



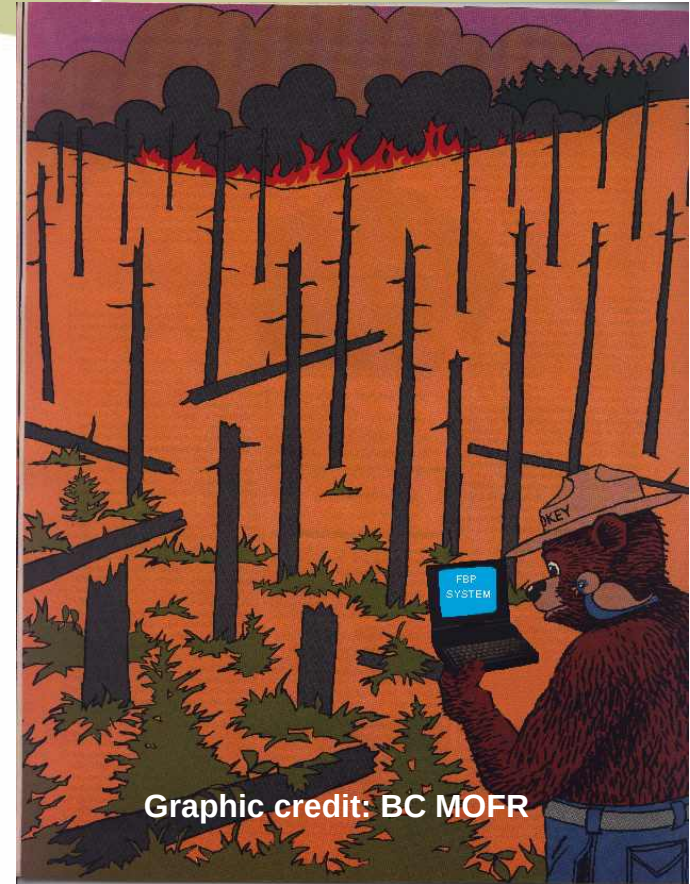
Future BC Fire Regimes: Emerging Fire and Forest Management Issues and Potential Adaptations Strategies

The Future Forest
Ecosystems of BC –
Exploring the Opportunities

Dec. 6, 2005

UNBC

Prince George



Graphic credit: BC MOFR

Brad Hawkes, Canadian Forest Service,
Pacific Forestry Centre, Victoria, B.C.





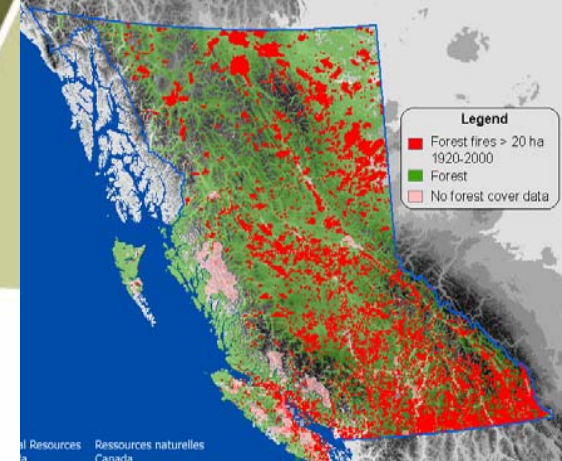
The Future is Not what is Used to Be



- Future is hard to predict - modeling
- Americans in 1893 predicted what 1993 would be like:
 - Gov't set up colleges to train servants
 - Aluminum houses - most forests cut down
 - Laws so simple - little need for lawyers
 - Travel by fast trains and balloons

Future transportation imagined
by Fred Strothman in 1900

<http://www.au.af.mil/au/awc/awcgate/awc-ofut.htm>



Presentation Outline

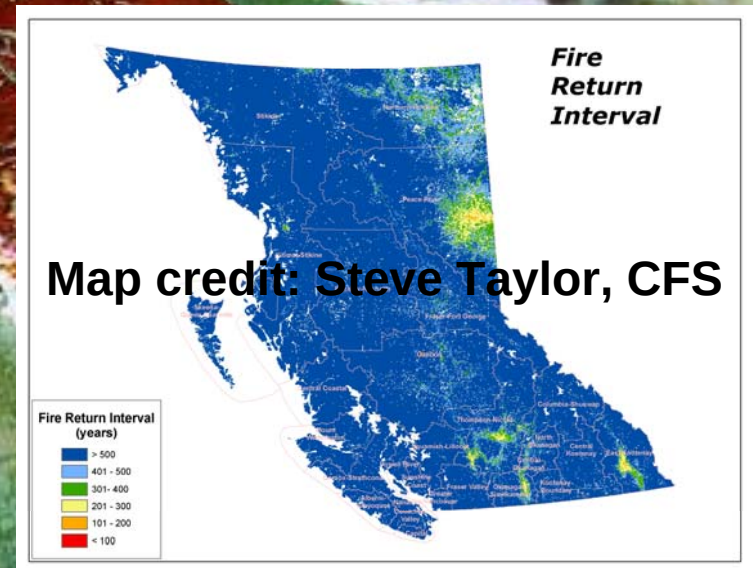
- BC Fire Regimes –components, change and future
- Emerging Fire and Forest Management Issues
- Potential Adaptation Strategies
 - Fire Strategy
 - Assessing, sharing and minimizing fire risk
 - Increased incorporation of fire into sustainable forest management

Fire Regime

Frequency Intensity/Fire Type Severity
Size Pattern Season

- Frequency (fire cycle – time to burn over whole study area or % area disturbed per year – neg exponential model)
- Intensity/Fire Type (low intensity surface fires versus high intensity crown fires)
- Severity (forest floor; above ground e.g. tree crowns)

