RISK REDUCTION STATUS of RECOVERING WILDFIRE-IMPACTED COMMUNITIES in CANADA

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INTRODUCTION

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PRESENTATION OBJECTIVES

- Raise awareness about wildland/urban interface fire disasters.
- Release results and conclusions of a recent study regarding the effectiveness of programs to reduce wildfire losses.
- Discuss applications of study results.

WILDLAND FIRES DON'T HAVE TO BE DISASTERS

- A different kind of disaster.
- This is a solvable problem.
- We can reduce wildfire risk.
- There is great hope…
- But, "we" are not prepared.
- So…. we worry!

A UNIQUE STUDY

"To what degree have homeowners adopted measures to reduce risk of wildfire losses."

- Early studies on WUI knowledge & attitudes.
- This study focused on wildfire precautions actually taken in communities recovering from past disasters.
- Measures effectiveness of existing wildfire risk mitigation programs.

Kelowna, British Columbia
Slave Lake, Alberta
Wildfire Disasters

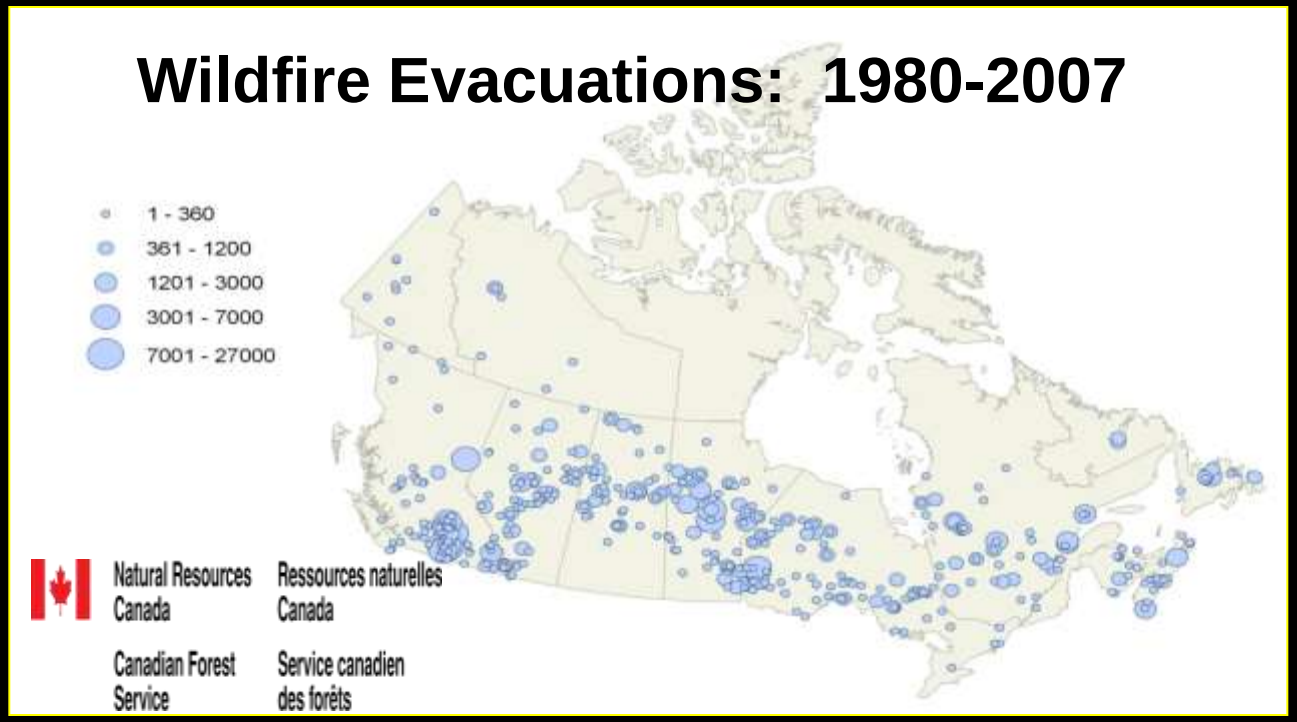
TWO DISTINCT WILDFIRE DISASTER SCENARIOS

Key Differences:

- Wildfire environment
  - Vegetation, fire cycle
  - Drought, weather
- Geography
- Time frame
  - Season, progression
- Municipal Situation

DIFFERENT, BUT TYPICAL !

- Representative of the Canadian situation.
- Window on the future.
- **IF**…..



