Wildfire Risk Management System

Joint project of: B.A. Blackwell and Associates Ltd. and Forest Ecosystem Solutions Ltd.

Presented by:Bruce Blackwell

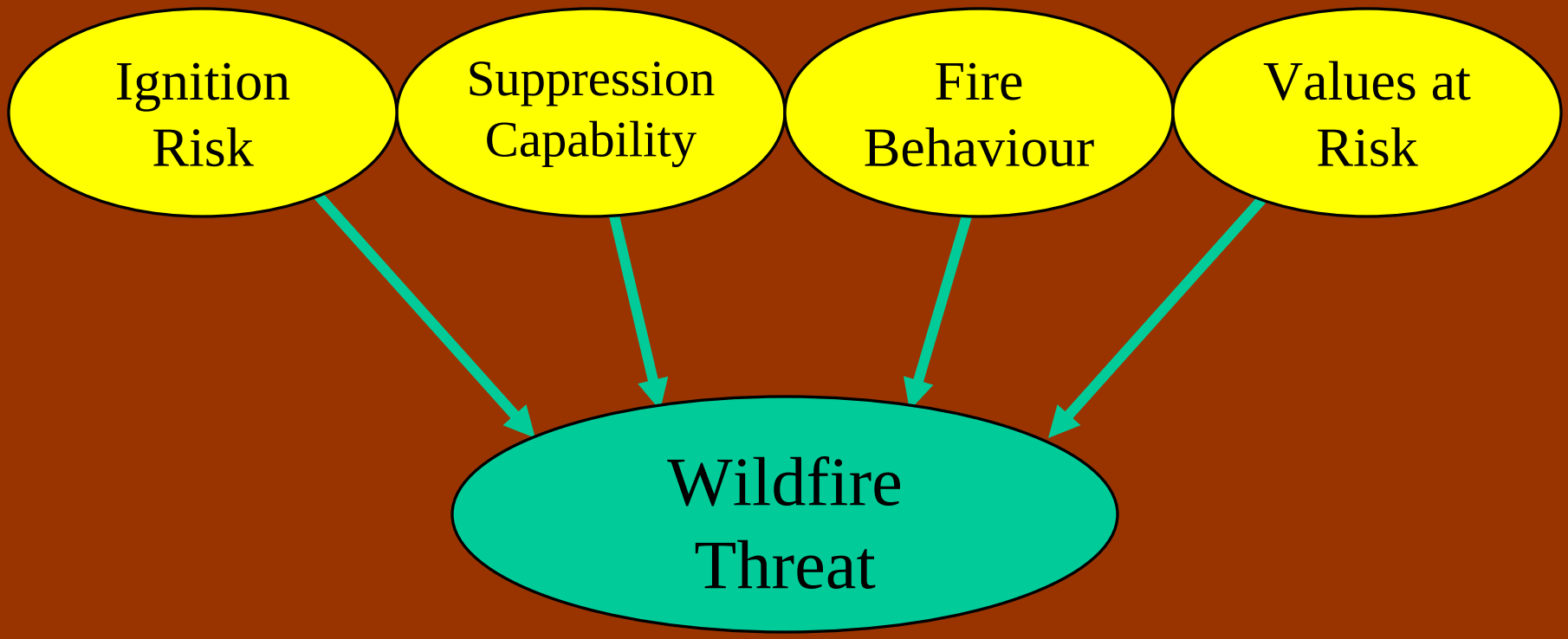
B.A. Blackwell and Associates Ltd.

June 2006

Outline

- History of WRMS project
- Static model structure
- Dynamic model development
- Model advancements
- Future plans

The Origin – Wildfire Threat Analysis



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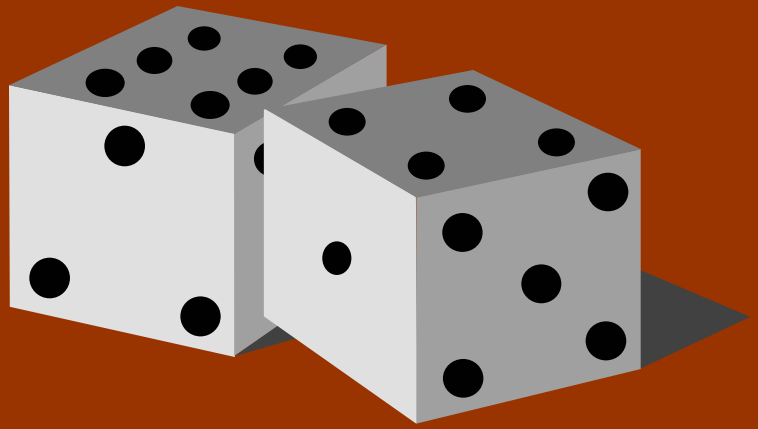
Wildfire Threat Analysis

Some Limitations

- Complexity of underlying relationships is masked
- "Threat" is insufficiently defined
- Greater transparency and flexibility with model inputs is required

Wildfire Risk Management Defined

"The *probability* and *consequences* of wildfire at a specified location under specified conditions."



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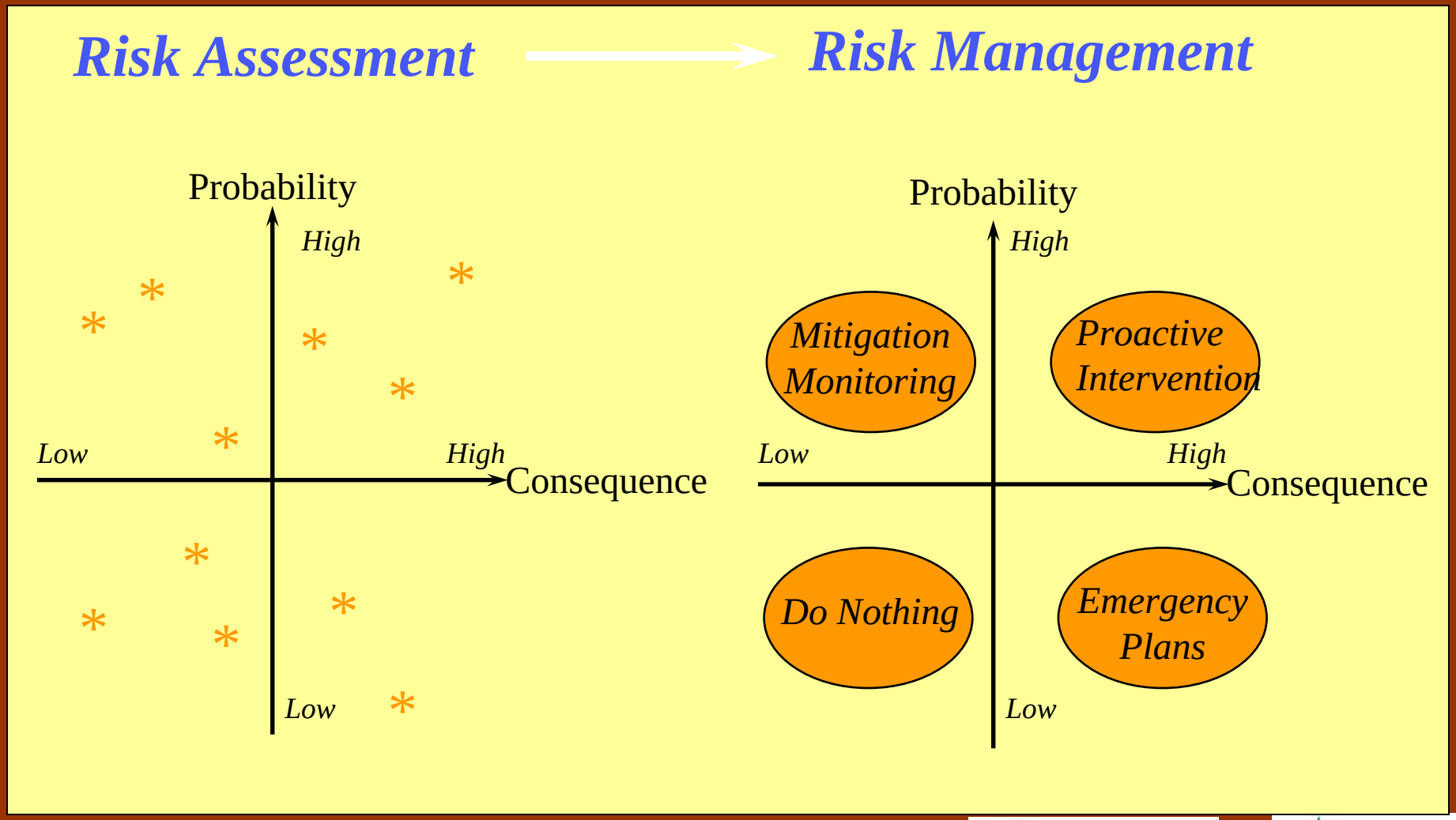
Wildfire Risk Management