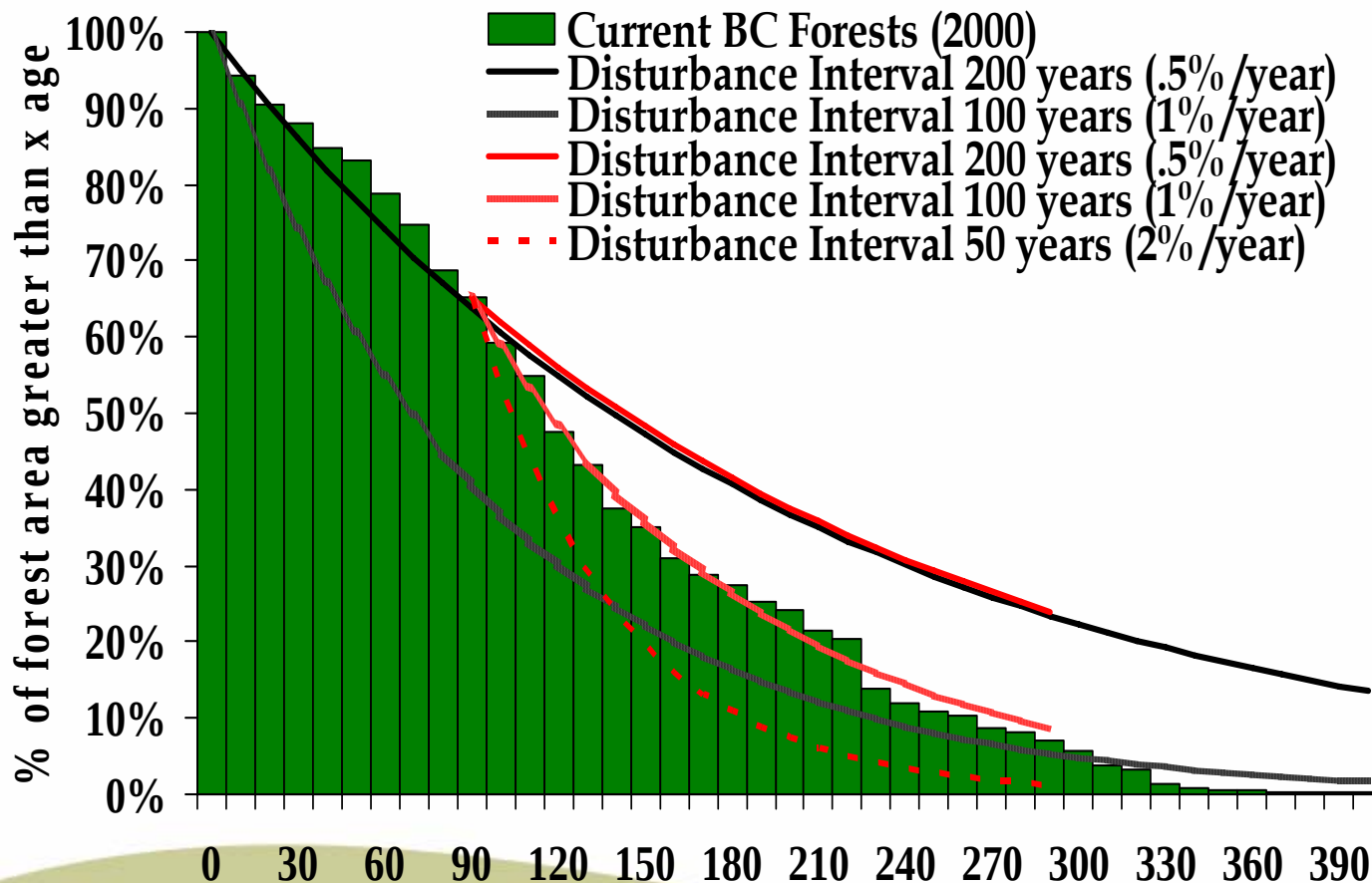
Image credit: Google Earth





BC Fire Regimes

MOFR age class analysis and fire cycles



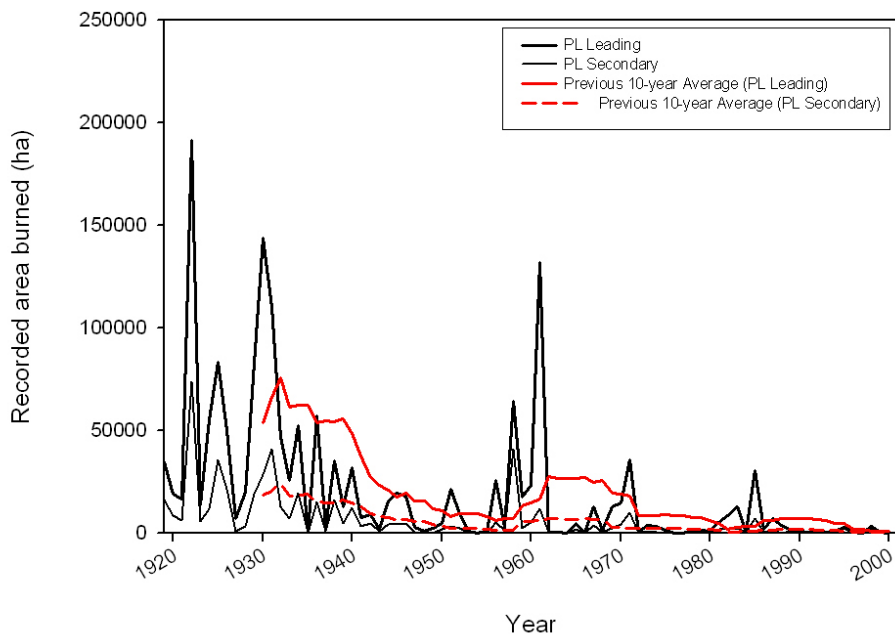


BC Fire Regimes

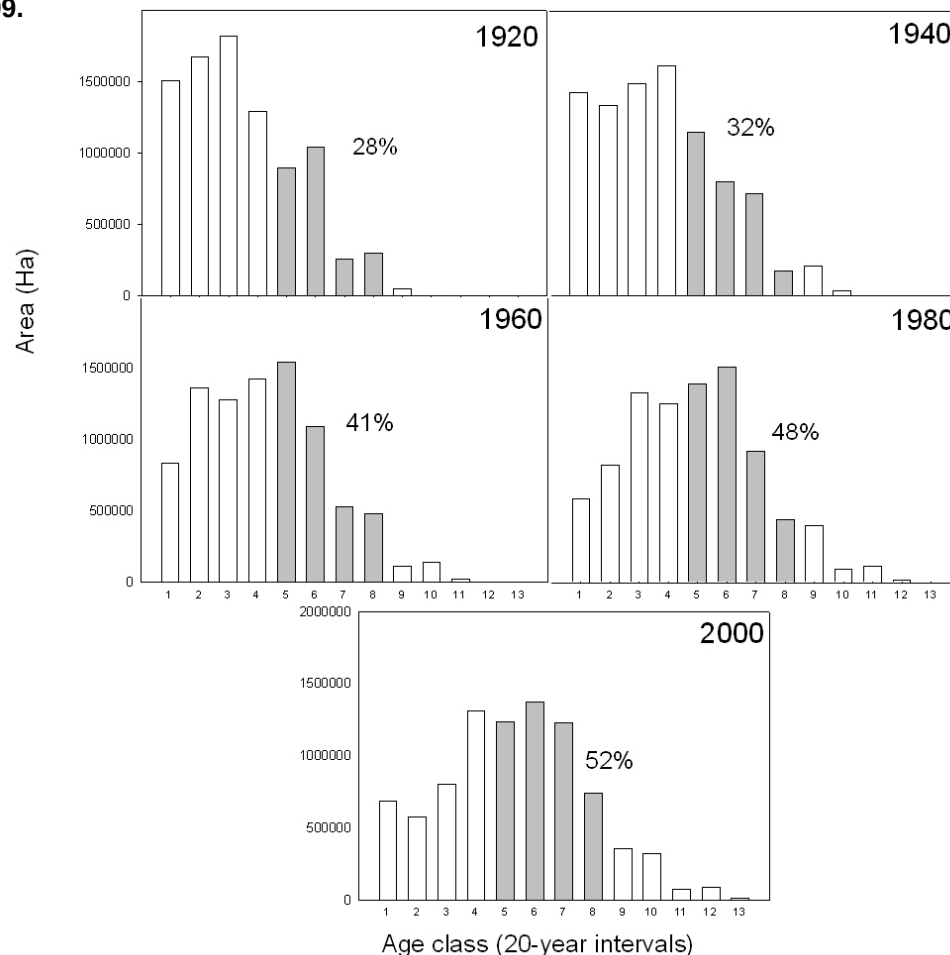
Lodgepole Pine Age Class and Area Burned Changes

Disturbance, forest age, and mountain pine beetle outbreak dynamics in BC: A historical perspective. 2004. Taylor, S.W.; Carroll, A.L. Pages 41-51 in T.L. Shore, J.E. Brooks, and J.E. Stone, editors. Mountain Pine Beetle Symposium: Challenges and Solutions. Canadian Forest Service, Pacific Forestry Centre, Victoria, British Columbia, Information Report BC-X-399. <http://bookstore.pfc.cfs.nrcan.gc.ca/>

Annual area burned in stands with PL leading, secondary in BEC units most affected by MPB.

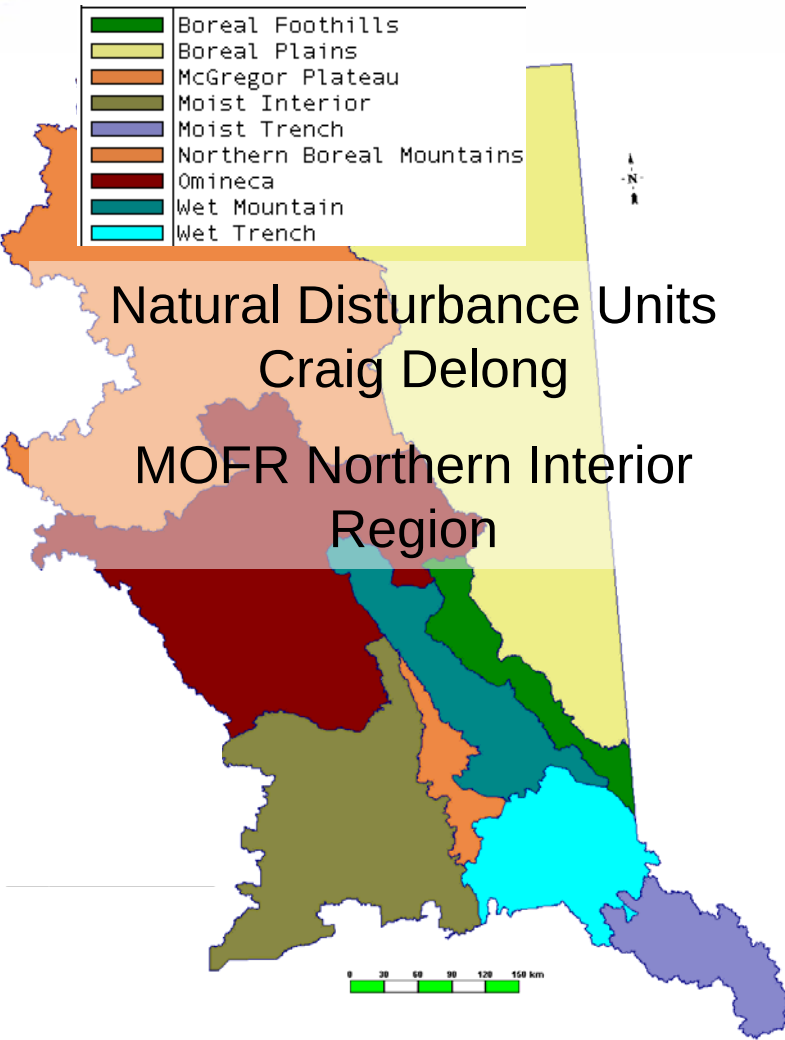
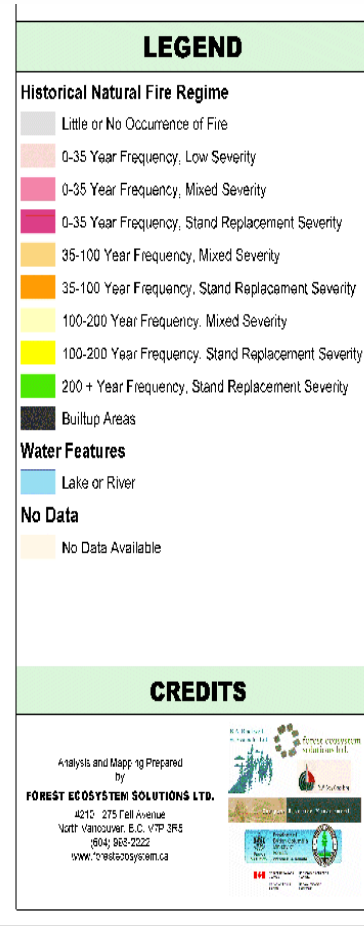


