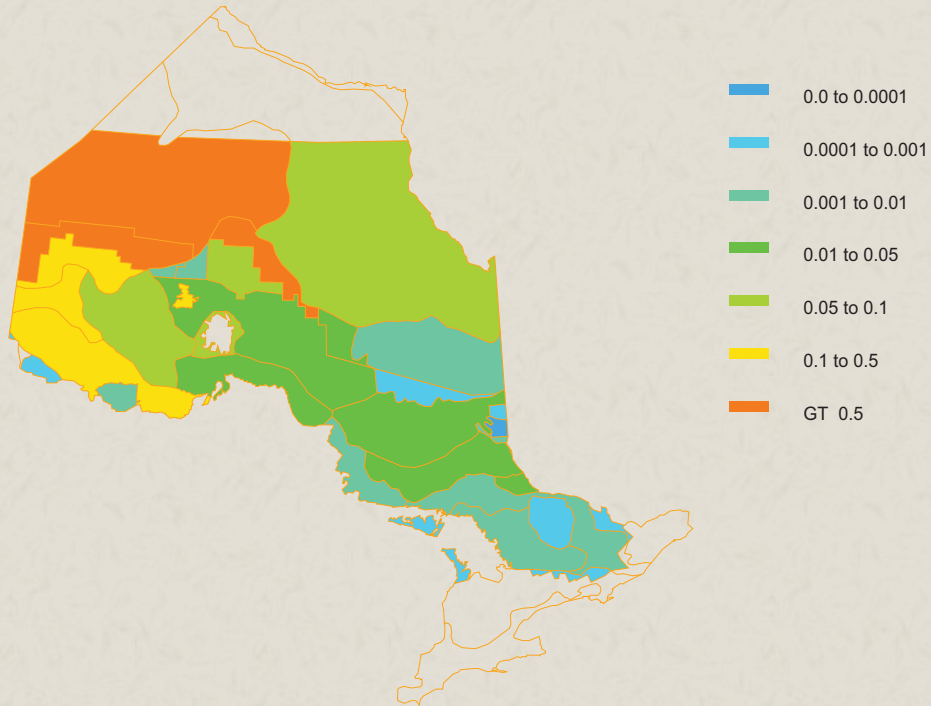
Maximize net profit:

Increased timber revenue (given the managed fire regime)

- cost of fire management



# Provincial Perspective



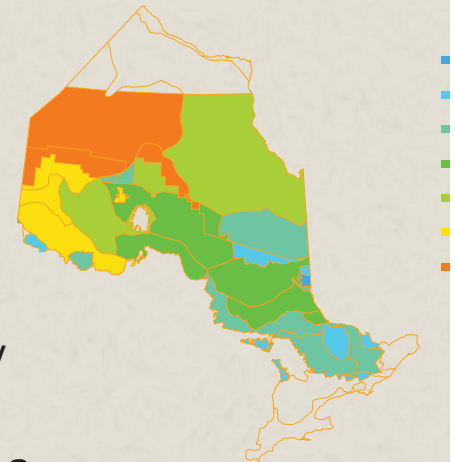
# Integrated Planning at the Provincial Level

Estimate AAC in each fire management analysis unit (FMAU) given current burn rates

Identify FMAUs where:

- 1) burn rates can be **decreased** at a reasonable cost
- 2) burn rates can be “allowed” to **increase** without significant impacts on timber supply

Re-allocate fire management resources to achieve a “better” balance of timber revenues and fire management costs across the province