HOME LOSSES

Kelowna (238)

- ~206 urban homes
- ~32 rural homes

Slave Lake (484)

- 428 urban homes
- 56 rural homes

THE WILDLAND/URBAN INTERFACE FIRE PROBLEM

- What is a wildland fire?
  - Fire burning in native vegetation
- What is the WUI?
  - a place?

    √ conditions allowing structures to ignite from flames or embers.
- What is a WUI fire?
  - wildfire spreads to urban fuel

COMPLEX NATURE OF WUI FIRE

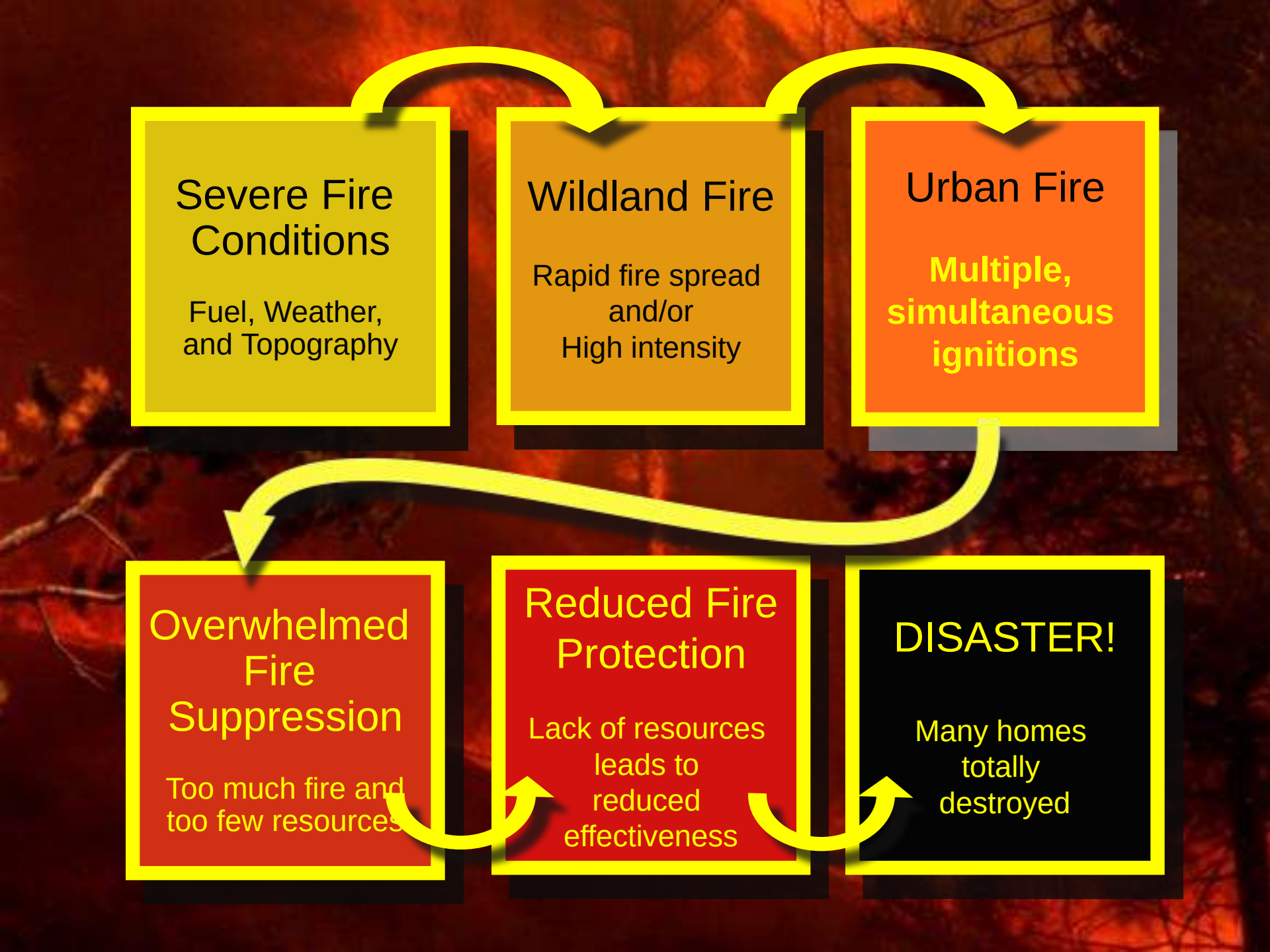
- Rapid fire spread, extreme conditions.
- Structural & wildland fuel.
- Many structures ignited.
- Large numbers of people.
- Extraordinary risk.
- Multi-jurisdictional.