Backcast lodgepole pine age distribution in BEC units most affected by MPB

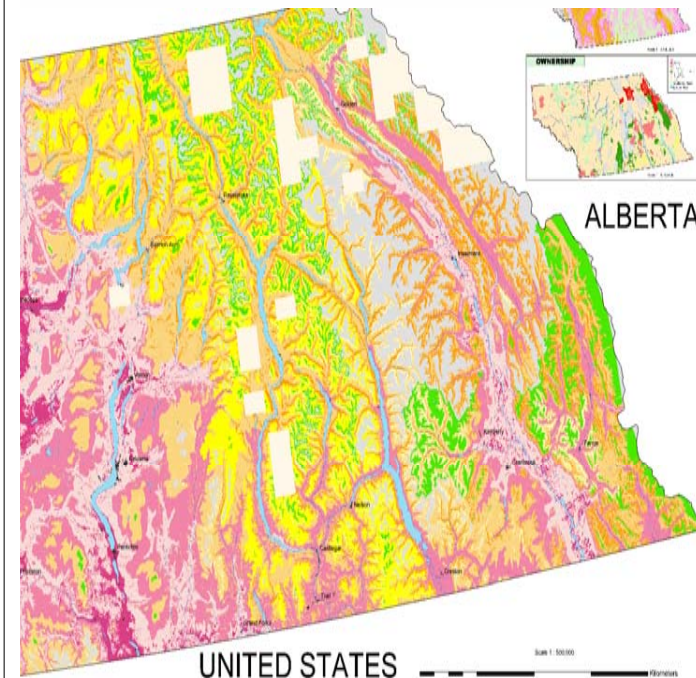


BC Fire Regimes

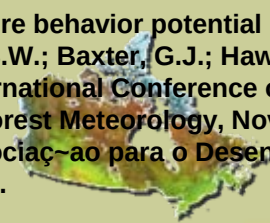
<http://www.for.gov.bc.ca/hfd/pubs/Docs/Lmh/Lmh53.htm>



**RW Gray; BA Blackwell,
 Consultants, Coarse Scale
 Approach to the
 Assessment of Forest Fuel
 Conditions in Southern BC**



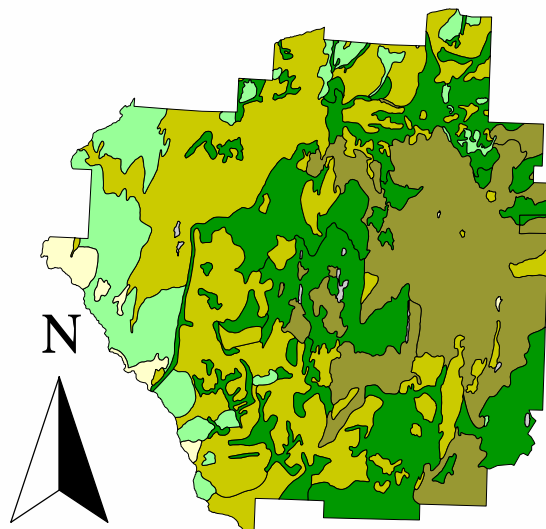
<http://www.forrex.org/publications/LINK/article.asp?article=183>



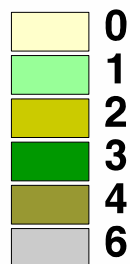
BC Fire Regimes

Changes in crown closure in Okanagan Mtn. Park 1938-1987 Steve Taylor, CFS

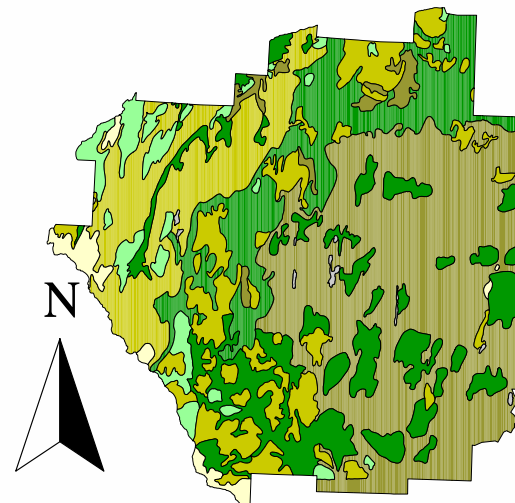
**Okanagan Mountain 1938
Crown Closure Class**



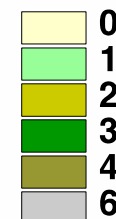
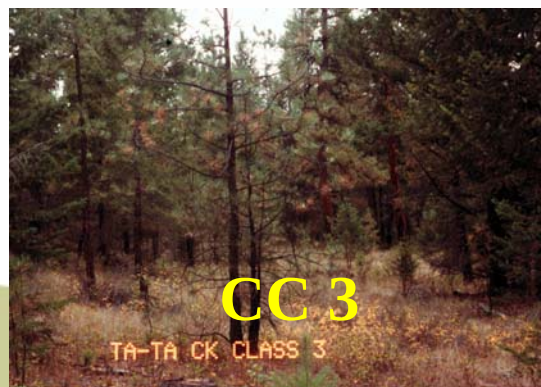
Ok38



**Okanagan Mountain 1987
Crown Closure Class**



Ok87

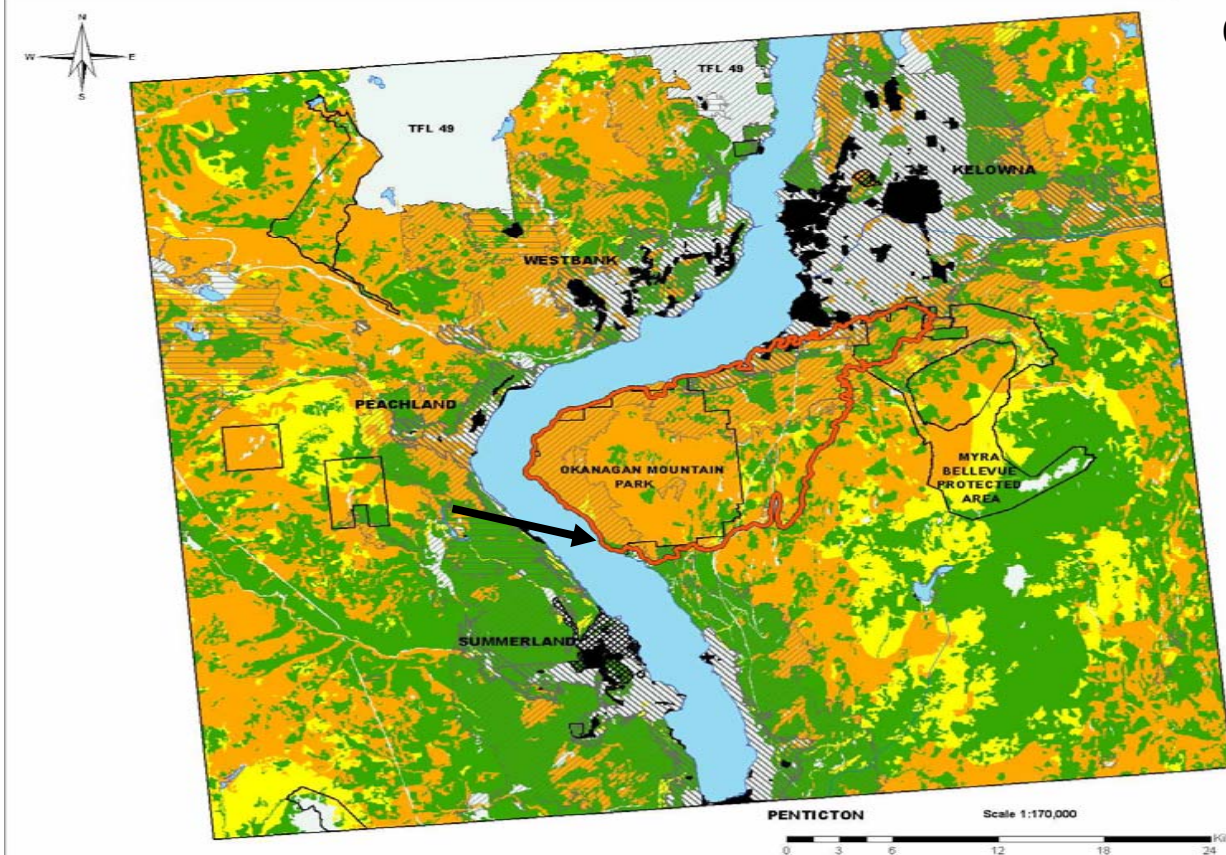


BC Fire Regimes



RW Gray; BA Blackwell,
 Consultants, Coarse Scale
 Approach to the
 Assessment of Forest Fuel
 Conditions in Southern BC

OKANAGAN MTN. PARK FIRE with CONDITION CLASS



LEGEND

- Fire Edge (August 24, 2003)
- Condition Class**
 - CC 0 - Non Contributing/No Data
 - CC 1
 - CC 2
 - CC 3
- Building Density Class**
 - Urban
 - Developed
 - Mixed
 - Isolated
 - Undeveloped
- Ownership**
 - Provincial Park
 - TFL
- Water Features**
 - Lake or River

