

Cost Benefit Analysis of Wildland Urban Interface Operations in the Southern Interior of British Columbia

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Outline

- Introduction
- Current Costs/Benefits of WUI Treatments
- Alternatives and Ideas
- Future Research



Acknowledgements



- BC Forest Science Program – Grant 2007-2009
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- Saint Mary’s Band
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- BC Ministry of Forests and Range
- R.W. Gray consulting Ltd.
- City of Cranbrook

Introduction

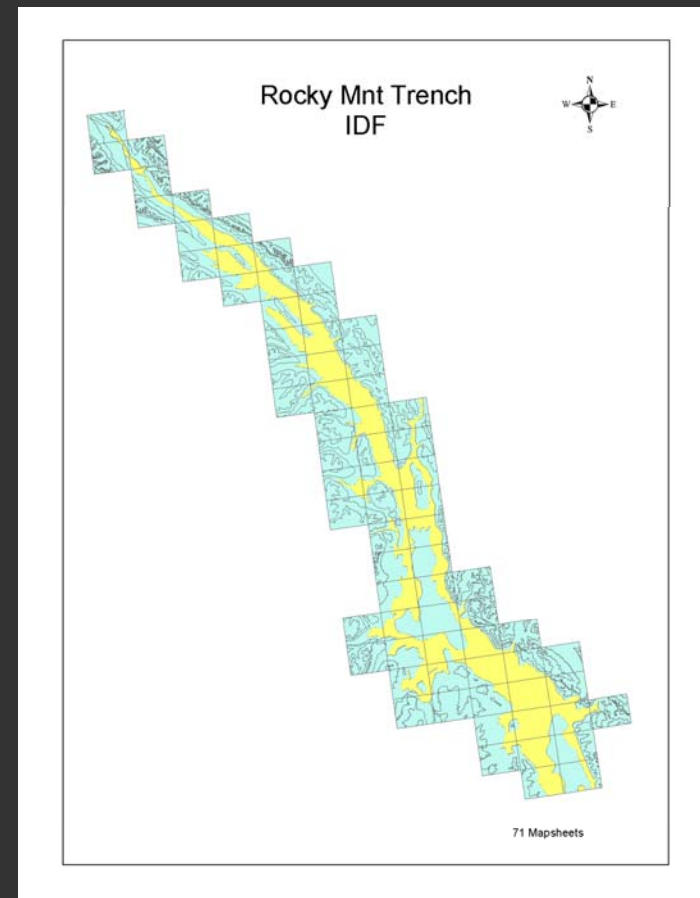
Wildfire Risk Problem

Mainly caused by:

- Forestry practices
- Fire suppression
- Vigorous regeneration

- 250,000 HA need fuels treatments in the RMT NDT 4 and Fire maintained ecosystems