THE WILDFIRE DISASTER CYCLE

How do wildland/urban fire losses occur?

Slave Lake, AB
May 15, 2011

Institute for Catastrophic Loss Reduction


Severe Fire Conditions
Fuel, Weather, and Topography
Wildland Fire
Rapid fire spread and/or High intensity
Urban Fire
Multiple, simultaneous ignitions
Overwhelmed Fire Suppression
Too much fire and too few resources
Reduced Fire Protection
Lack of resources leads to reduced effectiveness
DISASTER!
Many homes totally destroyed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MORE FIRE TRUCKS ARE NOT THE SOLUTION

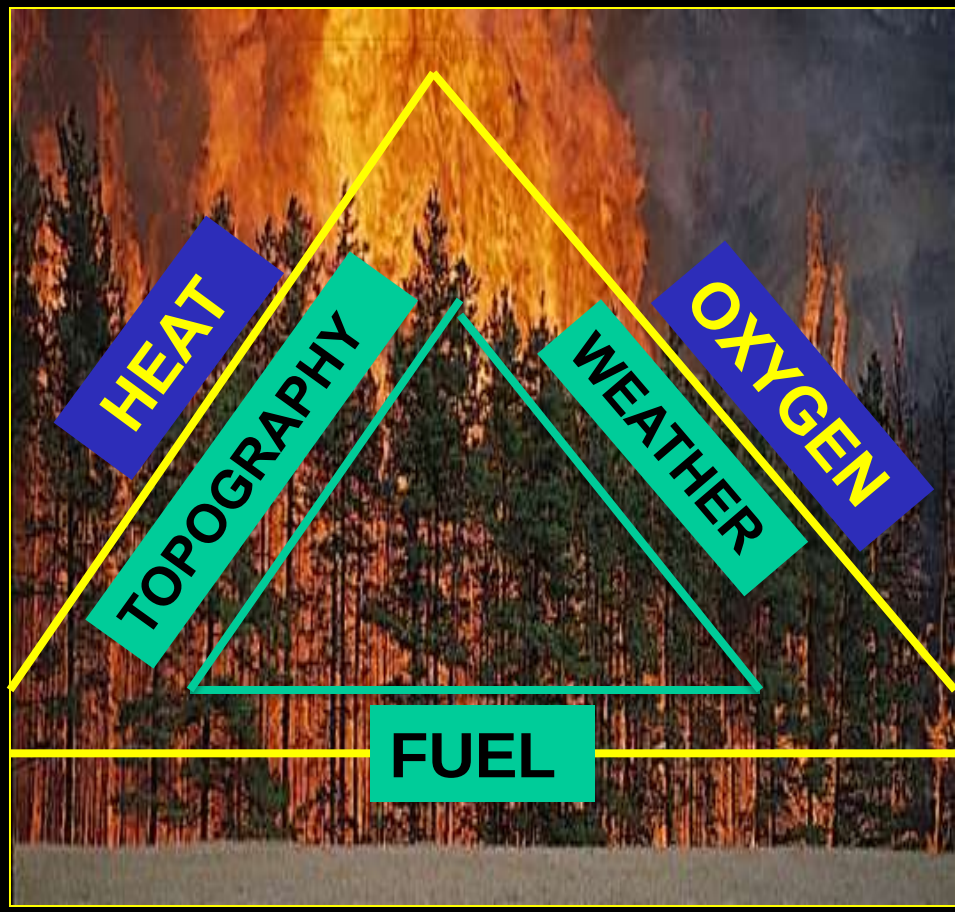
- Even extraordinary fire responses will be overwhelmed.
- Fire outcome depends on actions taken well **BEFORE** fire starts.

FIRE BEHAVIOR

FIRE BEHAVIOR IS CONTROLLED BY:

1. Topography/ Heat
2. Weather/ Oxygen
3. Fuel/ More Fuel

ONLY FUEL
can be managed
to reduce risk !



FUEL PROPERTIES

- How much?
- How dry?
- How easily ignited?
- How is it arranged?
- Chemical content?