CREDITS

Analysis and Mapping Prepared
 by
FOREST ECOSYSTEM SOLUTIONS LTD.
 #210 - 275 Felt Avenue
 North Vancouver, B.C. V7P 3R5
 (604) 898-2222
 www.forestecosystem.ca

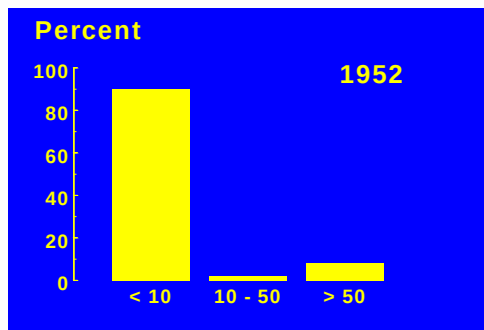
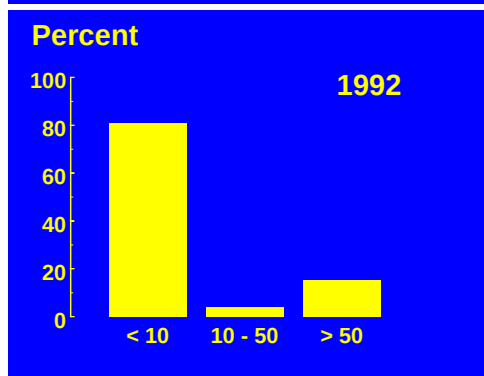
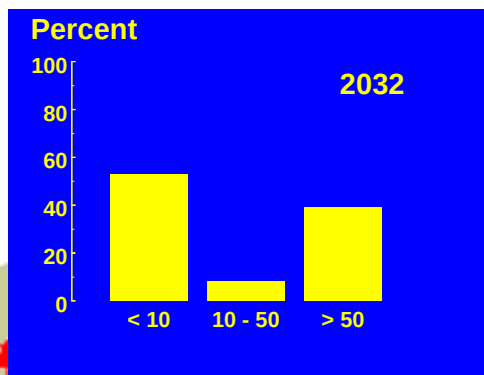


<http://www.forrex.org/publications/LINK/article.asp?article=183>



BC Fire Regimes

Increasing stand density – fire behavior implications – Steve Taylor, CFS



Tata Creek normal fire season crown fraction burned class frequencies

Area susceptible to crown fire
>50% CFB
7 to 14% from 1956-96
29% by 2032



1900s

a.



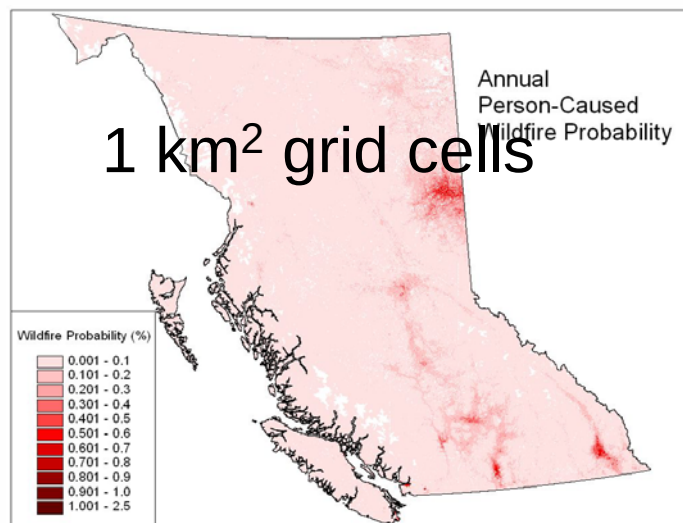
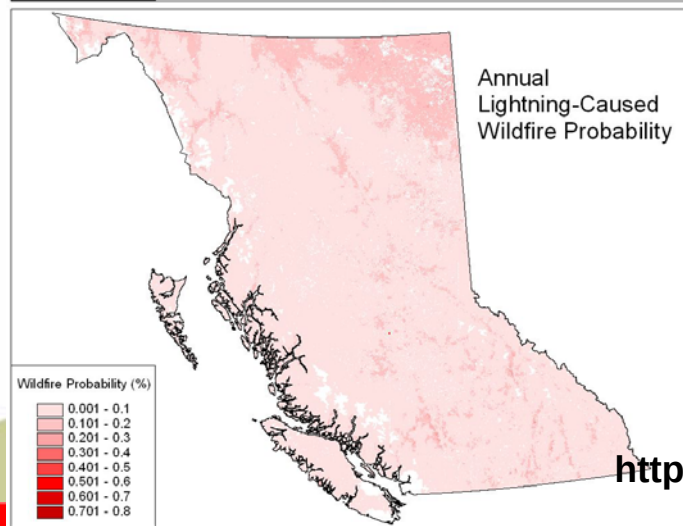
1990s

Photo credit: Cliff White, Parks Canada



BC Fire Regimes – The Future?

Fire Probability – influences and future predictability – Steve Taylor, CFS



Parameter	DF	Estimate
Intercept	1	4.217
Mean FPMC	1	-0.0437
Mean DC	1	-0.0186
Slope	1	-0.0161
Max DSR	1	-0.0374
Max DC	1	0.0102
Elevation	1	0.0004
Forest type	1	-0.1824
Lightning density	1	-0.0002
Max FPMC	1	0.0164
Aspect	1	-0.0005
Land cover	1	-0.0001
Mean DMC	1	0.0308
Popn density	1	0.0008
Road density	1	0.0302
Vegetation type	1	0.0262
Mean DSR	1	0.0184
Max DMC	1	-0.0032
Terrain roughness	1	0.0001

http://www.pfc.cfs.nrcan.gc.ca/fires/disturbance/index_e.html

BC Fire Regimes - The Future?

Fire Behavior and Severity - Fuel arrangement, condition, moisture content after MPB mortality

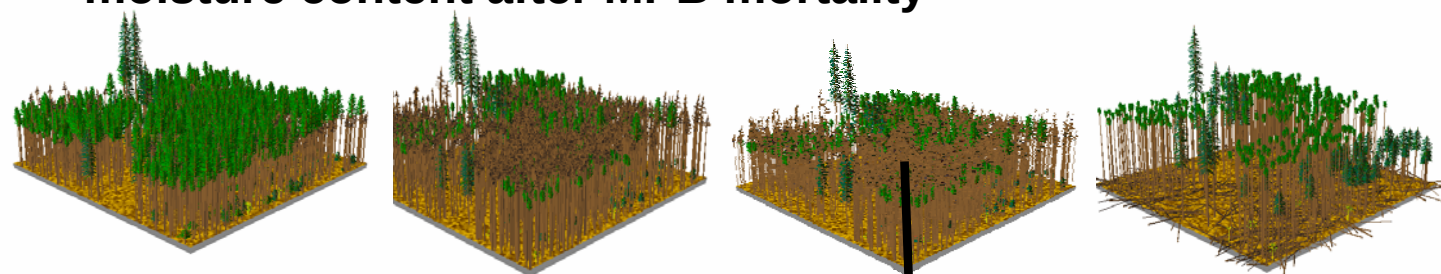
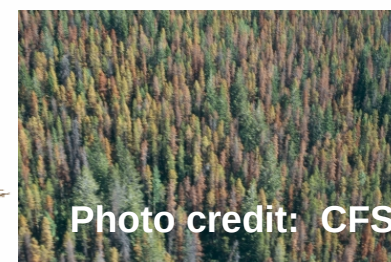
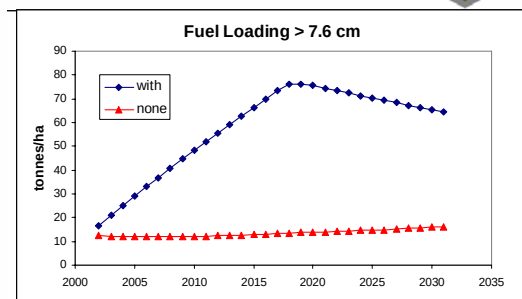
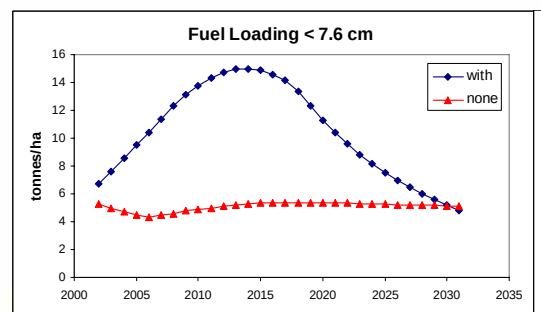
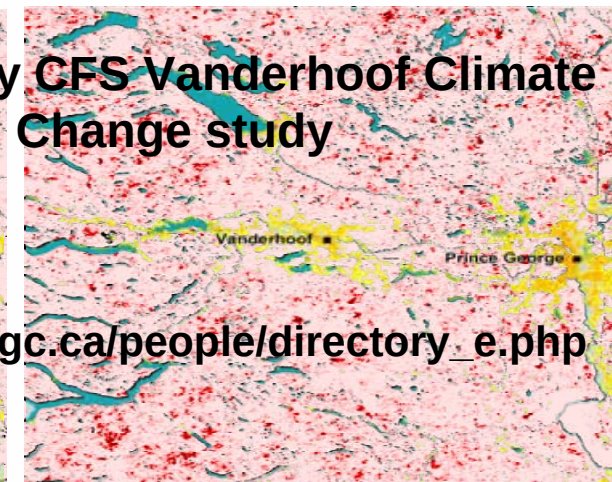