- 1000's of HA in WUI

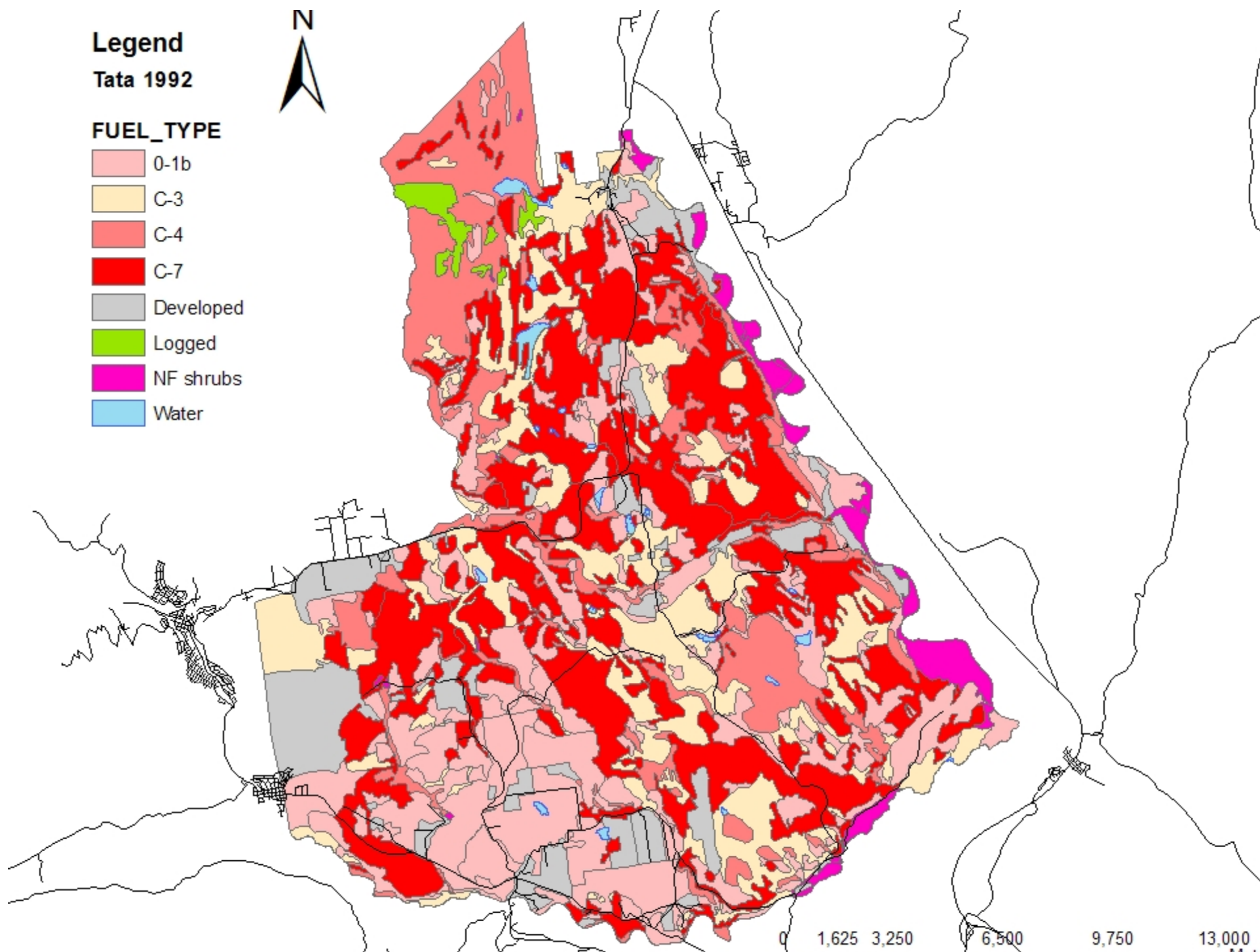


Legend

Tata 1992

FUEL_TYPE

- 0-1b
- C-3
- C-4
- C-7
- Developed
- Logged
- NF shrubs
- Water



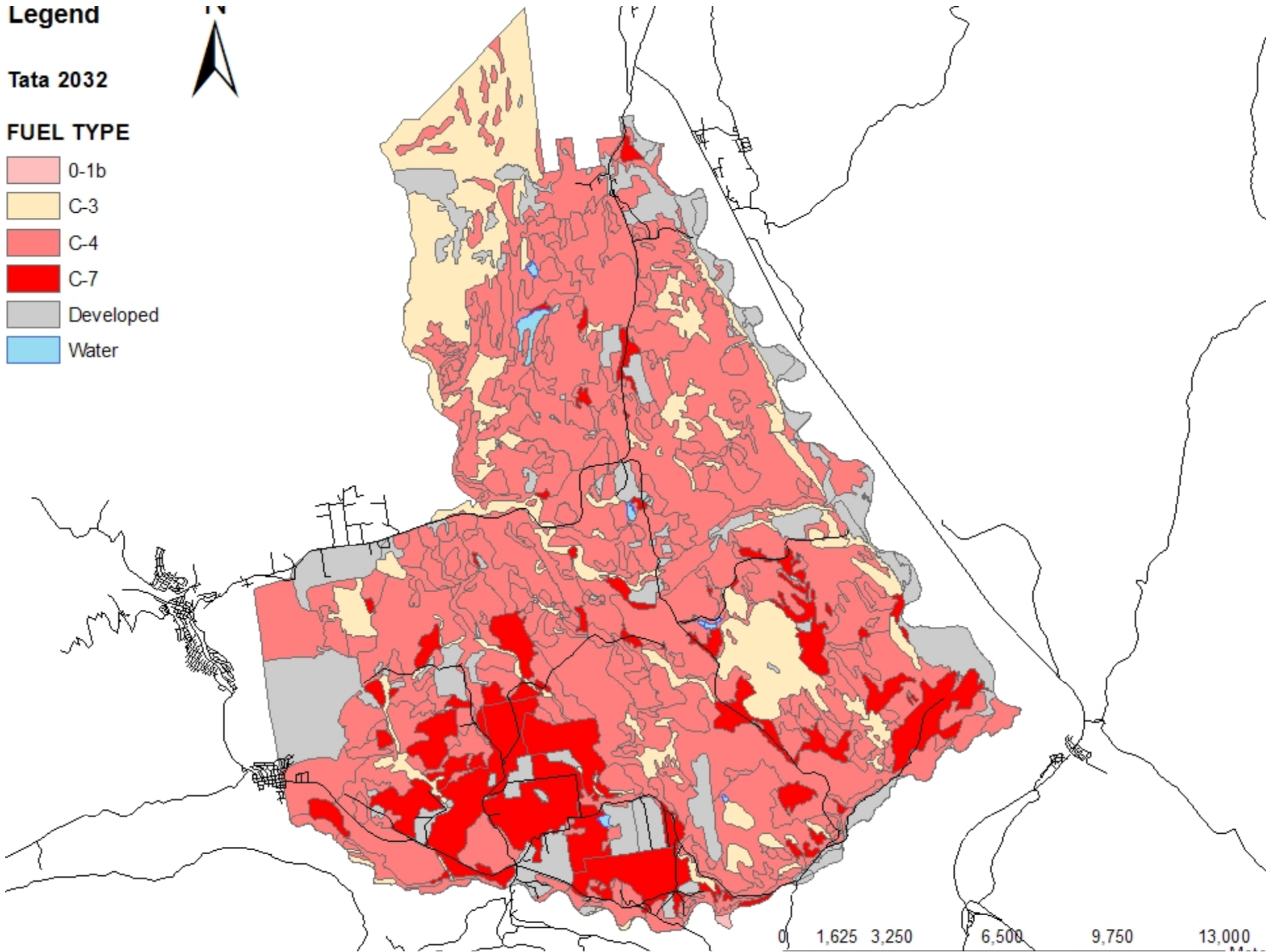
0 1,625 3,250 6,500 9,750 13,000

Legend

Tata 2032

FUEL TYPE

- 0-1b
- C-3
- C-4
- C-7
- Developed
- Water



Introduction