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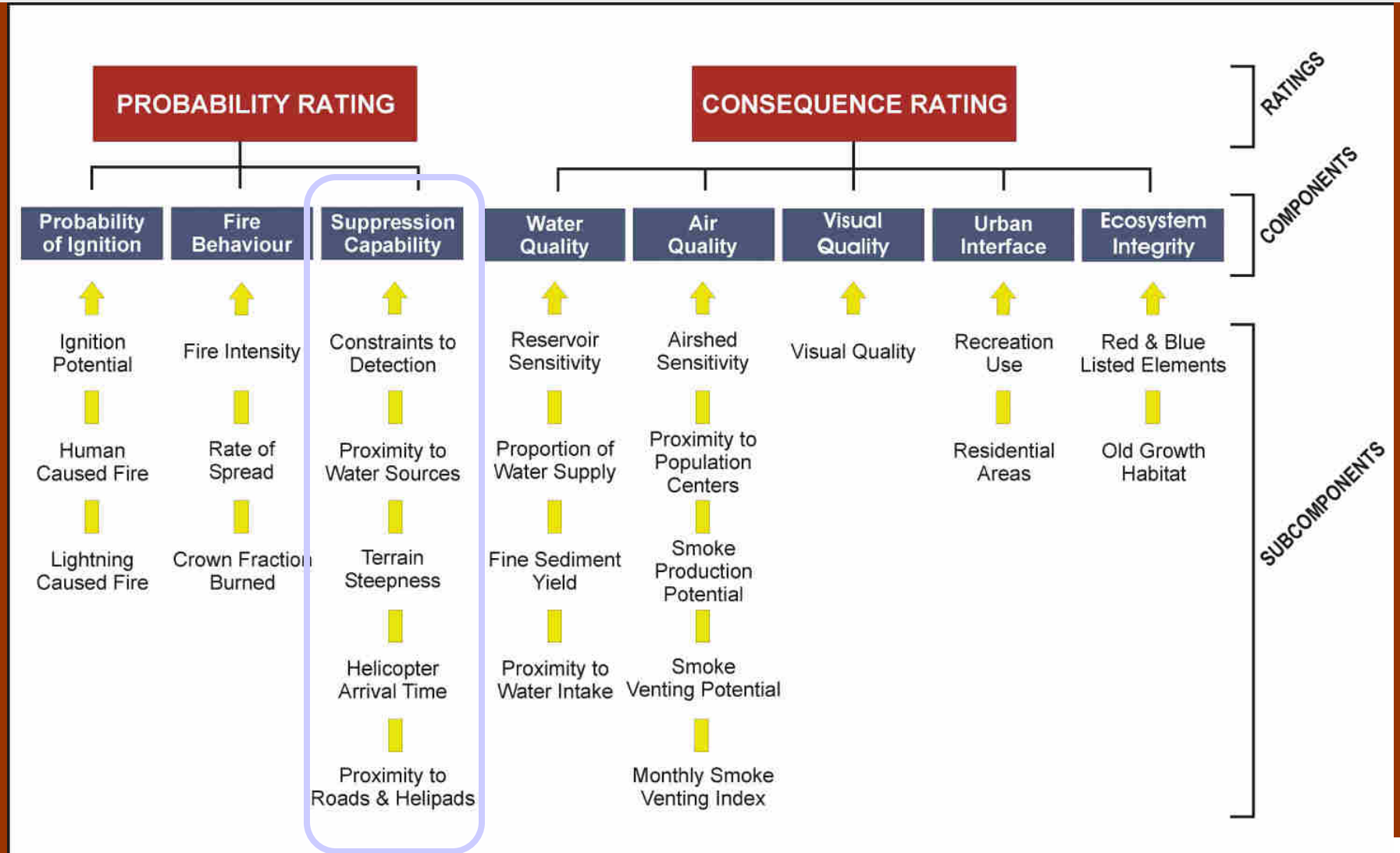
WRMS – Basic Model Structure



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The Greater Vancouver Watersheds

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Sub-Component Method

Sub-Component	Indicator / Units	Rating Scale		Weight
Constraints to Detection *Indicator of the ability to detect a fire (Note: reconnaissance at higher elevations is often constrained by cloud cover)*	Elevation metres	> 1000	10	10%
		500 - 1000	7	
		0 - 500	2	
Proximity to Water Sources *Indicator of the ability to access water quickly for fire fighting. Based on distance from streams and lakes.*	distance metres	>300	10	10%
		101-300	7	
		0-100	2	
Helicopter Arrival Time *Indicator of the time for initial attack, measured as concentric flight time from Seymour base PLUS fixed assumptions about contracted response time to the base.*	minutes	> 70	10	40%
		51 - 70	7	
		31 - 50	5	
		11 - 30	3	
		0 - 10	0	
Terrain Steepness *Indicator of the difficulty of control/contain on the landscape.*	Slope Class %	> 60	10	30%
		41 - 60	7	
		21 - 40	3	
		0 - 20	0	
Proximity to Roads and Helipads *Indicator of the ability to get suppression resources into an area. Based on a bush walking rate of 1 km / hour.*	minutes	> 120	10	10%
		61 - 120	7	
		31 - 60	5	
		16 - 30	3	
		0 -15	0	

Water Quality

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Air Quality

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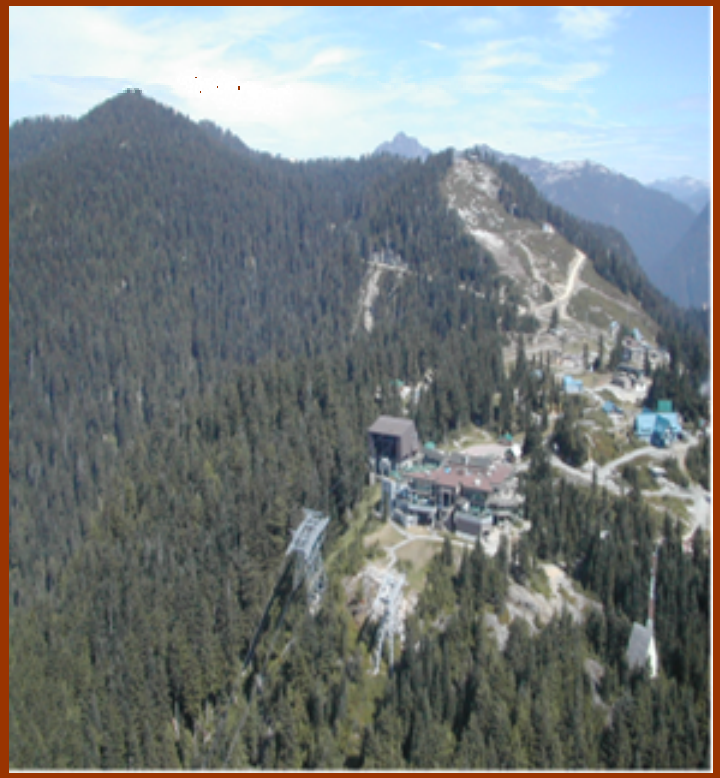
Visual Quality

Urban Interface



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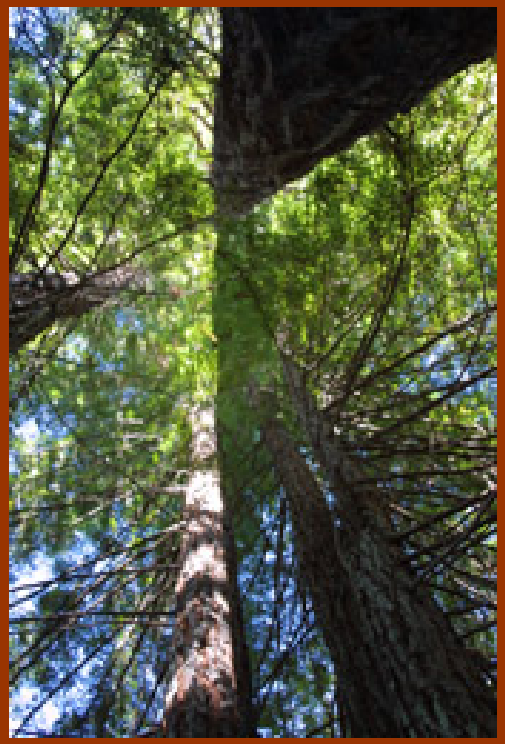
Ecosystem Integrity



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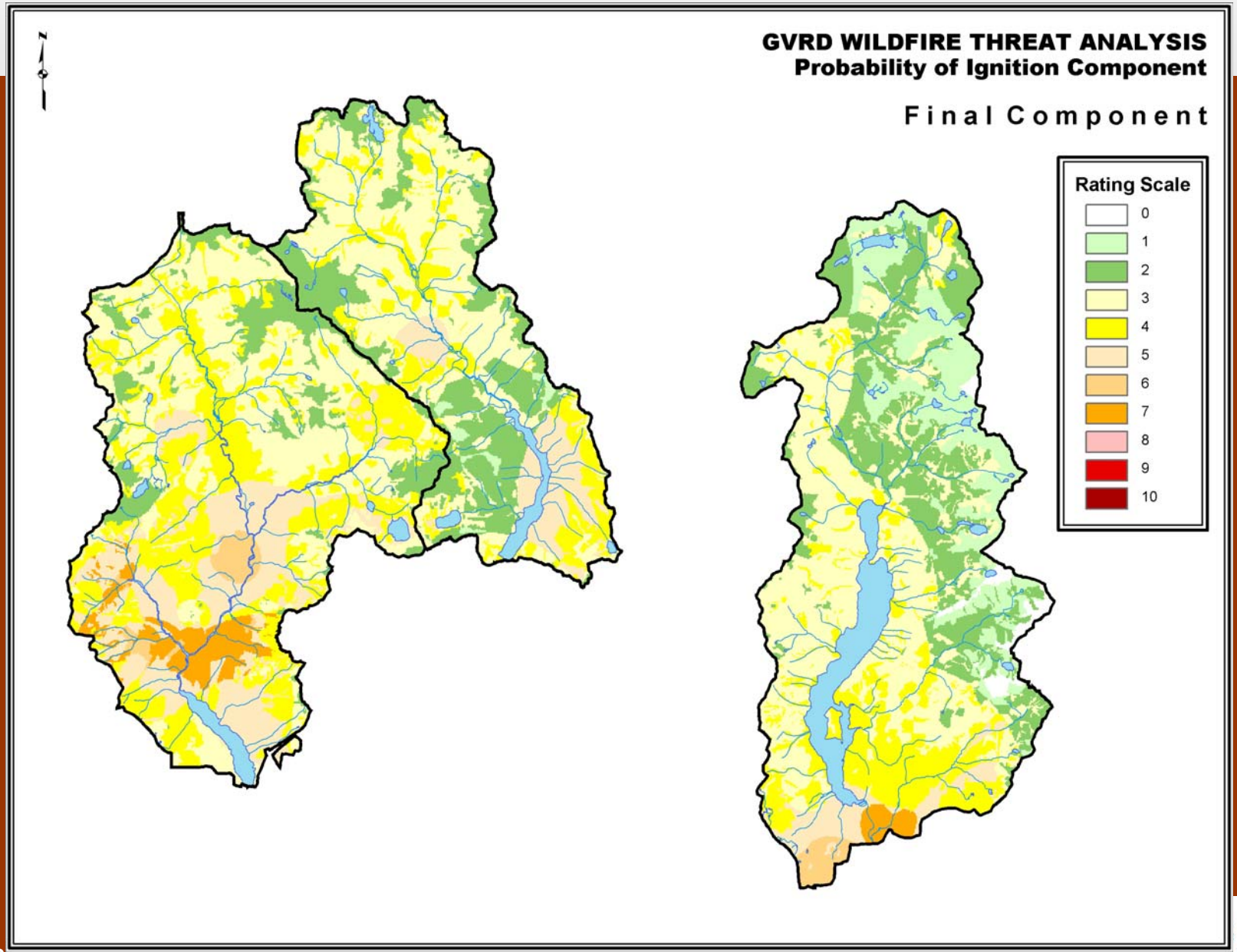
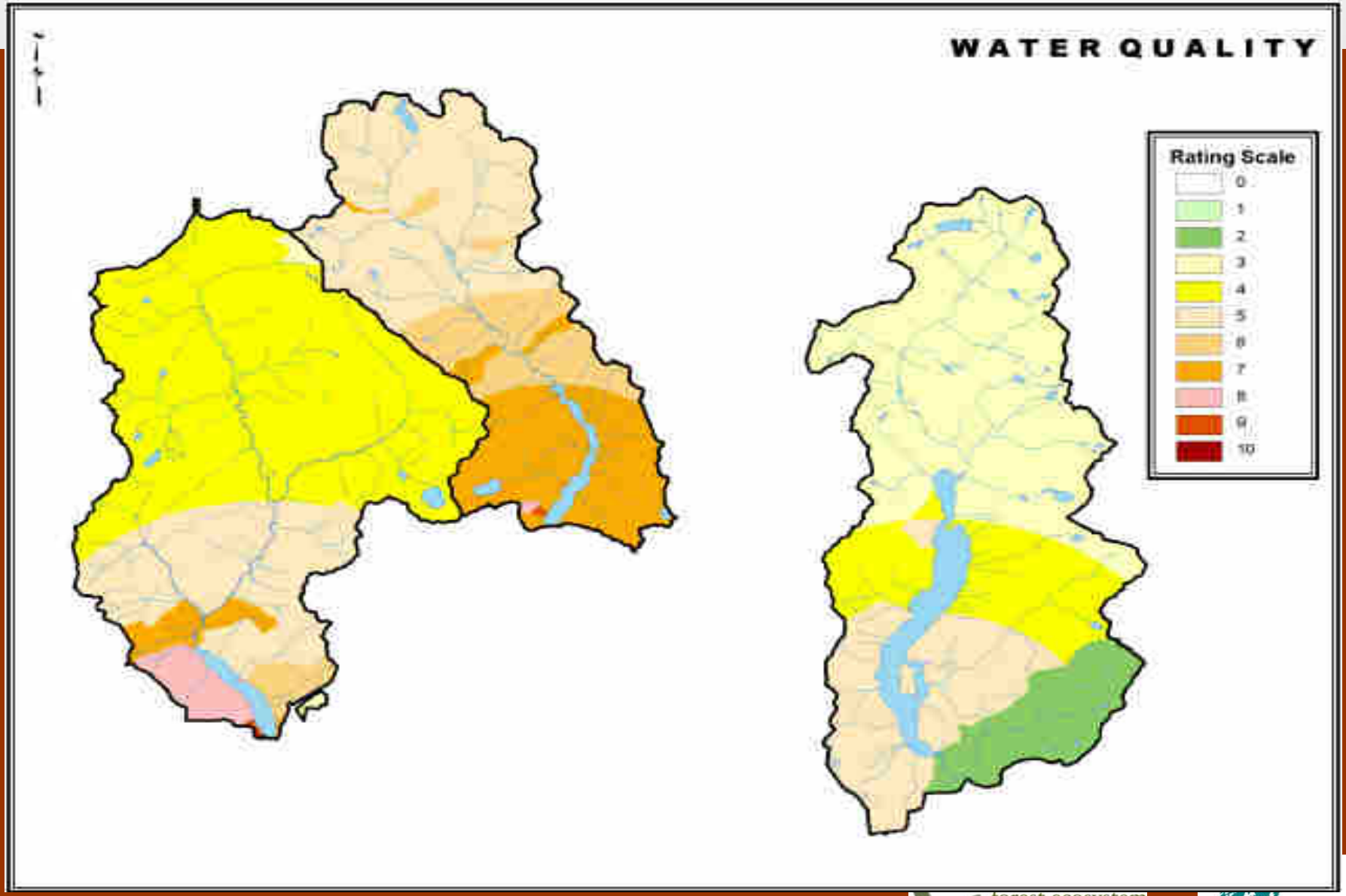
Probability of Ignition Theme