Photo credit: CFS



Conditions 2041-60 (no
climate change – assume
all stands in gray stage)



Conditions 2041-60
(cgcm2 climate change
scenario – gray stage)

BURNP3 model used

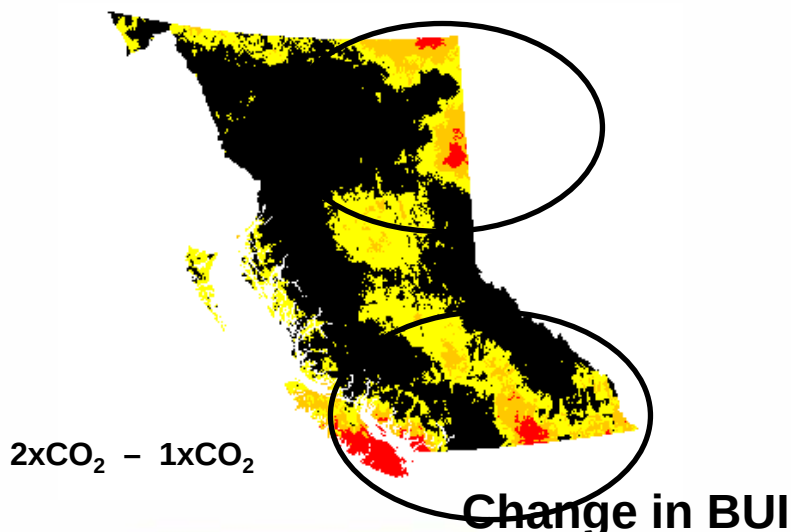
http://www.nofc.cfs.nrcan.gc.ca/people/directory_e.php



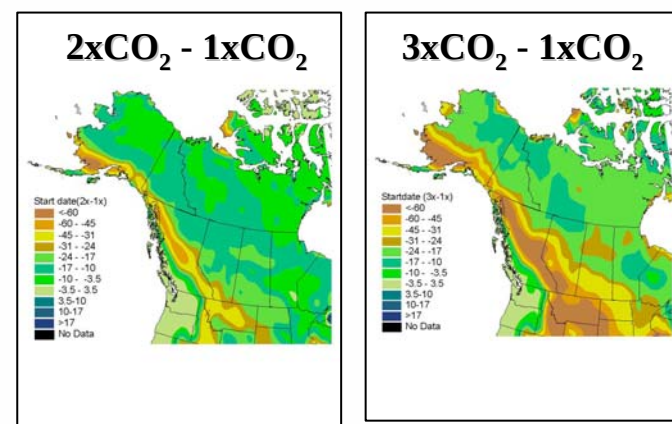
BC Fire Regimes – The Future?

Climate Change and Fire in BC – Flannagan and Todd 2000

**Mean Buildup Index
predicted to increase in BC:
2 – 4 by 2045
2 – 6 by 2085**



**Fire Seasons predicted to
start earlier in BC:
1-3 weeks by 2045
2-5 weeks by 2085**

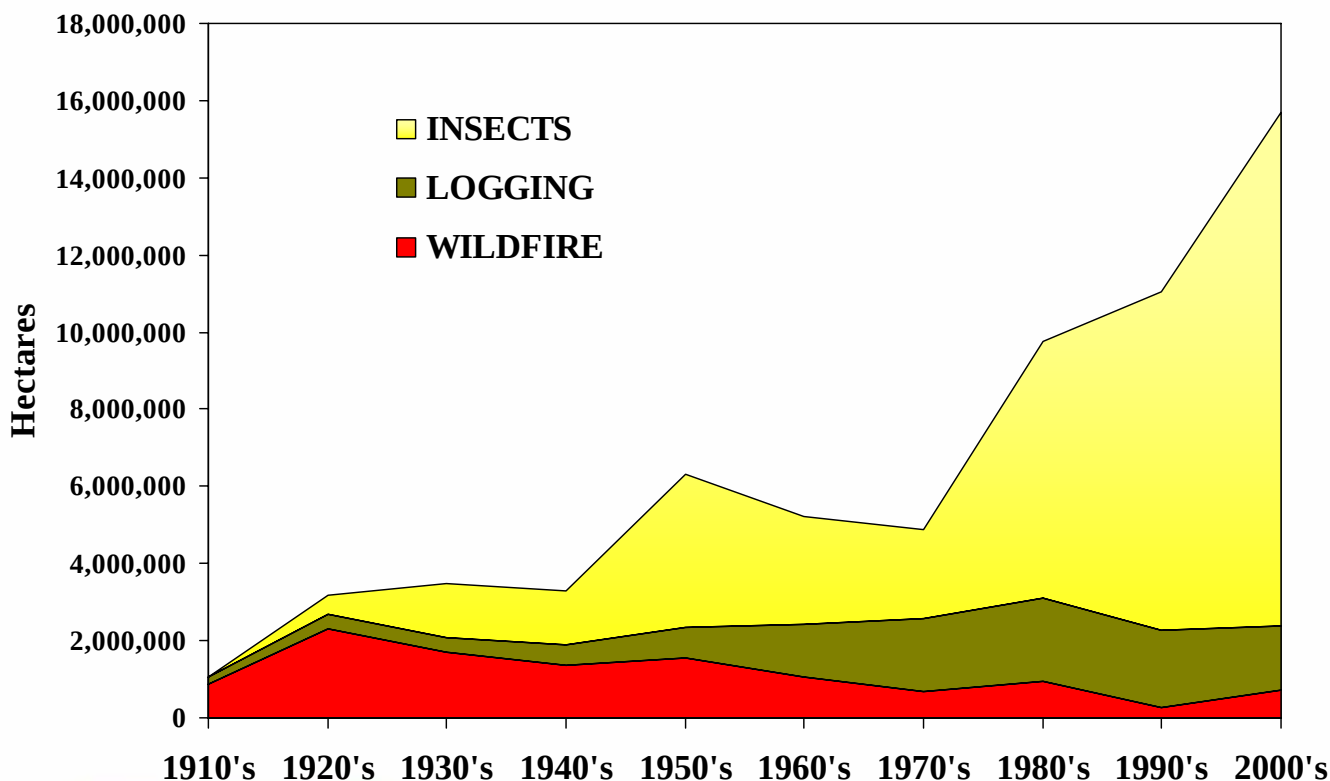


Implications of Climate Change in British Columbia's Southern Interior Forests
April 26-27, 2005 - Revelstoke, BC, Canada Proceedings on: <http://www.cmiaae.org/>



Emerging Fire and Forest Management Issues

Who is getting the biggest piece of the BC forest pie? Will this trend continue or will fire take a bigger piece in the future?

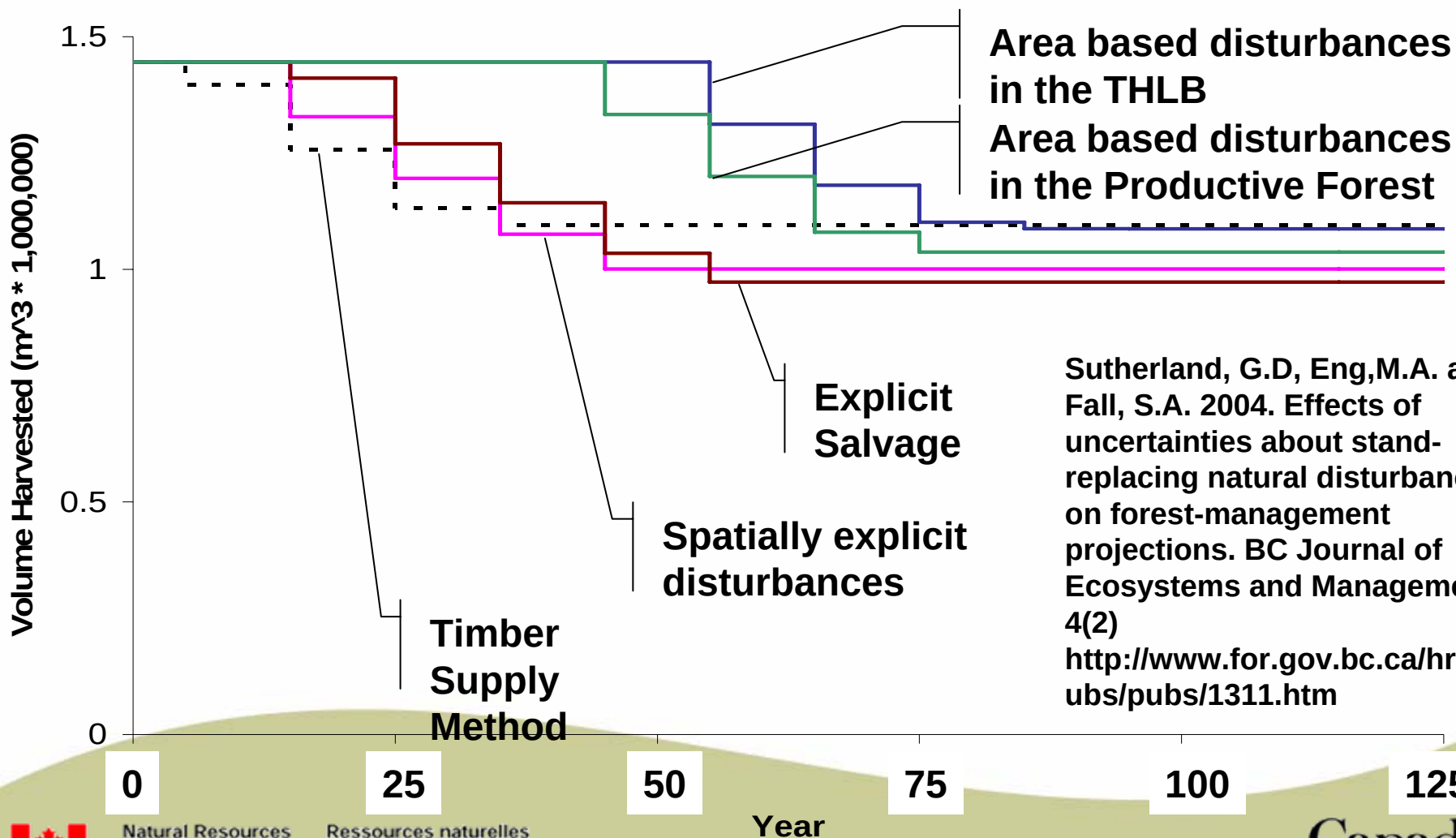


Historic area disturbed including protected areas – from MOFR Annual Reports



Emerging Fire and Forest Management Issues

Incorporating stochastic fire disturbance in modeling e.g. Marvin Eng MOFR – CFS workshop presentation at Pacific Forest Centre 2004 funded by FIA FSP