Taylor et al 1998 (NR Canada) 32,000 ha Study Area

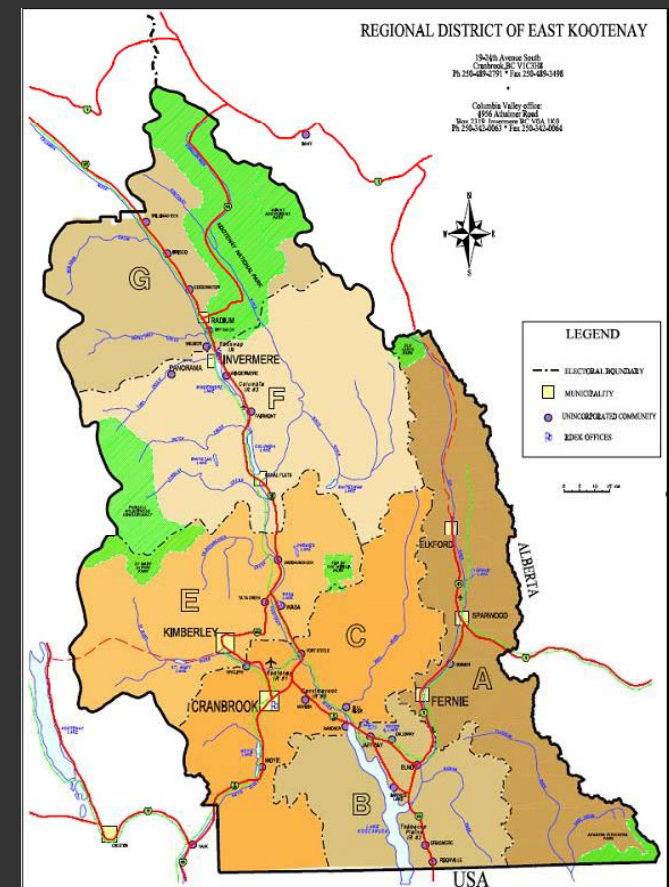
- Crown closure >55% dense forest
Increased from 2,000 ha's 1952 to
19,000 ha's projected by 2032 using FVS Prognosis
- Crown-fraction burned by 2032
For dense forest types was greater than 50%
- Fire Intensity Class by 2032
For dense forest types was 38% at the
highest intensity prediction

Introduction

Wildland Urban Interface Issues in the RMT

Challenging to implement
fuels reduction projects due to:

1. Low timber merchantability
2. High cost of treatments
3. Lack of incentives for private land owners, First Nations Reserves and Crown Tenure holders