# Fire threatens

Public safety

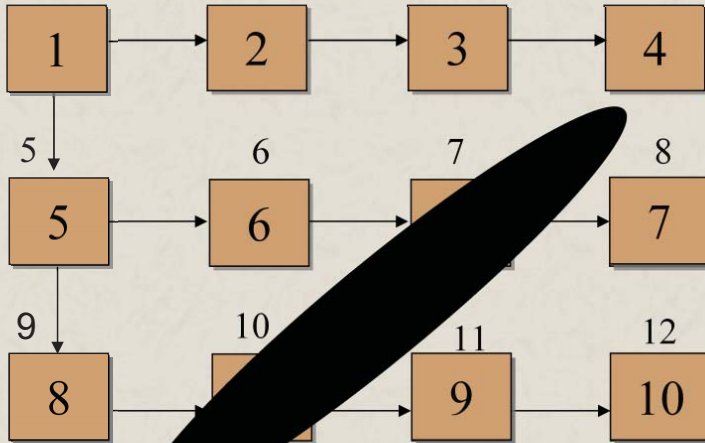


Ontario Ministry of Natural Resources



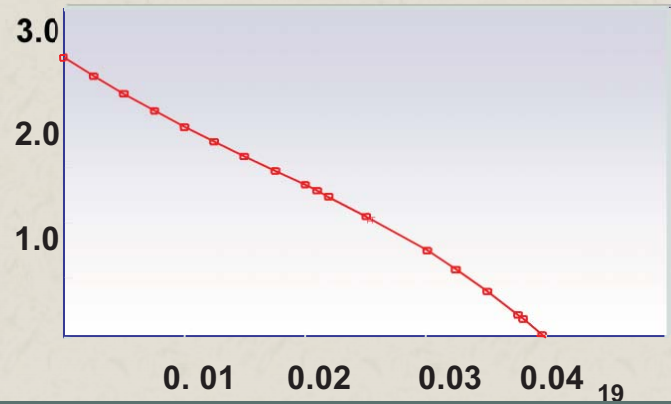
Property

# Fire destroys timber



Impact on harvest schedule

Impact on timber supply



# Fire does not destroy forests



Kenora 23  
1980



Kenora 23  
2001



# The fire management challenge

Fire **destroys** people,  
property and trees

Fire does **NOT** destroy  
forest landscapes



Ontario Ministry of Natural Resources

To what extent and how should we **tamper** with nature ?

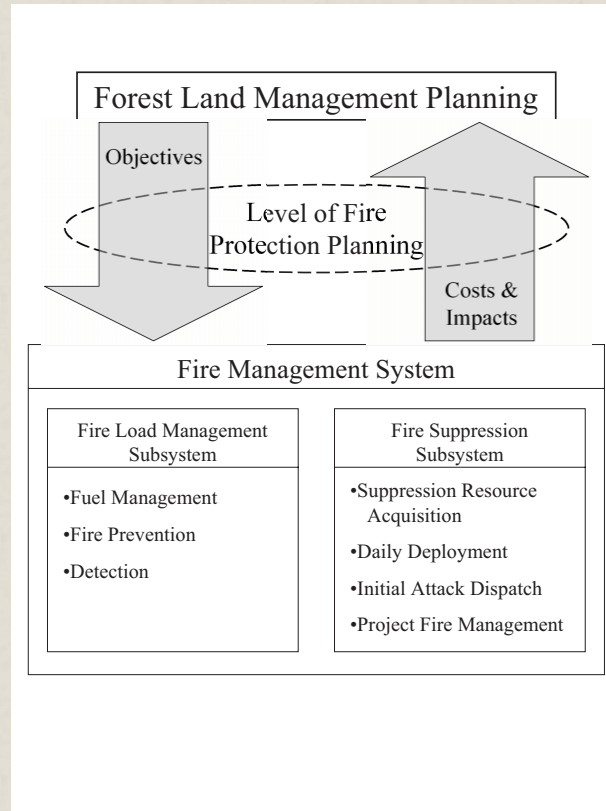
# Truly Integrated Provincial Level Planning

Partition the province into Fire Management Analysis Units (FMAUs)

Assess the potential impact of different burn rates on people, property, forest resources, and natural ecosystem processes in each FMAU

Decide what average annual burn fraction the fire management program will “deliver” to each FMAU and how land managers will manage their resources given those burn rates

# Fire impact management should address land management objectives



# Looking Beyond the Smoke and Flames

Fire but one of many significant sources of uncertainty that complicate the management of forest landscapes

Short term:                      globalization and prices

Intermediate term:    spruce budworm and mountain  
   pine beetle  
   societal needs and expectations

Long term:                      climate change