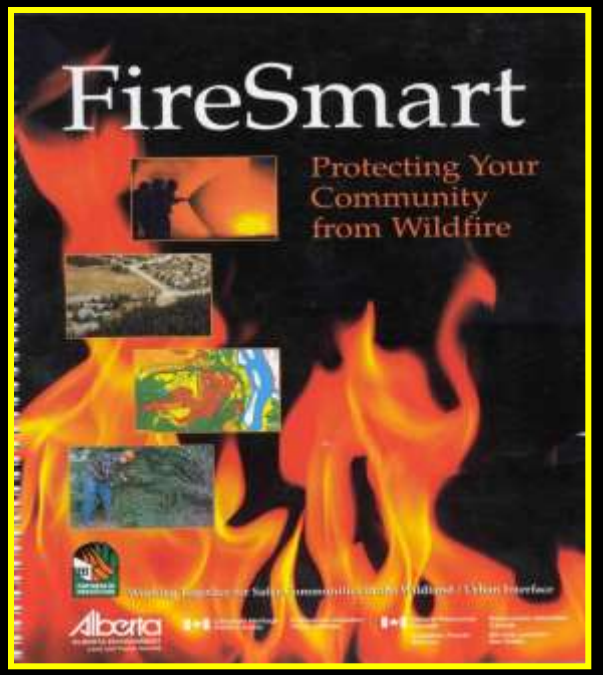
HOW DO HOMES IGNITE ?

It's the little things !

- Flames (convection)
- Radiant heat (from fire or adjacent homes).
- Embers (conduction) a.k.a. firebrands