Sutherland, G.D, Eng, M.A. and Fall, S.A. 2004. Effects of uncertainties about stand-replacing natural disturbances on forest-management projections. BC Journal of Ecosystems and Management. 4(2)
<http://www.for.gov.bc.ca/hre/pubs/pubs/1311.htm>



Emerging Fire and Forest Management Issues

Maintaining Timber Supply with increased fire activity: e.g. Glen Armstrong, U of A –
CFS workshop presentation at Pacific Forest Centre 2004 funded by FIA FSP

For each of 100 burn sequences

For each year from 2000 to 2099

Calculate AAC

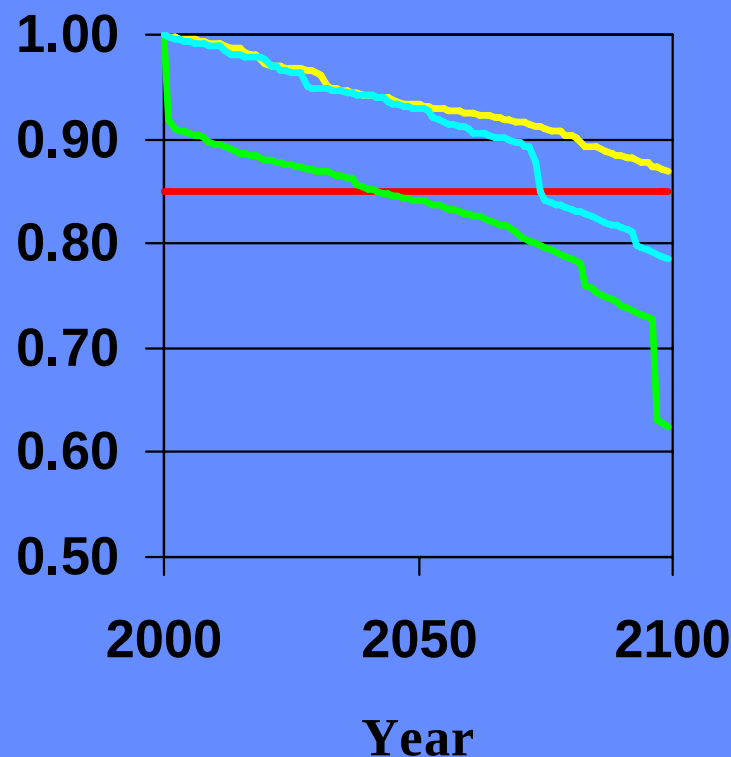
Harvest requested volume

Burn according to simulated
sequence

When harvest is 85% of AAC calculated for
2000

Harvest level is unsustainable when AAC is
below red line

Armstrong W. 2004. Sustainability of timber supply
considering the risk of wildfire. For. Sci. 50:626-639.





Emerging Fire and Forest Management Issues

BC Protected Areas: fire and vegetation management

Photo credit: MOFR



**Mt Robson Provincial Park Moose
River Prescribed Burn**



Photo credit: BC Parks

- Some opportunities for limited action fire management zones
- Fire and vegetation plans available for most parks
- New agreement between MOE and MOFR Protection – aligned with Wildfire act and assist with prescribed burning
- Prescribed burns: usually treatment of fuels before burning and can pose a potential escape risk.
- MOFR high fire suppression load reduces staff available for prescribed burning
- Smoke management



Emerging Fire and Forest Management Issues

Emulating natural fire patterns but not fire process – block shape and islands -broadcast burning, slash fuel load.

http://www.for.gov.bc.ca/rni/Research/Extension_notes/PG05-wildfire.pdf

<http://www.for.gov.bc.ca/hfp/publications/00062/index.htm>

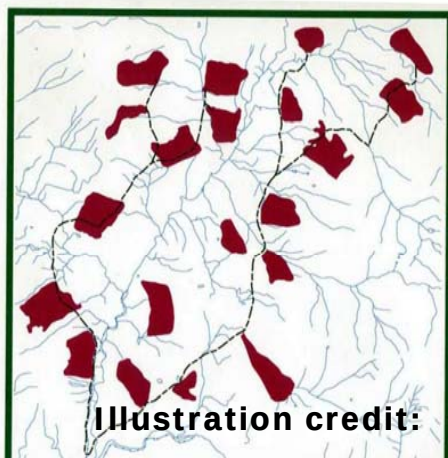
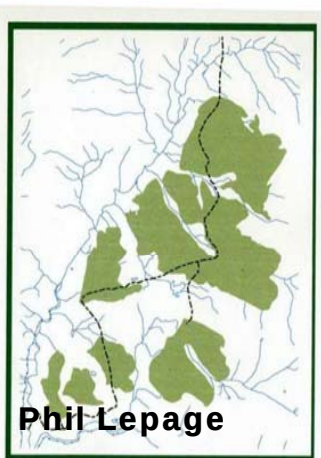


Illustration credit:



Phil Lepage



Photo credit: Craig Delong



Photo credit: Craig Bennet



Photo credit: Colin Neiser



Photo credit: John Parminter





Emerging Fire and Forest Management Issues

Insect induced tree mortality and fire hazard

- ➔ millions of ha MPB
- ➔ Red Needled to Gray Stage to deadfall – fuel dynamics
- ➔ Not all areas will be salvaged
- ➔ Scale beyond anything caused by wildfire

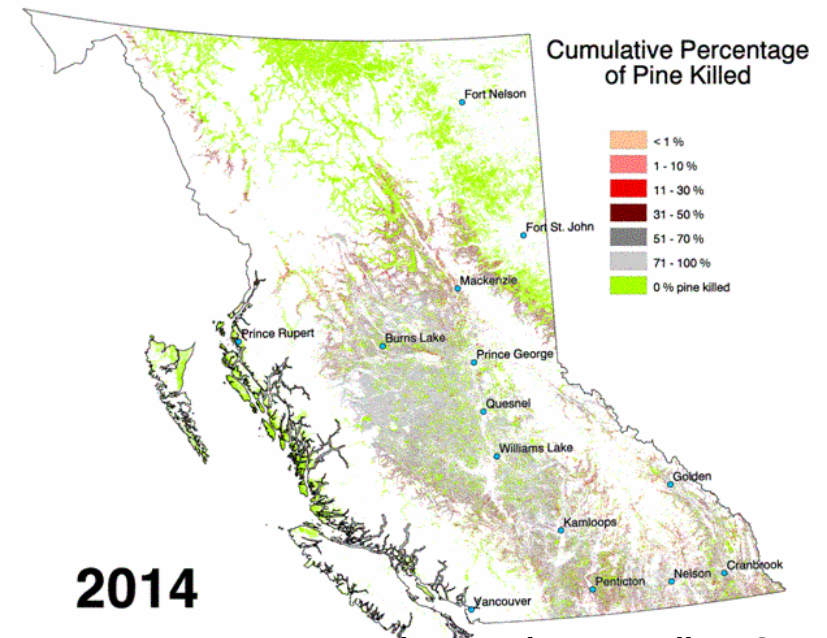
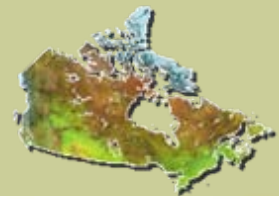


Photo and Map credit: MOFR





Potential Adaptation Strategies

Canadian Wildland Fire Strategy

- Last one in 1924
- Conducted by Canadian Council of Forest Ministers
- Development team co-chairs: Tim Sheldan, ADM, BC MOFR and Brian Emmett, ADM, NRCAN, CFS
- Address growing threat that fires pose to human life and the forest sector

http://www.nrcan.gc.ca/cfs-scf/national/what-quoi/viewpoint/index_e.php?ArticleId=221&IssueId=23



Potential Adaptation Strategies

Canadian Wildland Fire Strategy

- Supplement efficient fire suppression with proactive hazard mitigation, preparedness, and recovery programs
- New ways of sharing risk from an economic standpoint that builds on decades of effective interagency cooperation
- Increase the awareness and knowledge of those living and working in the wildlands about the role of fire, their vulnerability to wildfire, and the potential risk management strategies -
PREVENTION