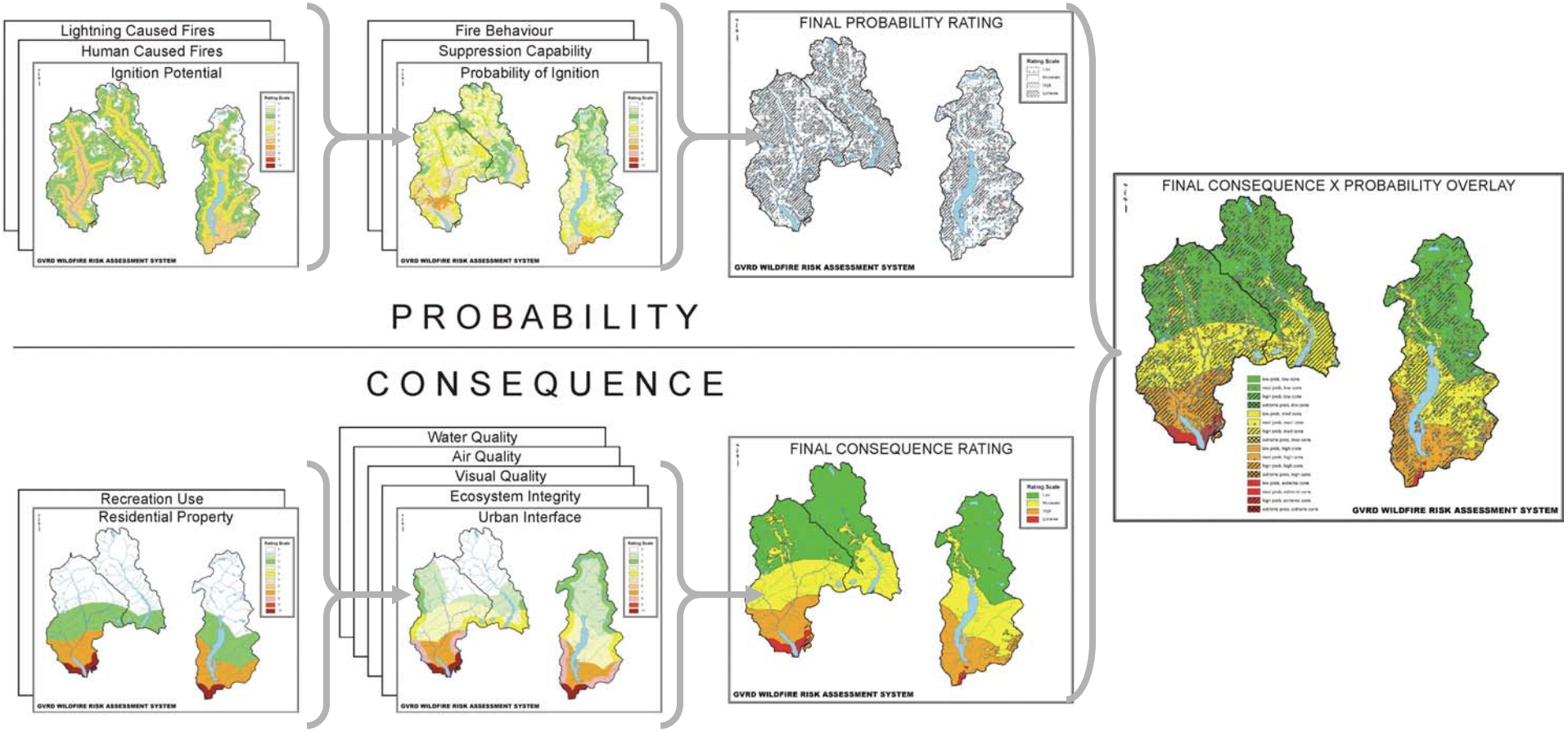


Water Quality Theme



Summary of Mapping Outputs

SUBCOMPONENTS → COMPONENTS → FINAL RATINGS → FINAL OVERLAY

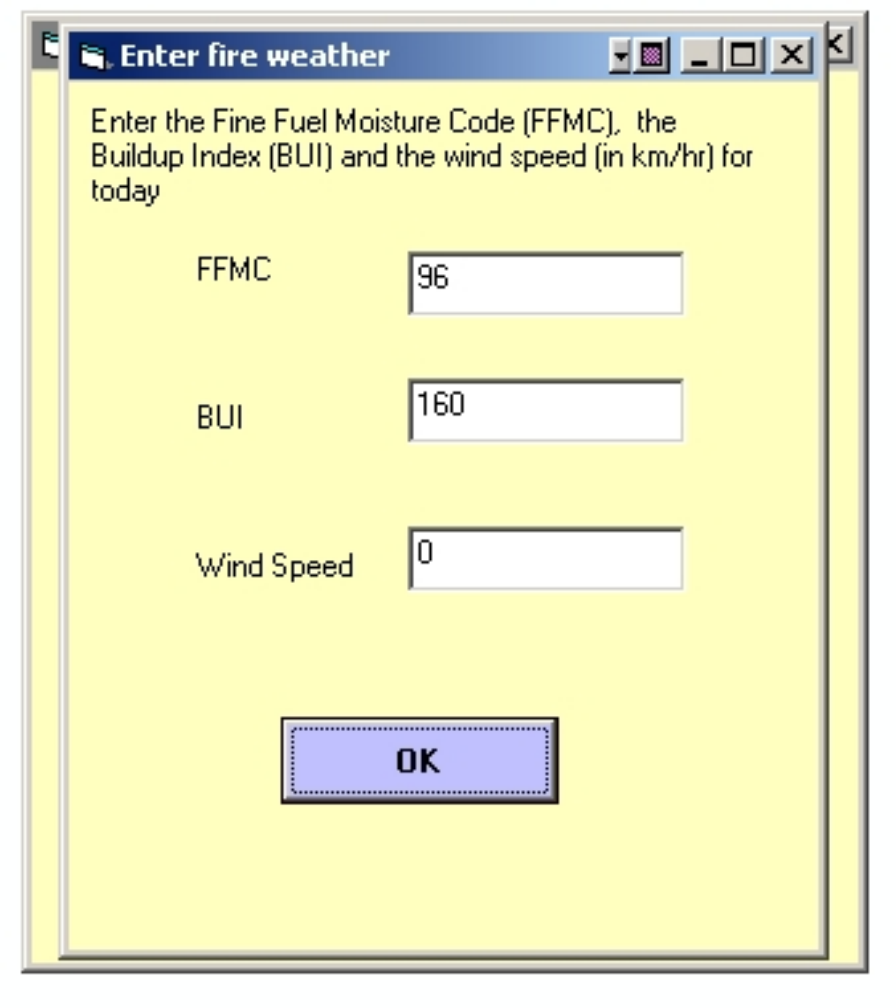



Edit View Insert Selection Tools Window Help
WTRS Welcome
WTRS
Wildfire Threat
Rating System
Developed by:
B.A. Blackwell
And Associates Ltd.
forest ecosystem
solutions ltd.
Canadian
Forest Service
Province of
British Columbia
Ministry of
Forests
Integrated Resource Management
Customized for:
Greater
Vancouver
Regional
District
START ...
TRS
25.46 2.27 Inches