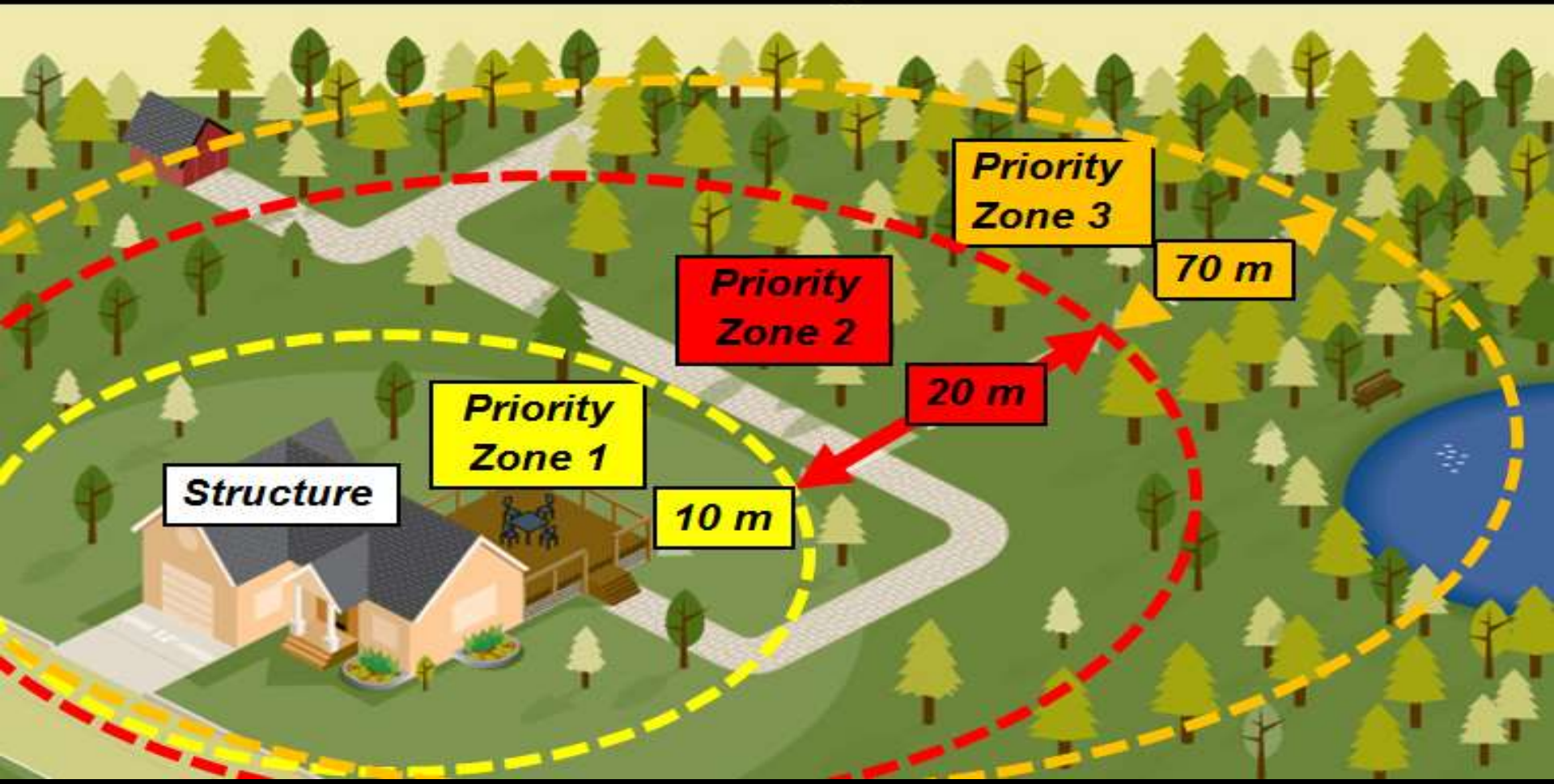
FIRESMART

- Principles & programs for reducing wildfire loss.
- 2 Key elements:
  - Recommended FireSmart guidelines:
    - Structure
    - Vegetation
    - Infrastructure
  - Hazard assessment system
- Originated by non-profit assoc.
- Based on NFPA standards



Home Ignition Zone Concept

Structure + Priority Zones 1 - 2 - 3



METHODOLOGY

How well have FireSmart measures been adopted?

Applied the FireSmart Hazard Assessment System to 20 known hazard factors in the Home Ignition Zone:

- Quantified the actual wildfire hazards.
- Used hazard level as a proxy for acceptance and adoption of FireSmart measures.

METHODOLOGY

- Assessed 445 single family homes.
- “Rapid” Assessment technique.
- Data collected: 2014.
- 3 – 4 days; each study area.
- Multi-level analysis.
- Rural and urban study sites.

QUESTIONS ?

RESULTS

Overall FireSmart Hazard Rating and Degree of Adoption

STUDY SITE	# HOMES SAMPLED	AVERAGE WILDFIRE HAZARD & FIRESMART ADOPTION		
		Points	Hazard Level	FS Adoption
Kelowna Rural	18	67	HIGH	Poor
Kelowna Urban	170	58	MODERATE +	Fair to Poor
Slave Lake Urban	226	35	LOW	Excellent
Slave Lake Rural	31	34.5	LOW	Excellent

RESULTS

Average Hazard Points & Percent by Hazard Category

	MAJOR HAZARD CATEGORIES							
STUDY SITE	STRUCTURAL (max. 52 pts.)		VEGETAT'N/FUEL (max. 205 pts.)		TOPOGRAPHY (max. 21 pts.)		IGNITION SITES (max. 16 pts.)	
	Points	%	Points	%	Points	%	Points	%
Kelowna Urban	2.5	5.5	35.1	73.0	7.0	14.5	3.5	7.1
Kelowna Rural	4.0	5.9	42.6	63.3	14.5	21.5	6.3	9.3
Slave Lake Urban	5.0	39.4	4.0	31.7	.03	0.2	3.6	28.7
Slave Lake Rural	6.5	18.9	22.2	64.4	1.2	3.5	4.6	13.2
Overall Average	*4.5*	*17.4*	*26*	*58.1*	*5.5*	*9.9*	*4.5*	*14.6*

RESULTS

Relative Hazard Contributions of Structural Sub-Categories

	STRUCTURAL SUB-CATEGORIES			
STUDY SITE	**BUILDING MATERIALS (max. 40 pts.)**		**BUILDING FEATURES (max. 12 pts.)**	
	Points	**%**	**Points**	**%**
Kelowna Urban	**1.3**	**2.9**	**1.2**	**2.6**
Kelowna Rural	**1.9**	**2.9**	**2.1**	**3.0**
Slave Lake Urban	**3.1**	**24.4**	**1.9**	**14.9**
Slave Lake Rural	**3.5**	**10.1**	**3.0**	**8.8**
Overall Average	***2.5***	***10.1***	***2.0***	***7.3***

RESULTS

Hazard Contributions of Building Materials by Study Site.

STUDY SITE	BUILDING MATERIALS					
	ROOFING (max. 30 pts.)		EXTERIOR SIDING (max. 6 pts.)		WINDOWS (max. 4 pts.)	
	Points	%	Points	%	Points	%
Kelowna Urban	0.1	0.3	0.1	0.1	1.1	2.5
Kelowna Rural	0	0	0.6	0.9	1.3	2
Slave Lake Urban	0	0	2.0	16.1	1.0	8.2
Slave Lake Rural	0	0	2.5	7.2	1.0	2.9
Overall Average	*0*	*0*	*1.3*	*6.1*	*1.1*	*3.9*

HAZARD CONTRIBUTIONS OF BUILDING MATERIALS

Roofing, Siding, Windows.