Photo credit: Parks Canada



Photo credit: Partners in
Protection



Potential Adaptation Strategies

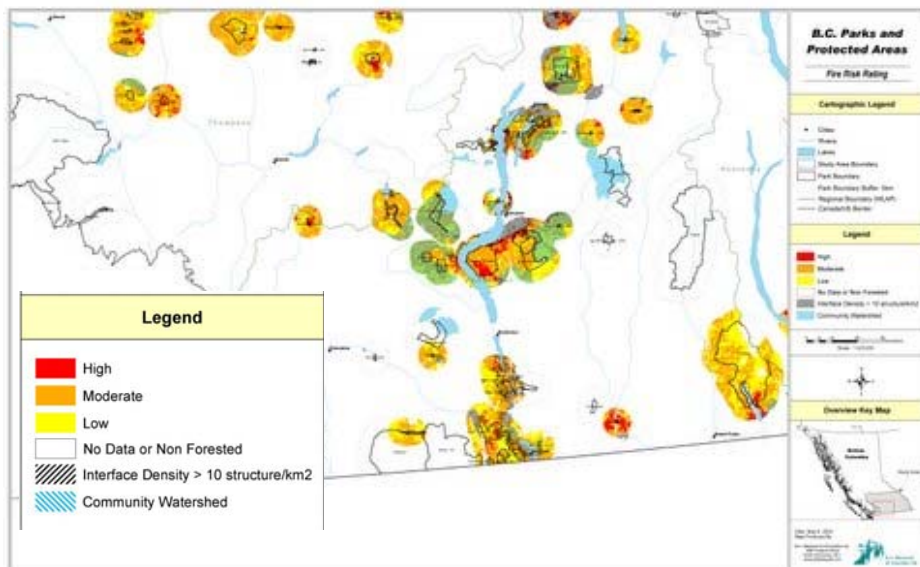
Canadian Wildland Fire Strategy

- Community-based programs whereby individuals, private companies, and government agencies partner to manage the fuels around homes and communities become the norm.
- Forestry ministers have signed a formal declaration establishing a common vision and set of principles using watchwords such as mitigation, preparedness, response, and recovery
- Seek funding and partnerships to tackle the issues before they become major problems and reduce overall burden on the fire suppression system and expenditures to taxpayers

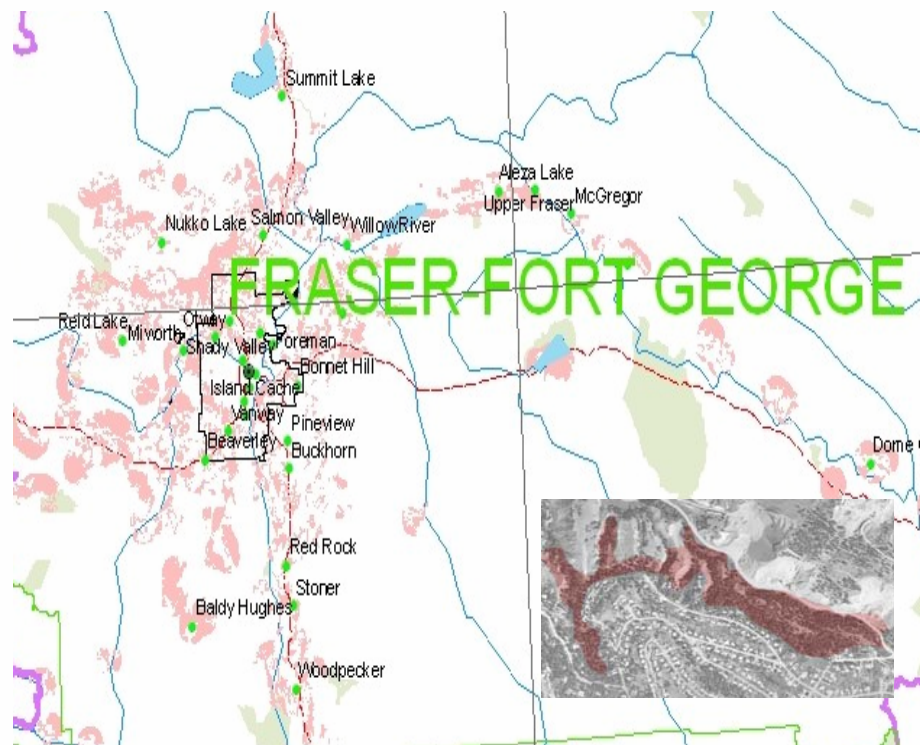


Potential Adaptation Strategies

Assessing Fire Risk – fire probability and consequence



**RW Gray; BA Blackwell,
 Consultants, Southern BC
 Parks Fire Risk Assessment**



Can Spot within 2km of Interface

MOFR 2005 Fire Risk Assessment



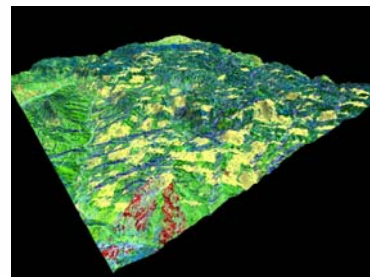
Potential Adaptation Strategies

MPB induced tree mortality and fire hazard

- Determine how potential fire behavior differs in dead pine versus live.
- Fire risk assessment of MPB impacted areas (Vanderhoof)
- Funding to mitigate hazard
- Incorporate landscape level fuel treatments/breaks into forest harvesting schedules.
- Investigate how fuel treatment patterns/orientation and proportion of landscape affect effectiveness

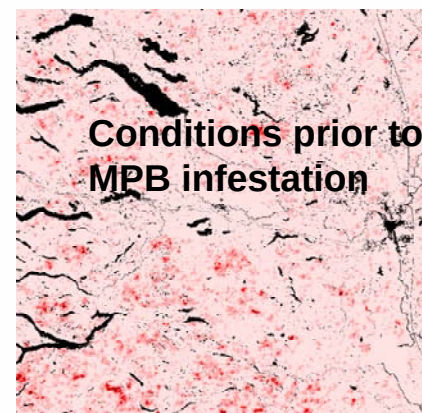
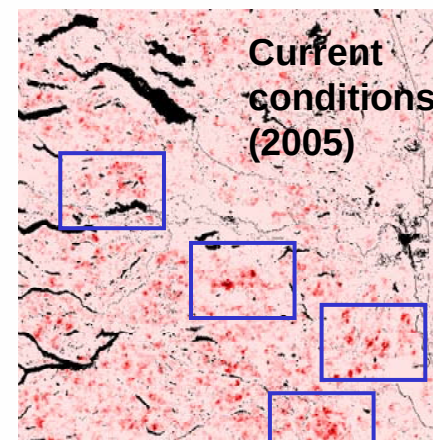


MPB expt burn project:
BC MOFR and CFS



Graphic and Photo credit:
Mark Finney USFS

BURNP3 model used



Jen Beverly CFS
Vanderhoof CC study



Potential Adaptation Strategies

Sharing Fire Risk: Partnerships; Mutual Aid among Gov't agencies, communities, forest companies

Union of BC Municipalities

Community Sprinkler
Protection Units

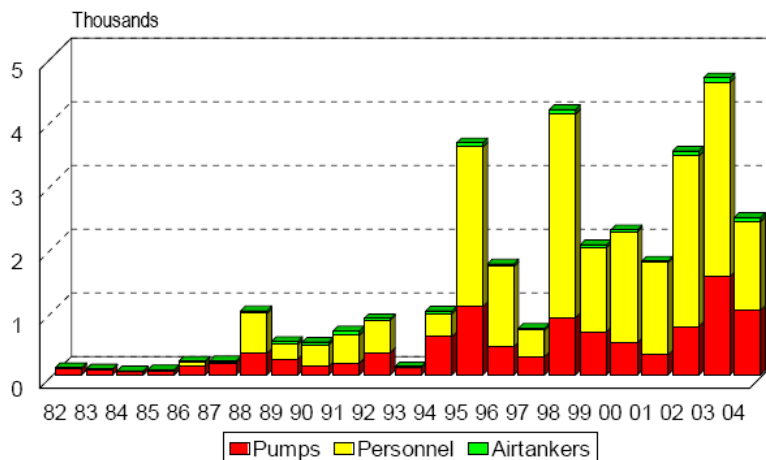
Community Wildfire
Protection Plans

BC Parks



Resource Units

1982 - 2004



Success requires acknowledging *ownership* of the problem, and then a combination of Community Planning, Fuel Management, and Fire Prevention



Potential Adaptation Strategies

Minimizing Fire Risk: increased incorporation of fire into sustainable forest management

MOFR Protection Program Fuel Management Staff Positions

Headquarters: Superintendent Fuel Management and Fuel Geomatics Analyst

Fire Centre Fuel Management

Specialists: Northern BC; Cariboo; Kamloops; South East; Coastal

Regional Fire Management Planners:

Southern Interior; Coastal; Northern Interior

Partner: Union of British Columbia Municipalities - Program Officer

Ministry of Environment

MOE regions: MPB regional specialist – fuel mgt in parks and protected

-mitigation of MPB impacts on fish and wildlife values inside and outside parks

Ecosystem restoration programs to be implemented in next fiscal year

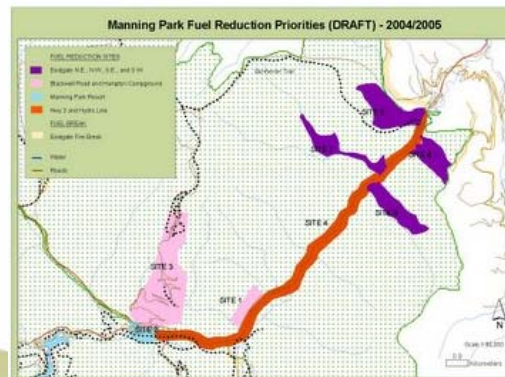


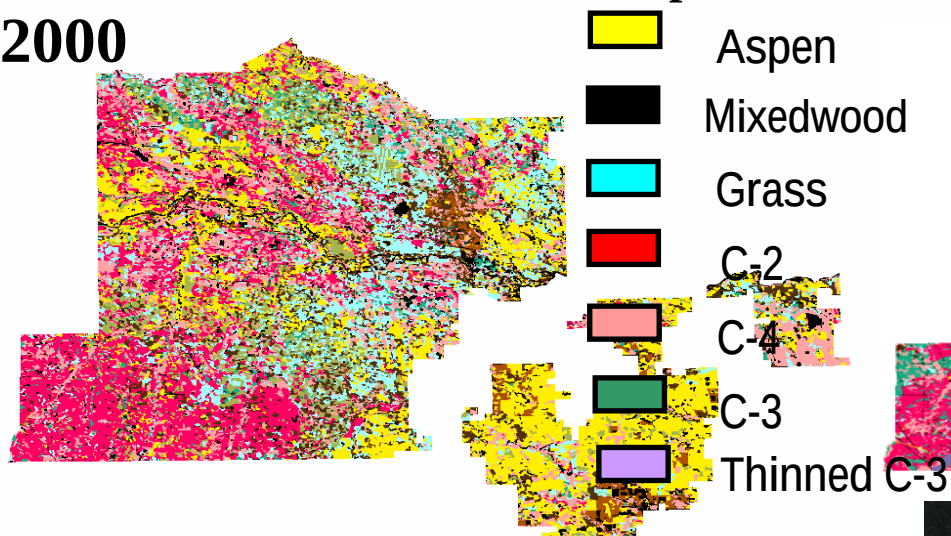
Photo credit: CFS

Map credit: BC Parks

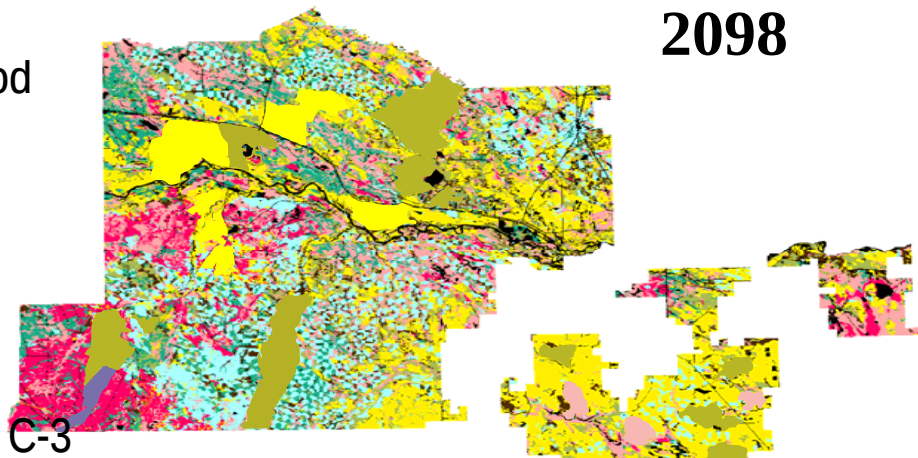
Potential Adaptation Strategies

Implementing fuels management at strategic locations on the landscape to reduce the risk of large fires (“fire door” effect)

2000



2098



Miller Western Forest Company, Alberta

SK 2002 fire spreads and spots across 1km wide fuel break

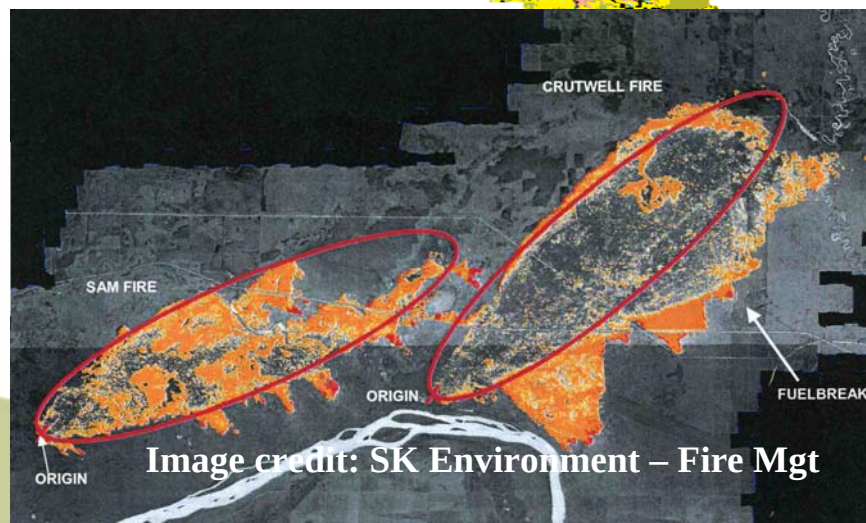


Image credit: SK Environment – Fire Mgt



Potential Adaptation Strategies

Minimizing Fire Risk: FireSmart, Fuel Treatments, Prevention Interface/community tenures to allow fuel treatment maintenance without obligation to regenerate

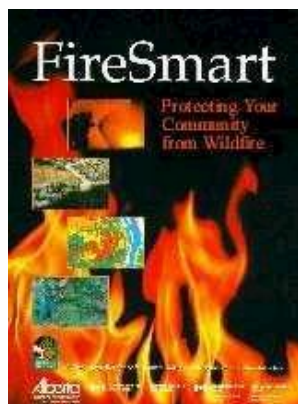
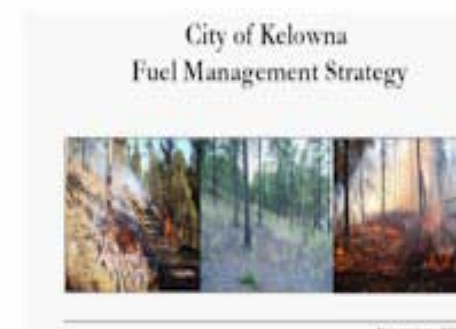


Photo credit: MOFR (all)



It is being shown that cooperation, creative thinking, and information sharing among Gov'ts/agencies/forest companies/landowners and long-term funding is needed.

<http://www.for.gov.bc.ca/protect/FuelManagement/>



Potential Adaptation Strategies

Minimizing Fire Risk: Increased use of prescribed burning in forest and range management and protected areas

- Training and Certification of Prescribed burn specialists
- Use of the private sector/forest companies – liability issues
- Set priorities with fire risk assessment
- Prescribed burn teams: available during busy fire suppression periods, mobile, burn experience each season
- Prescribed burn planning/budgets

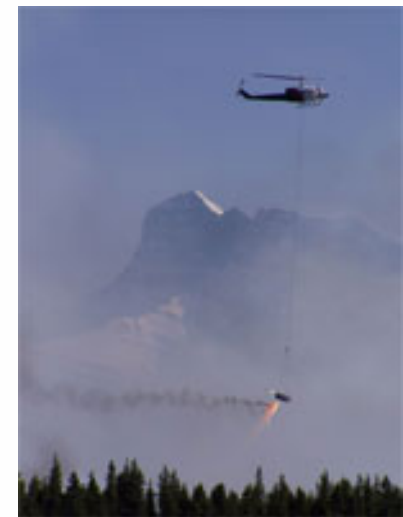


Photo credit: Parks Canada

(all)

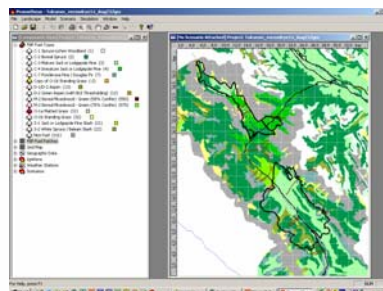
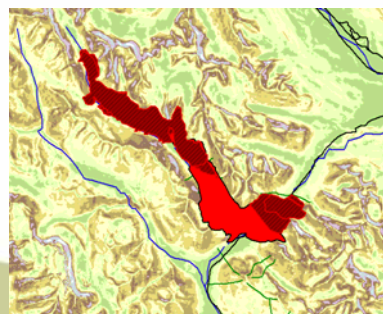
Canada



Parting Words

Landscape Management - A Balancing Act

- How much fire does the forest need?
- New systems and models are needed to balance multiple objectives for a landscape with climate change altered disturbances (fire, insects, wind etc.)
 - Biodiversity (including Habitat)
 - Harvesting
 - Protected areas
 - Tourism & Recreation
 - Carbon
 - And more



**Prometheus fire
growth model
predictions**



Photo credit: CFS (all)

Illustration credit: CFS



Parting Words

- growing recognition that it is neither economically possible nor ecologically desirable to eliminate all fires from our wildlands
- we are facing a complex challenge of managing a myriad of risks to people, the economy, and the environment within the context of climate change.