Current Features

- "Gaming" to alter weights of input layers
  - Look at different scenarios
  - Emphasize or omit different layers
- Fire behaviour is derived based on weather data
- Wind vectors – account for wind speed and direction
- Option to create presentation maps

Input of Daily Fire Weather



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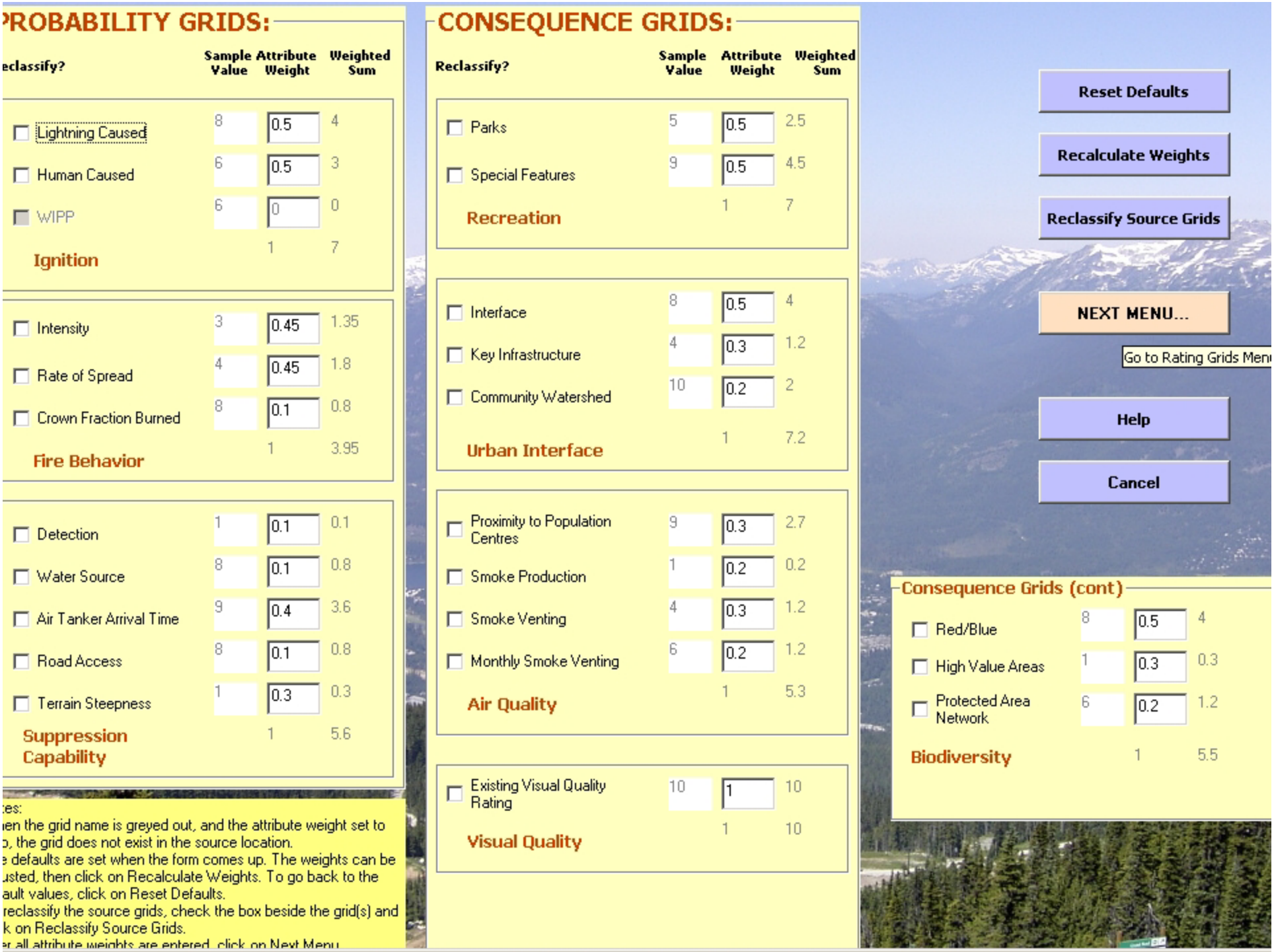
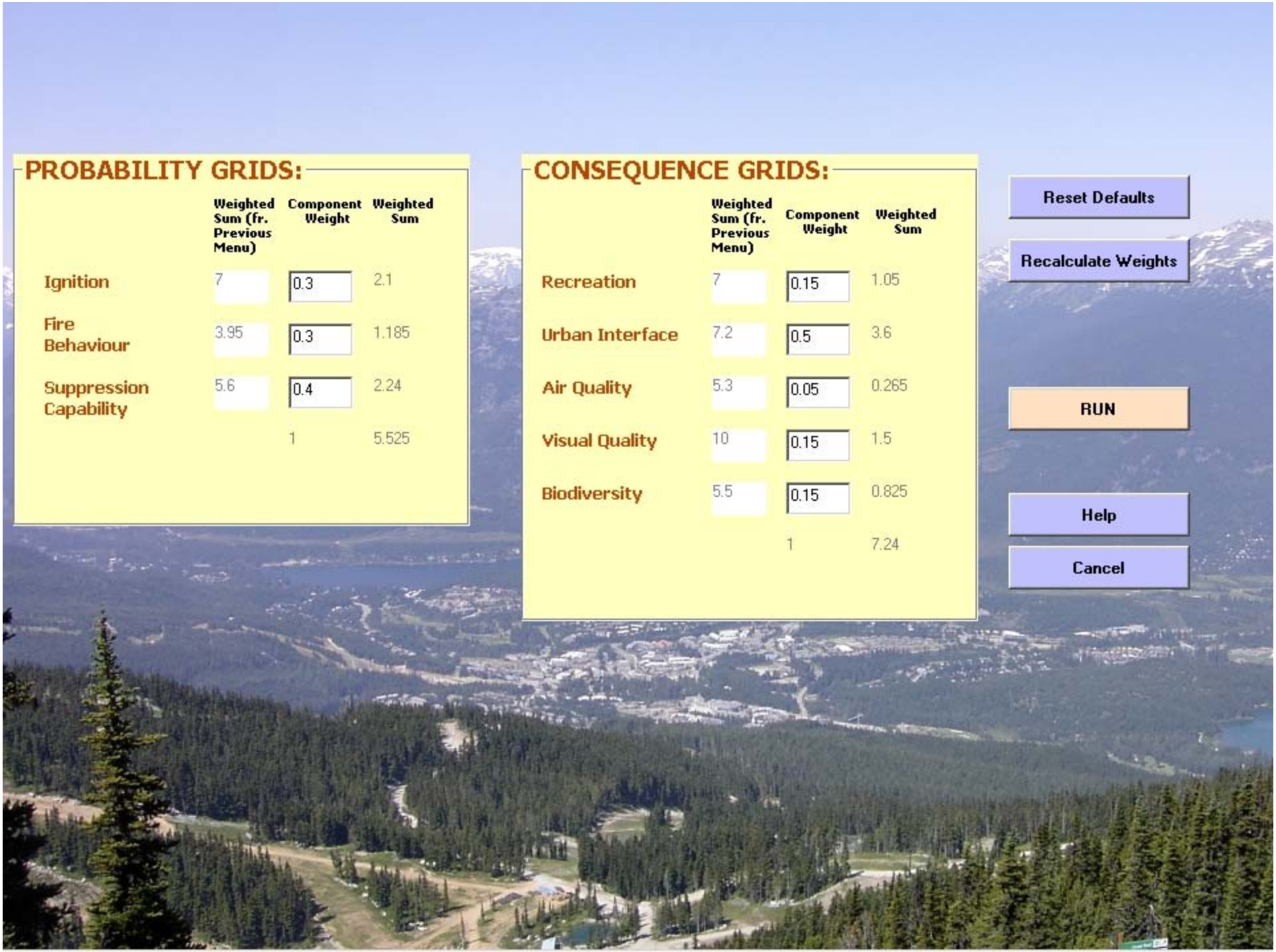
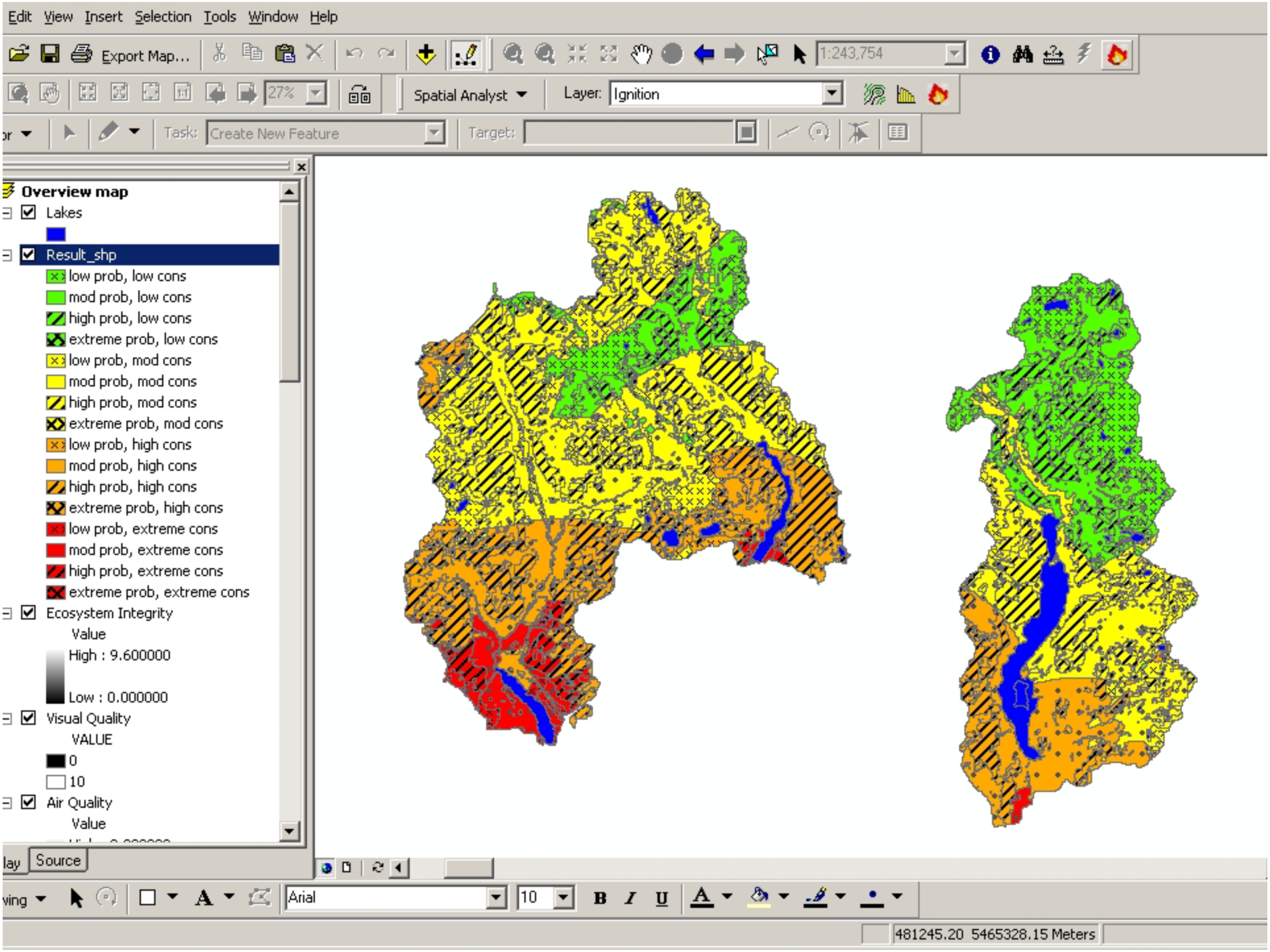
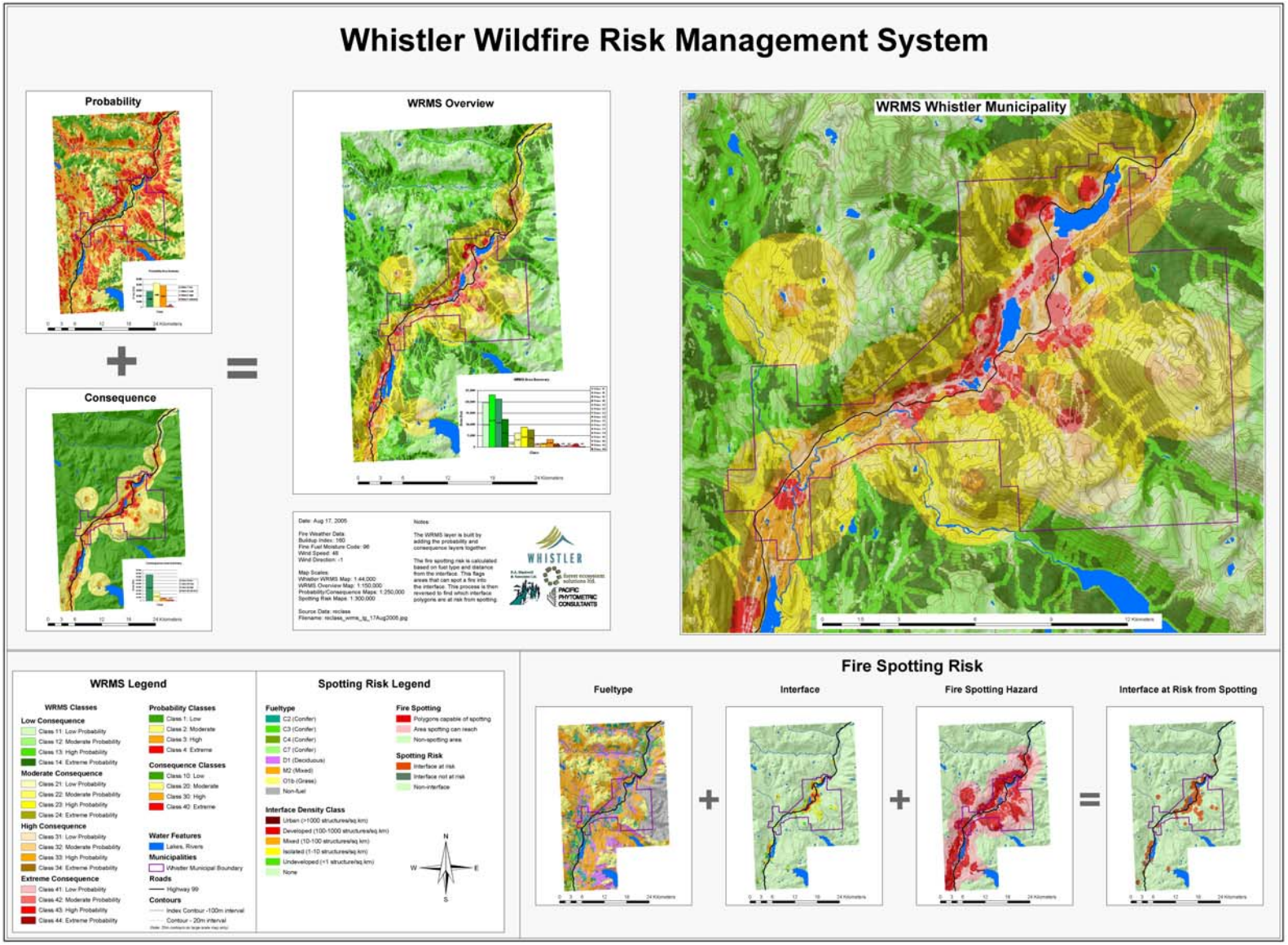