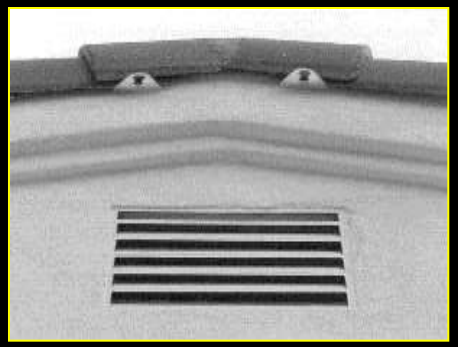
RESULTS

Hazard Contributions of Building Features

	BUILDING FEATURES			
STUDY SITE	EAVES, VENTS, OPENINGS (max. 6 pts.)		BALCONY, DECK, PORCH (max. 6 pts.)	
	Points	%	Points	%
Kelowna Urban	.05	0.2	1.2	2.4
Kelowna Rural	0	0	2.1	3.1
Slave Lake Urban	0	0	1.9	14.9
Slave Lake Rural	0.2	0.6	2.8	8.2
Overall Average	*0.1*	*0.2*	*2.0*	*7.1*

HAZARD CONTRIBUTIONS OF BUILDING FEATURES

Eaves, Vents, Openings & Balcony, Deck, Porch



VEGETATION/FUEL RESULTS

RESULTS

Vegetation/Fuel Hazard Attributed to Priority Zones

	PRIORITY ZONE VEGETATION/FUEL					
STUDY SITE	PRIORITY ZONE 1 (0 – 10M)		PRIORITY ZONE 2 (10 – 30M)		PRIORITY ZONE 3 (30 – 100^{+}M)	
	Points	%	Points	%	Points	%
Kelowna Urban	17.3	49	10.5	30	7.4	21
Kelowna Rural	16.3	38.3	14.4	33.9	11.8	27.8
Slave Lake Urban	2.3	56	1.1	26.7	0.7	17.3
Slave Lake Rural	3.1	14.1	8.5	38.4	10.5	47.5
Overall Average	*9.7*	*40*	*8.6*	*32*	*7.6*	*28*

VEGETATION HAZARD BY ZONE

P. ZONE-1

P. ZONE-1

P. ZONE-3

P. ZONE-1 + 2

VEGETATION HAZARD BY ZONE

- 2 High-Risk Situations:
  - "Jackpot" junipers
  - "Eaves" of destruction
- Research aligns with reality at Slave Lake.

RESULTS

Vegetation/Fuel Hazard by Vertical Fuel Layers

	VERTICAL FUEL LAYERS					
STUDY SITE	SURFACE FUEL (max. 75 pts.)		LADDER FUEL (max. 40 pts.)		OVERSTORY FUEL (max. 90 pts.)	
	Points	%	Points	%	Points	%
Kelowna Urban	10.37	30	7.0	20	17.7	50
Kelowna Rural	19.9	46.7	8.8	20.6	13.9	32.7
Slave Lake Urban	2.6	65	0.8	20	0.6	15
Slave Lake Rural	9.1	41.2	2.1	9.5	10.9	49.3
Overall Average	*10.5*	*46*	*4.7*	*17*	*10.8*	*37*

HAZARD by VEGETATION LAYER

Surface litter

Crown fuels

Combustible mulch

Fuel Ladders

RESULTS

Summary of Topographic Hazards by Study Site

	TOPOGRAPHIC HAZARD FACTORS					
STUDY SITE	SETBACK FROM EDGE OF SLOPE (max. 6 pts.)		SLOPE STEEPNESS (max. 10 pts.)		SLOPE POSITION (max. 5 pts.)	
	Points	%	Points	%	Points	%
Kelowna Urban	2.1	4.3	3.0	6.2	1.9	4.0
Kelowna Rural	4.5	6.8	6.3	9.3	3.7	5.4
Slave Lake Urban	.03	0.2	0	0	0	0
Slave Lake Rural	0.1	0.2	0.7	2.0	0.5	1.4
Overall Average	*1.7*	*3*	*2.5*	*4*	*1.5*	*2.7*

RESULTS

Topographic Hazards

Three Types:

- Setback from Top of Slope
- Slope Steepness
- Position on Slope

- Inherent Hazard Factors
- Compound other Hazards
- Mitigate by compensation

RESULTS

Summary of Ignition Site Hazard Factors

	MISCELLANEOUS IGNITION SITES					
STUDY SITE	ROOF CLEANLINESS (max. 3 pts.)		MISCELLANEOUS COMBUSTIBLES (max. 6 pts.)		EMBER ACCUMULATORS (max. 10 pts.)	
	Points	%	Points	%	Points	%
Kelowna Urban	.01	0.2	1.2	2.6	2.2	4.5
Kelowna Rural	0	0	2.1	3.1	4.2	6.3
Slave Lake Urban	0	0	2.1	17	1.5	11.7
Slave Lake Rural	0	0	2.4	6.8	2.3	6.5
Overall Average	*0*	*0*	*1.95*	*7*	*2.6*	*7*