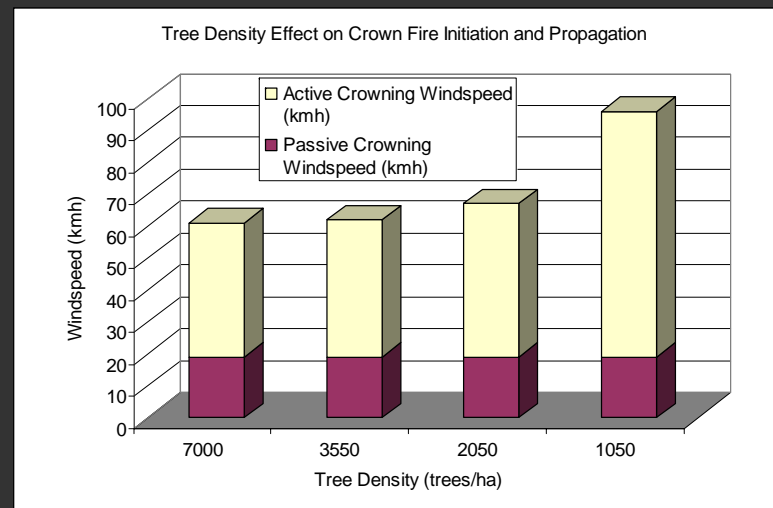
Introduction

Methods of Risk Assessment

Static models

- Fire and fuels effects (FFE)
- Fuels Management Analyst FMA+

Used to determine the hazard – crown fire potential, fire intensity



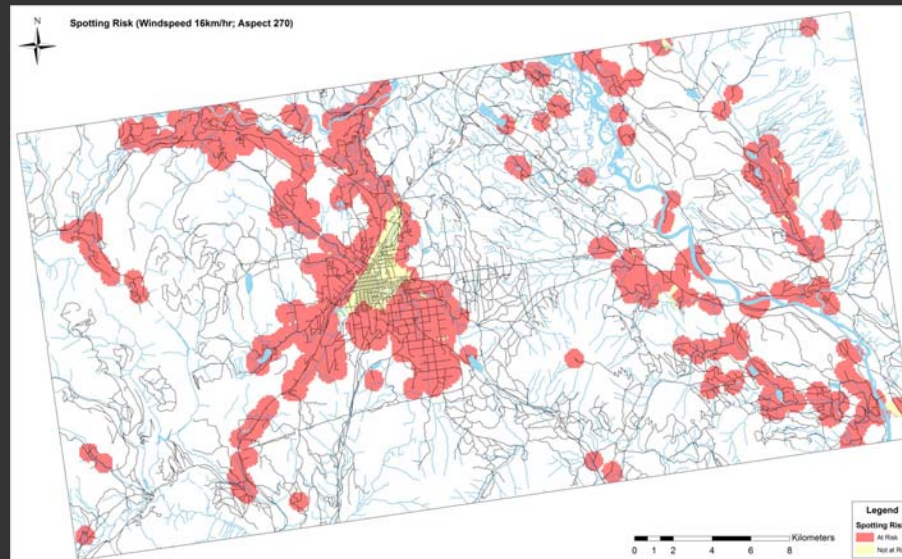
Introduction

Dynamic Models

- FARSITE

Use algorithms to calculate the effects of stand structure slopes, historical weather data to predict fire spread including spot fires.

- Static models are useful for determining the hazard in the first step of fuels treatment planning.
- Dynamic models are used to test the prescription as the second step. This is an essential component for WUI wildfire protection planning



Introduction

Data Collection Issues

Fire Hazard Assessments Are They Accurate?

- May have large risk variance when validated
- Without the proper data, models for mitigating risk may be significantly in error, and expenditures for fuels treatments will be excessive or misallocated.
- Need to balance data collection costs with accuracy requirements



Introduction

Market and Non-Market Values

Fuels Treatment Benefits on High Risk Stands include:

- Fire fighting costs avoided
- Fatalities avoided
- Facility losses avoided
- Timber losses avoided
- Biomass losses avoided
- Regeneration and rehabilitation costs avoided
- Community value of fire risk reduction
- Increased water yield
- Watershed protection
- Non-timber forest products
- Regional economic benefits
- Carbon sequestration



Introduction

Key Questions for WUI Land Management

1. Where to treat fuels?
2. How to treat fuels?
3. How to maintain once thinned?
4. What are the financial and social costs?
5. What are the financial and social benefits?
6. Are fuels treatments cost effective in meeting protection objectives?



Costs/Benefits

Cost Benefit Analysis

- Evaluates reducing wildfire risk by discounting the PV of the net benefits over a specified time horizon

Challenges:

- Many of these benefits (or avoided costs) are difficult to adequately calculate, especially in the WUI
- Determining which stands should be treated
With limited resources is difficult with little data to predict costs
- BC has an estimated 1.7 million hectares within the WUI, many of which have heavy fuels loads and would be cost prohibitive to treat all stands if subsidies are required



Costs/Benefits

Cranbrook Case



Timber Income City of Cranbrook Lands	Hectares Treated	Timber Volume M ³	Timber Vol./HA M3	Price M ³	Species	Total Timber Value	Average Value/M3
8th Ave	3.5	310.46	88.70	\$ 60.00	DF	\$ 18,627.60	
Industrial Park	27.5	960.29		\$ 60.00	DF	\$ 57,617.40	
Industrial Park	27.5	979.23		\$ 40.00	PP	\$ 39,169.20	
Volume Sub-total		1939.52	70.53				
Airport	86.7	1714.89		\$ 60.00	DF	\$ 102,893.40	
Airport	86.7	2226.96		\$ 40.00	PP	\$ 89,078.40	
Airport (Galloway)	86.7	158.17		\$ 45.00	PP	\$ 7,117.65	
Volume subtotal		4100.02	47.29				
Total	117.7	6350				\$ 314,503.65	\$ 49.53