PROBABILITY GRIDS:
Reclassify?
Sample Value
Attribute Weight
Weighted Sum
Lightning Caused 8 0.5 4
Human Caused 6 0.5 3
WIPP 6 0 0
1 7
Ignition
Intensity 3 0.45 1.35
Rate of Spread 4 0.45 1.8
Crown Fraction Burned 8 0.1 0.8
1 3.95
Fire Behavior
Detection 1 0.1 0.1
Water Source 8 0.1 0.8
Air Tanker Arrival Time 9 0.4 3.6
Road Access 8 0.1 0.8
Terrain Steepness 1 0.3 0.3
1 5.6
Suppression Capability
CONSEQUENCE GRIDS:
Reclassify?
Sample Value
Attribute Weight
Weighted Sum
Parks 5 0.5 2.5
Special Features 9 0.5 4.5
1 7
Recreation
Interface 8 0.5 4
Key Infrastructure 4 0.3 1.2
Community Watershed 10 0.2 2
1 7.2
Urban Interface
Proximity to Population Centres 9 0.3 2.7
Smoke Production 1 0.2 0.2
Smoke Venting 4 0.3 1.2
Monthly Smoke Venting 6 0.2 1.2
1 5.3
Air Quality
Existing Visual Quality Rating 10 1 10
1 10
Visual Quality
Reset Defaults
Recalculate Weights
Reclassify Source Grids
NEXT MENU...
Go to Rating Grids Menu
Help
Cancel
Consequence Grids (cont)
Red/Blue 8 0.5 4
High Value Areas 1 0.3 0.3
Protected Area Network 6 0.2 1.2
1 5.5
Biodiversity
es:
en the grid name is greyed out, and the attribute weight set to
, the grid does not exist in the source location.
e defaults are set when the form comes up. The weights can be
usted, then click on Recalculate Weights. To go back to the
ault values, click on Reset Defaults.
reclassify the source grids, check the box beside the grid(s) and
k on Reclassify Source Grids.
r all attribute weights are entered, click on Next Menu


PROBABILITY GRIDS:
Weighted Sum (fr. Previous Menu)
Component Weight
Weighted Sum
Ignition
7
0.3
2.1
Fire Behaviour
3.95
0.3
1.185
Suppression Capability
5.6
0.4
2.24
1
5.525
CONSEQUENCE GRIDS:
Weighted Sum (fr. Previous Menu)
Component Weight
Weighted Sum
Recreation
7
0.15
1.05
Urban Interface
7.2
0.5
3.6
Air Quality
5.3
0.05
0.265
Visual Quality
10
0.15
1.5
Biodiversity
5.5
0.15
0.825
1
7.24
Reset Defaults
Recalculate Weights
RUN
Help
Cancel

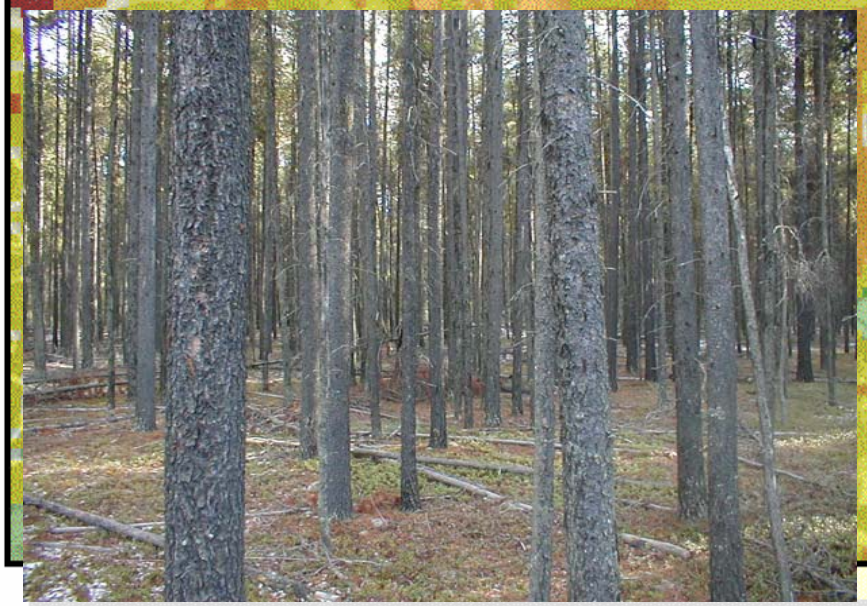

Edit View Insert Selection Tools Window Help
Export Map...
1:243,754
27%
Spatial Analyst
Layer: Ignition
Task: Create New Feature
Target:
Overview map
Lakes
Result_shp
low prob, low cons
mod prob, low cons
high prob, low cons
extreme prob, low cons
low prob, mod cons
mod prob, mod cons
high prob, mod cons
extreme prob, mod cons
low prob, high cons
mod prob, high cons
high prob, high cons
extreme prob, high cons
low prob, extreme cons
mod prob, extreme cons
high prob, extreme cons
extreme prob, extreme cons
Ecosystem Integrity
Value
High : 9.600000
Low : 0.000000
Visual Quality
VALUE
0
10
Air Quality
Value
Source
Arial
10
481245.20 5465328.15 Meters