RESULTS

FireSmart Hazard Levels

	FIRESMART HAZARD LEVELS			
STUDY SITE	**LOW (0 - 42 pts.)**	**MODERATE (43 – 58 pts.)**	**HIGH (59 – 70 pts.)**	**EXTREME (70+ pts.)**
	% Homes	**% Homes**	**% Homes**	**% Homes**
Kelowna Urban	**45**	**18**	**14**	**23**
Kelowna Rural	**22**	**44**	**6**	**28**
Slave Lake Urban	**97**	**2**	**0**	**1**
Slave Lake Rural	**68**	**23**	**9**	**0**
% of Homes	***72%***	***12%***	***6%***	***10%***

RESULTS

Adoption Rates for Specific FireSmart Mitigations

RESIDENT ADOPTION OF FIRESMART MITIGATIONS FOR WUI HAZARD FACTORS		
POOR	FAIR – GOOD	EXCELLLENT
Surface fuel in Priority Zone-1	Building exterior	Roofing material
Ladder fuel in Priority Zone-1	Balcony, deck, porch	Eaves, vent, openings
Canopy fuel in Priority Zone-1	Location of combustibles	Windows and doors
Surface fuel in Priority Zone-2	Ember accumulators	Roof cleanliness
Ladder fuel in Priority Zone-2	Surface fuel Priority Zone-3	
Canopy fuel in Priority Zone-2		
Ladder fuel in Priority Zone-3		
Canopy fuel in Priority Zone-3		

CONCLUSIONS

1. Adoption of FireSmart Practices.
2. Public Communication & Engagement.
3. Vegetation/Fuel Management.
4. Home Construction.
5. Ignition Sites.

CONCLUSIONS: Adoption of FireSmart Practices

1. Wide variability in FireSmart adoption level.
2. Slave Lake study areas rated “FireSmart”.
3. Conditions set for 2003 repeat at Kelowna.
4. Spatial risk analysis revealed weaknesses.
5. Vegetation factors have lowest adoption.
6. Key hazards in homeowner authority.
7. Low FireSmart adoption likely prevails.

CONCLUSIONS: Public Communication and Engagement

1. Progress in some areas, cautious optimism.
2. Slave Lake benefits from innovative FS program.
3. Doubt effectiveness of FS communications.
4. Study insights could guide future improvement.
5. Improved communication and public engagement is critical to Kelowna situation.

CONCLUSIONS: Vegetation and Fuel Management

1. Greatest weakness; best opportunity for gains.
2. Most critical issues located in PZ-1, near surface.
3. Perilous proliferation of volatile conifers in Kelowna.

CONCLUSIONS: Home Construction

1. Structural factors accounted for 17% of risk.
2. Excellent compliance partly due to homebuilder innovations, new materials, design preferences.
3. AB code changes only ½ measure in WUI.
4. Structural advantages overwhelmed by untreated vegetation/fuel.

CONCLUSIONS: Ignition Sites

1. Ignition sites accounted for 15% of total hazard.
2. Ignition factors rated at fair to good compliance
3. Pattern of home losses suggests ignition of home affects vulnerability of adjacent homes.

RECOMMENDATIONS: Adoption of FireSmart Practices

1. Strategic investment by Federal Government to restore momentum to the Canadian Wildland Fire Strategy and national FireSmart initiative.
2. Broader collaboration between provincial and municipal departments and FireSmart Canada to support more effective WUI fire prevention.
3. Continue leading-edge work at Slave Lake to sustain high levels of FireSmart adoption.

RECOMMENDATIONS: Public Communication and Engagement

1. Targeted launch of FireSmart Canada Community Recognition Program by City of Kelowna.
2. Incorporate FireSmart principles into training for foresters, arborists, landscape technicians.
3. Build on Alberta success with guidebooks on environmentally based FireSmart fuel treatments.

RECOMMENDATIONS:
Vegetation and Fuel Management

1. Build 2nd - generation vegetation/fuel guidelines that address resident concerns and values.
2. Agency adoption and dissemination of upgraded vegetation/fuel guidelines to public.
3. Kelowna authorities engage residents in treating hazardous forest enclaves (2 options).