Costs/Benefits



Expenses	Expenses Itemized	Per HA Cost
Mechanical thinning/Logging	\$ 441,487.50	\$ 3,750.96
Mechanical thinning Biomass		
Project Supervision/Logistics/Public		
Fire science	\$ 13,000.00	\$ 110.45
Professional forester	\$ 5,704.63	\$ 48.47
City of Cranbrook	\$ 15,000.00	\$ 127.44
Moir Park Prescribed Burn		
Equipment (fuel)	\$ 639.65	\$ 5.43
COTR student training and ops.	\$ 2,880.00	\$ 24.47
City of Cranbrook:		
Supervision	\$ 4,700.00	\$ 39.93
Crew wages	\$ 5,130.00	\$ 43.59
Engine rental	\$ 11,520.00	\$ 97.88
Misc. (meals, equipment)	\$ 662.45	\$ 5.63
Consulting Burn Boss	\$ 7,351.49	\$ 62.46
Hog fuel grinding (low-bed Tembec)	\$ 816.50	\$ 6.94
Total Costs	\$ 530,904.67	\$ 4,510.66

Net Income	-\$ 96,402.23	-\$ 819.05
Net Income - less UBCM Grant	-\$ 216,402.23	-\$ 1,838.59

Costs/Benefits

Biomass Value

- Tembec Industries – chipping biomass for cogen on WUI sites (biomass chipped at roadside as shown)



Costs/Benefits



Energy Analysis Cranbrook Industrial Park

Energy Value	HA's	BDT	BDT/HA	M ³	M ³	Kwh/M ³	Price	Value	Value	Energy	Total Value
		Biomass		Unmerch	per		Kwh \$.065	Per M ³	per BDT	Value per	
		Harvested		per HA	BDT					HA	
	27.5	1034	37.6	57	2.38	315.19	0.065	\$ 20.49	\$ 48.78	\$ 1,167.79	\$ 32,114.23

Costs/Benefits



Cost-Benefit of WUI Fuels Treatments

Cranbrook case study

Benefits	Per HA	Per Acre	Per M3	Per BDT
Timber Value	\$ 2,672.07	\$ 1,081.81	\$ 49.53	
Biomass Value				
Co-gen - Electricity (potential)	\$ 1,167.79	\$ 472.79		\$ 48.78
Co-gen - low pressure heat value	TBD	TBD		
Training Value- Fire Personnel	TBD	TBD		
Reduced loss of property casualty	Unknown	Unknown		
Reduced fire suppression costs	Unknown	Unknown		
Total Benefits	\$ 3,839.86	1,554.60	\$ 49.53	\$ 48.78

Costs	Per HA	Per Acre	Per M3	Per BDT
Logging-Thinning	\$ 3,750.96	\$ 1,518.61		
Prorated cost for merch fibre			\$ 36.85	
Prorated cost for biomass			\$ 30.93	\$ 12.91
Project Supervision/Logistics/Public	\$ 286.36	\$ 115.94		
Prescribed Burning Cost	\$ 286.32	\$ 115.92		
Grinding/chipping costs				\$ 8.00
Hauling to Co-gen 30k				\$ 10.71
Total Cost - Timber+Biomass	\$ 4,323.64	1,750.46		
Logging Costs			\$ 36.85	
Biomass Cost feedstock delivered BDT				\$ 31.63
Net Value - Timber				
Net Value - Biomass			\$ 12.68	17.15
Net Benefit	TBD	TBD		

Alternatives and Ideas

Innovative harvesting methods

- Whole tree harvesting may reduce harvest costs



Alternatives and Ideas

Small Diameter Harvesting

- Alternative machinery may be more cost effective



Alternatives and Ideas

- Thinning plantations for biomass



Alternatives and Ideas

- Non-Timber Forest Products

If developed could add value and reduce net cost of fuels treatments



Future Research



Forest Science Program

- Assess fuels hazard and risk in the WUI
- Use integrated approach to prioritize stands for fuels treatments using appropriate tools e.g. LMS, FARSITE, FMA+
- Collect additional data for Cost/Benefit Analysis
- Link WUI research with other fuels treatment projects e.g. Ecosystem Restoration in the RMT



Future Research

Forest Science Program

- Link with biomass utilization research in hopes of expanding the options for biomass
- Develop guidelines for WUI fuels treatment planning, provide extension to foresters, fire protection specialists
- Develop CBA and Cost Effectiveness models that may be used for determining fuels reduction efficiency and effectiveness on a site specific basis



Future Research

Our Hope



Our Fear