Whistler Wildfire Risk Management System



Valemount Fuel Treatment Demo

Tête Jaune



Valemount Detailed Wildfire Threat Analysis

FINAL MATRIX
Probability x Consequence

- low cons; low prob
- low cons; mod prob
- low cons; high prob
- mod cons; low prob
- mod cons; mod prob
- mod cons; high prob
- high cons; low prob
- high cons; mod prob
- high cons; high prob

Cartographic Legend

- Town
- Creek
- Mt Robson Provincial Park
- Lake

N
W E
S

1:250,000

0 3 6 12 km

Advancements

Fuel Typing

Modeling Spotting Potential

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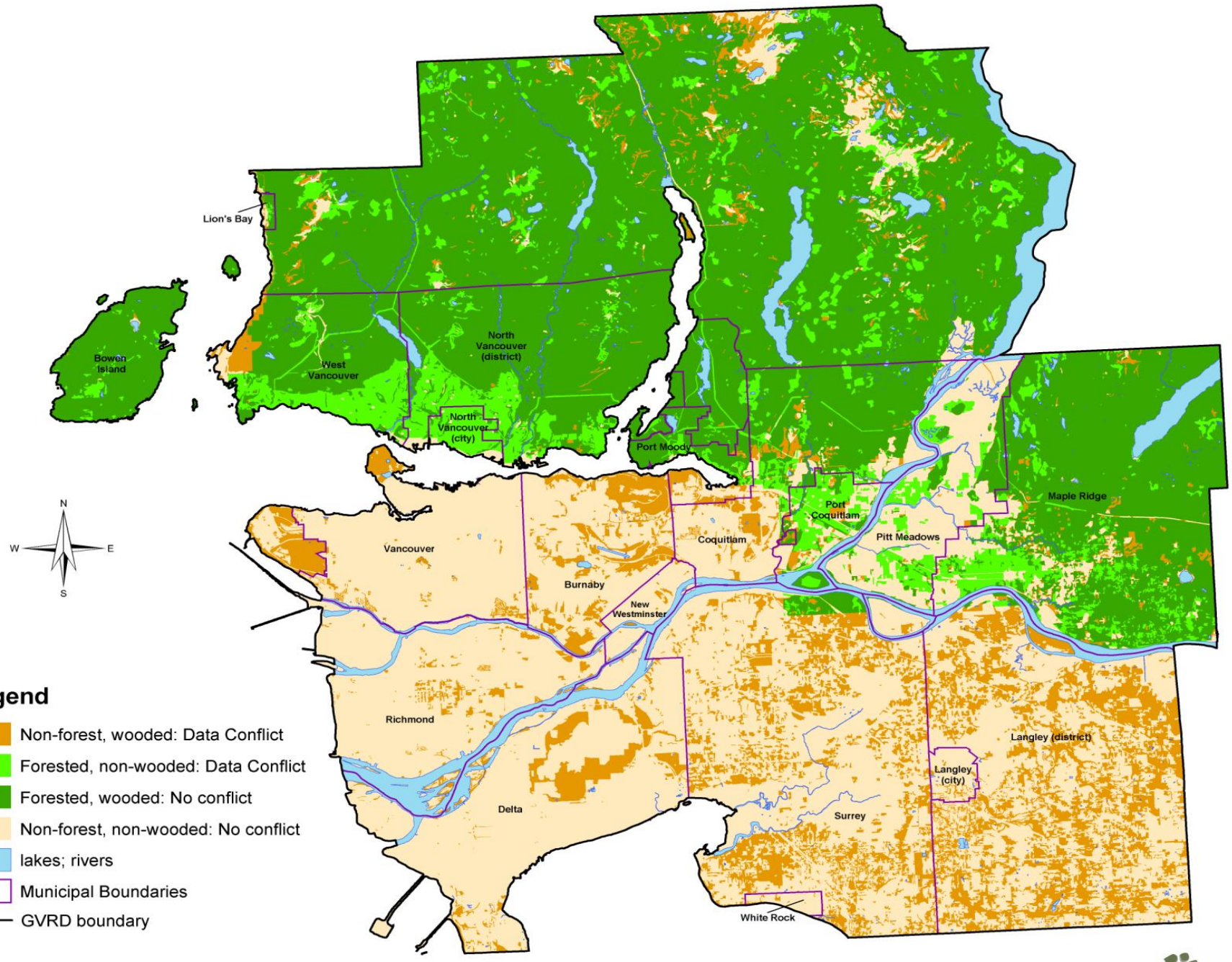
Lion's Bay
Bowen Island
West Vancouver
North Vancouver (district)