RECOMMENDATIONS: Home Construction

1. Engage Canadian Homebuilders Assoc. to raise awareness and build on positive contributions.
2. Create pamphlet on FireSmart guidelines for home builders, building suppliers, and planners.

RECOMMENDATIONS: Research, Regulations, Planning.

1. Initiate social science investigation the FireSmart awareness and attitudes of Kelowna residents.
2. Apply principles of forensic investigation to wildfire disasters and maximize lessons learned.
3. Increased diligence by planners and developers to develop block plans that mitigate wildfire risk.
4. Enact regulations and/or code to expand use of fire-resistant building materials in the WUI and limit use of volatile landscaping materials.

SUMMARY

LOOKING BACK – LOOKING FORWARD

"In my opinion it is because Fernie was situated in the heart of a thickly timbered area that the disaster fell upon it with such crushing fury. To many other parts throughout the province, Fernie will contain a lesson in this respect."

Wm. Fernie, Town Founder Sept. 1908

SUMMARY

1. This study answered ICLR's question about levels of FireSmart adoption.

2. Shows strengths and weaknesses in current programs which promote wildfire loss reduction.

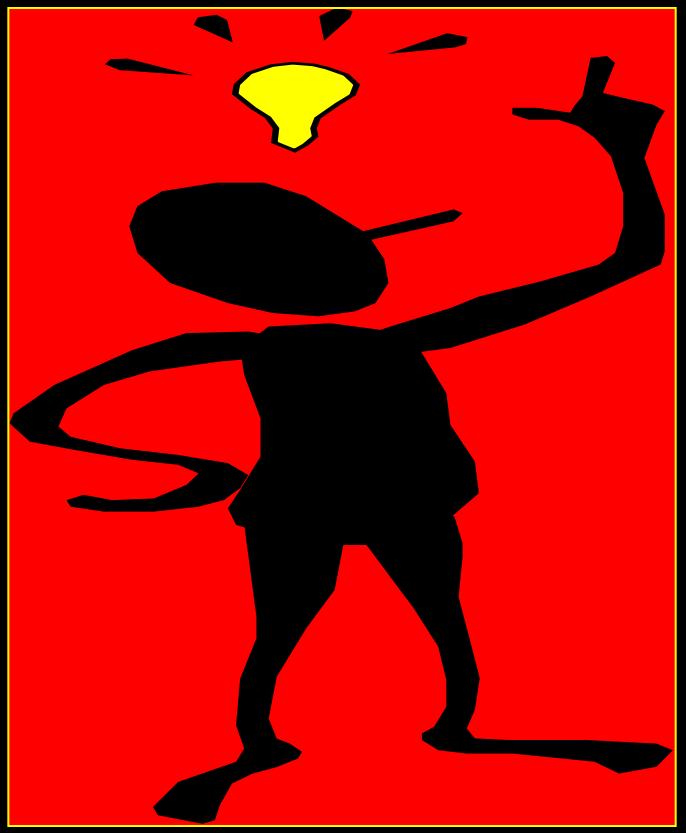
SUMMARY

3. Points out opportunities to enhance effectiveness of future risk mitigation programs and communications.

4. Challenges many agencies and organizations to become more involved in solving a significant threat to the safety of Canadians.

ANY BURNING QUESTIONS ?

COMMENTS, IDEAS ?



Converging Trends

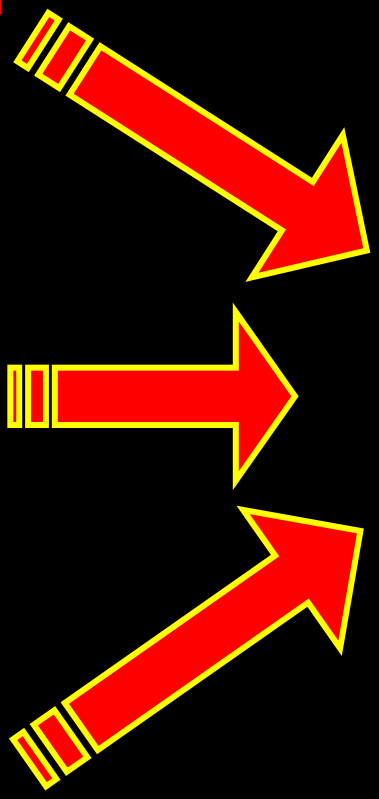
Climate Change

Expansion of WUI Area

Lack of FireSmart Mitigations

Forest Health Issues

- Rising Fuel Loads



<u>More Frequent</u>

<u>WUI Disasters</u>

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