North Vancouver (city)
Port Moody
Port Coquitlam
Maple Ridge
Pitt Meadows
Coquitlam
Vancouver
Burnaby
New Westminster
Richmond
Delta
Surrey
Langley (district)
Langley (city)
White Rock
N
W
E
S
Legend
Non-forest, wooded: Data Conflict
Forested, non-wooded: Data Conflict
Forested, wooded: No conflict
Non-forest, non-wooded: No conflict
lakes; rivers
Municipal Boundaries
GVRD boundary
gvrd_wooded.jpg
May 10, 2005
0
5
10
20
30
40
Kilometers
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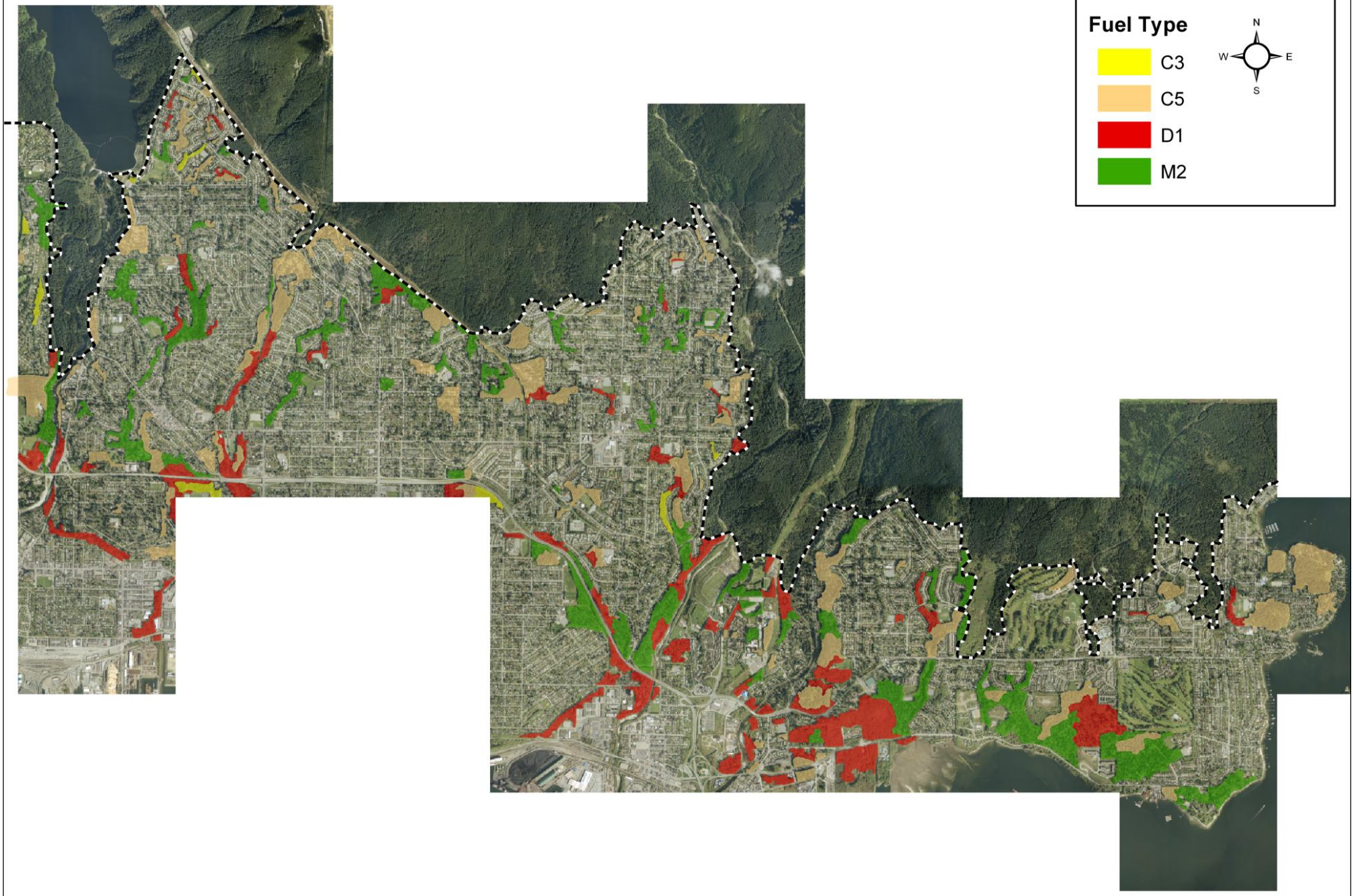
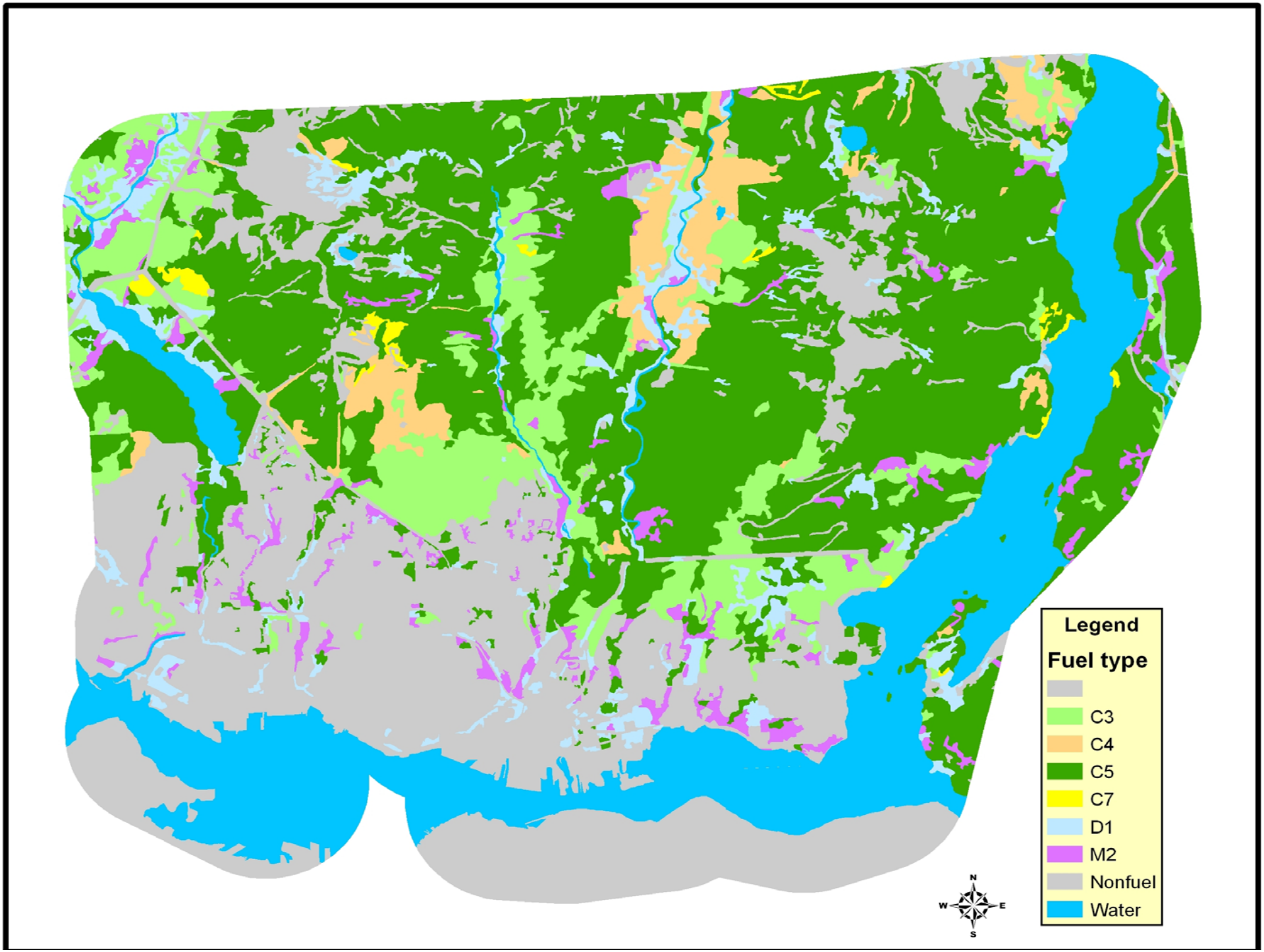
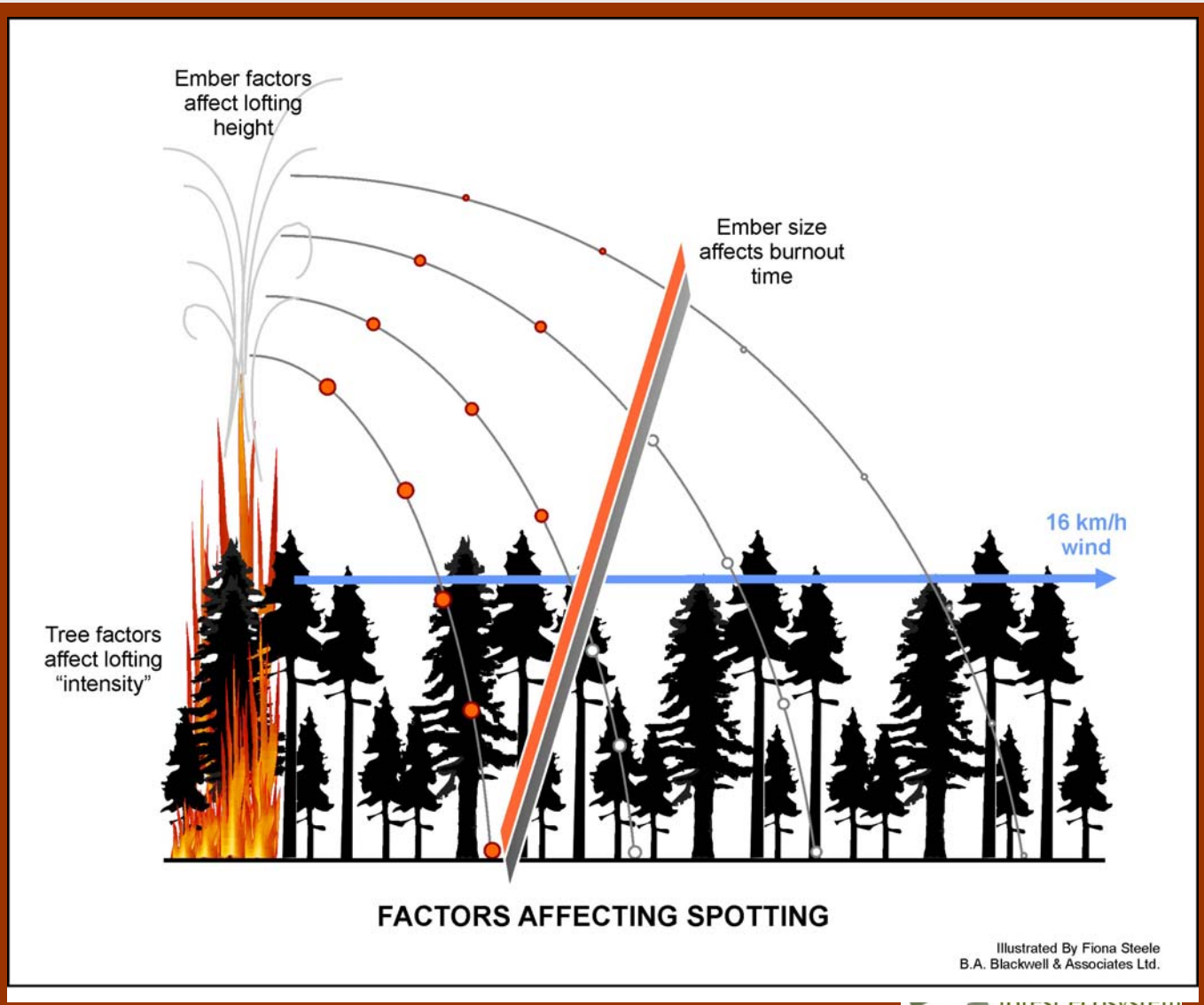
District of North Vancouver - Fuel & Fire Behaviour Analysis

Fuel Types: Within DNV Urban Area

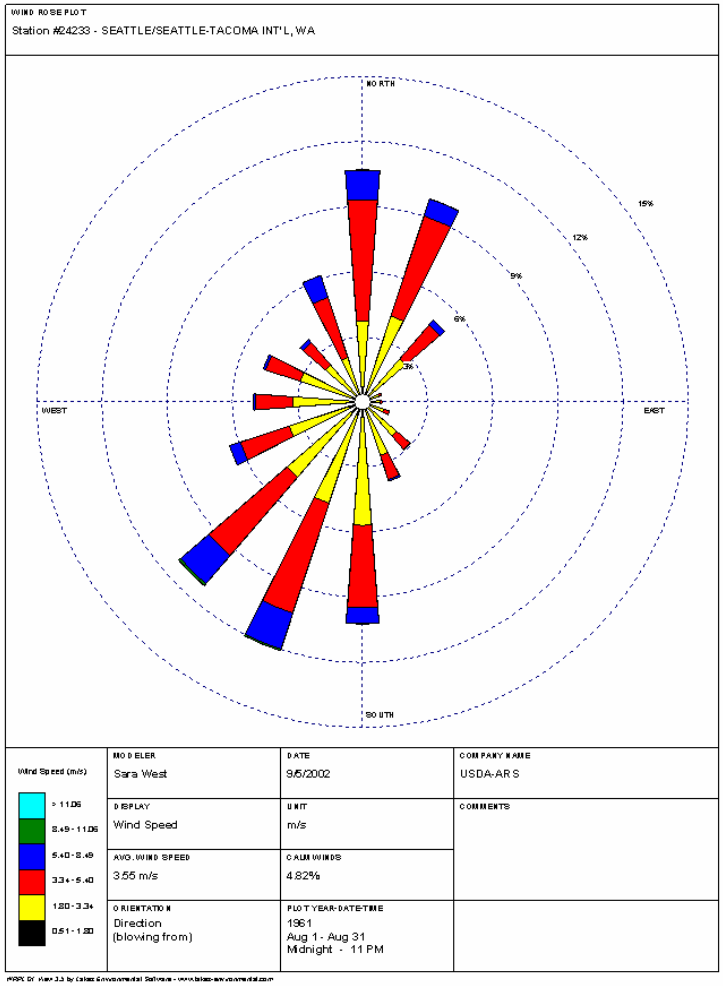



Legend
Fuel type
C3
C4
C5
C7
D1
M2
Nonfuel
Water
N
W
E
S

Spotting

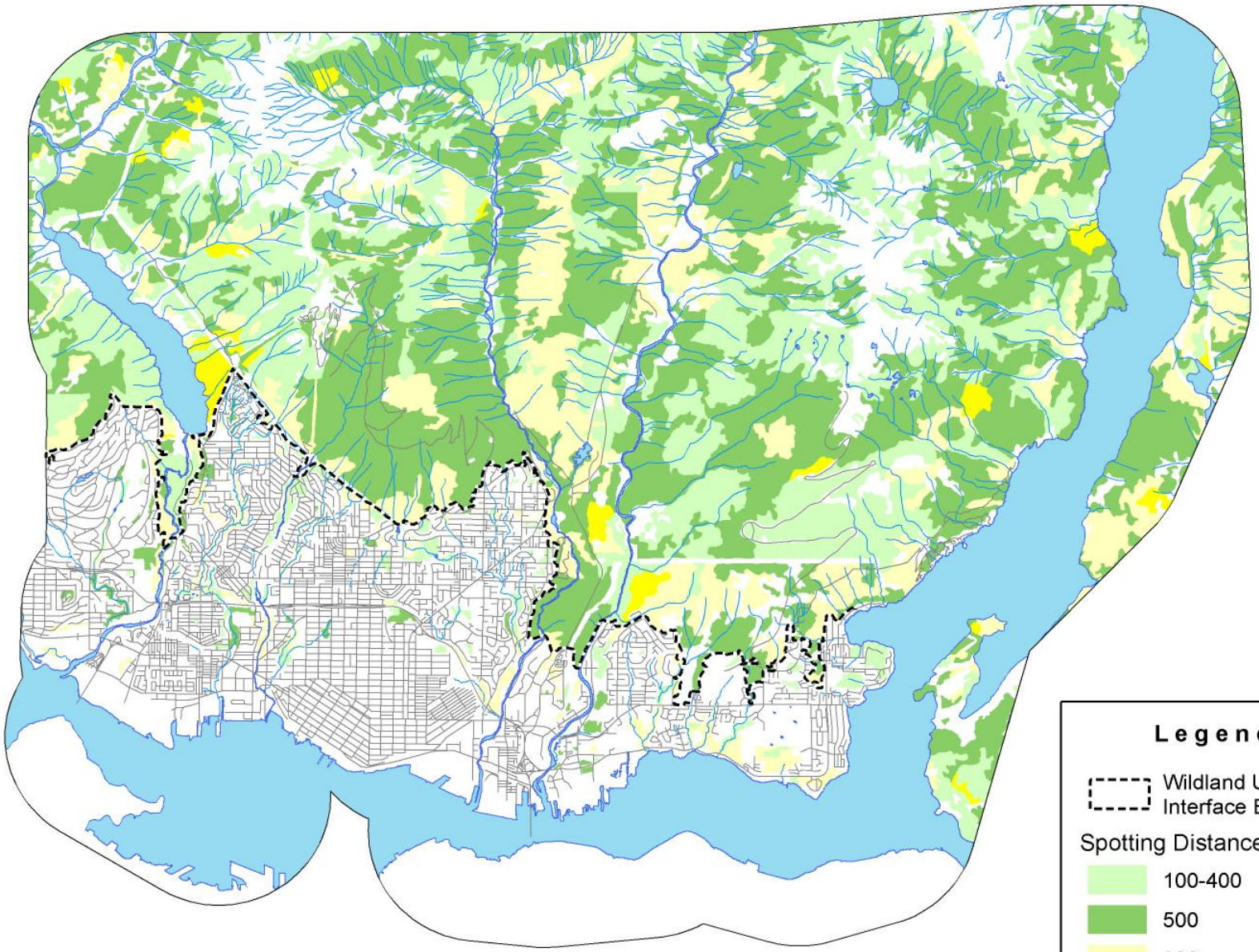


Wind Speed and Direction



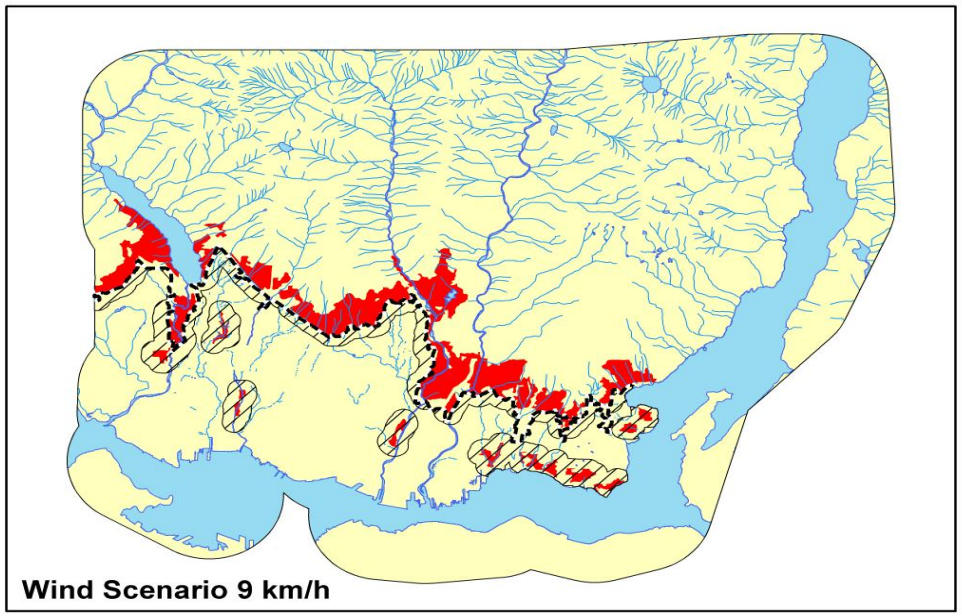
District of North Vancouver - Fuel & Fire Behaviour Analysis

Spotting Distance Simulation: Wind Scenario 16 km/h

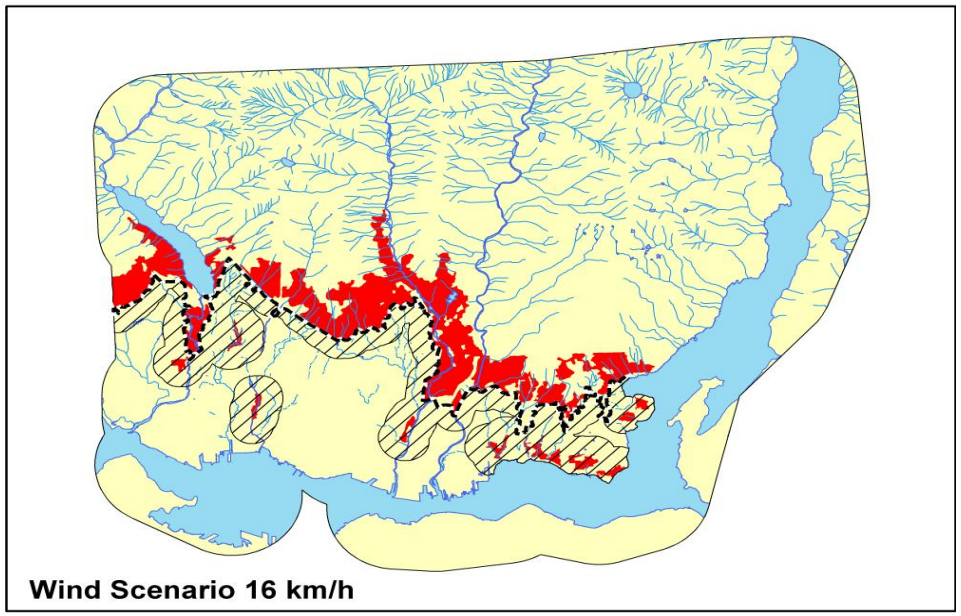


District of North Vancouver - Fuel & Fire Behaviour Analysis

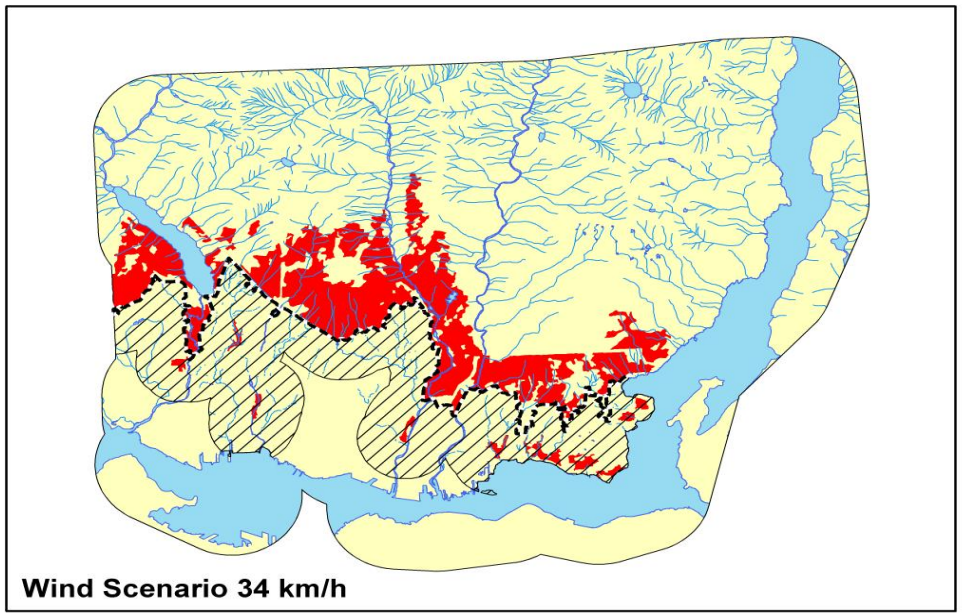
Wildfire Spotting Simulation



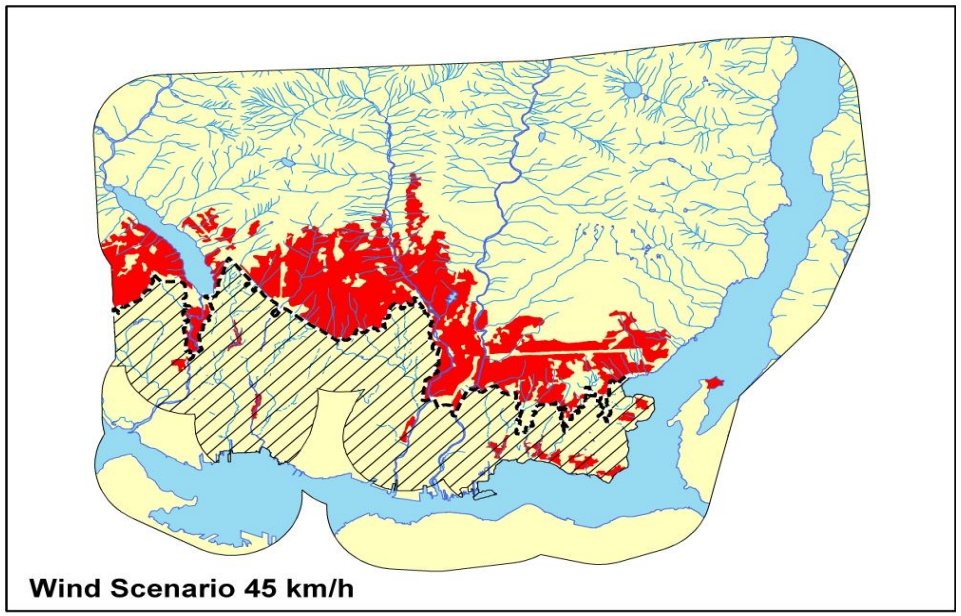
Wind Scenario 9 km/h



Wind Scenario 16 km/h



Wind Scenario 34 km/h



Wind Scenario 45 km/h

Wildland Urban Interface Boundary

Area within interface vulnerable to spotting

Can spot into interface

Won't spot into interface

Modeling Achievements

- Create a dynamic risk model that can be uploaded to the world wide web
- Create a dynamic calculation of spotting distance by fuel type for a given set of weather parameters
- Develop real time model capability such that daily fire weather can be used to assess the daily risk profile.

Future Plans

- Fully automate weather data
  - Go to Internet site and download
- Analysis at different scales
  - Projects that cover regions, but can also be used for municipalities within the region

Further Information

- Contact Bruce Blackwell, bablackwell@bablackwell.com

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