

Workshop on Research and Education in Support of Fire Resilient Societies



Wildland Fires



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WATERLOO



The Wildland Fire Science Lab

Doug Woolford dwoolfor@uwo.ca

TD Professor in Data Analytics
Director Master of Data Analytics
Associate Prof. of Environmetrics
Statistical & Actuarial Sciences, Western

Charmaine Dean

VP, Research & International and
Professor of Statistics, U. Waterloo
Prof. Emeritus, Stat. & Act. Sci., Western



Research program focus: data science for wildland fire science and management, analyzing complex spatio-temporal data structures provided by collaborators in Canadian fire management agencies. Sometimes this involves applied analytics. Other times it requires the development and application of novel analytics methodology.

Training: Postdocs, MSc Statistics, PhD Statistics, and RAs, emphasizing interdisciplinary collaborations in teams.

Research projects and interests:

- Monitoring for climate change impacts to fire regimes
- Spatially explicit fine-scale fire occurrence prediction
- Fire “lifetime” modelling
- Prevention impacts (fire bans, industrial protocols)
- Quantifying risk
- Detection and suppression systems
- Forest ecology
- Smoke exposure
- Decision support tools

Analytics expertise:

- Visualization of complex data and models
- Advanced statistical modelling
- Statistical inference
- Spatio-temporal analyses
- Stochastic models
- Risk modelling
- Simulation
- Biostatistics (survival, longitudinal & multi-state modelling, disease mapping)

Wildfire & Communities in British Columbia

- **Lori Daniels** (lori.daniels@ubc.ca)
Shannon Hagerman, Harry Nelson, Dominik Roeser, Bianca Eskelson + other colleagues
Faculty of Forestry, UBC-Vancouver
- **Research team:** 2PDFs, 4PhD, 4MSc
- **Research:** Wildfire preparedness (homes to landscapes)
- **Current Educational Courses:** Modules/labs in Abiotic Disturbance, Forest Operations, Spring and Fall Field Courses
- **Key affiliations:** BC Wildfire Service, BC Community Forest Association, FN Emergency Services Society, FP Innovations, Intact Foundation



Wildfire Exposure Assessment

A planning tool for identifying values at risk
and prioritizing mitigation effort

Team Lead: Jen Beverly

Wildfire Analytics Research Group

University of Alberta

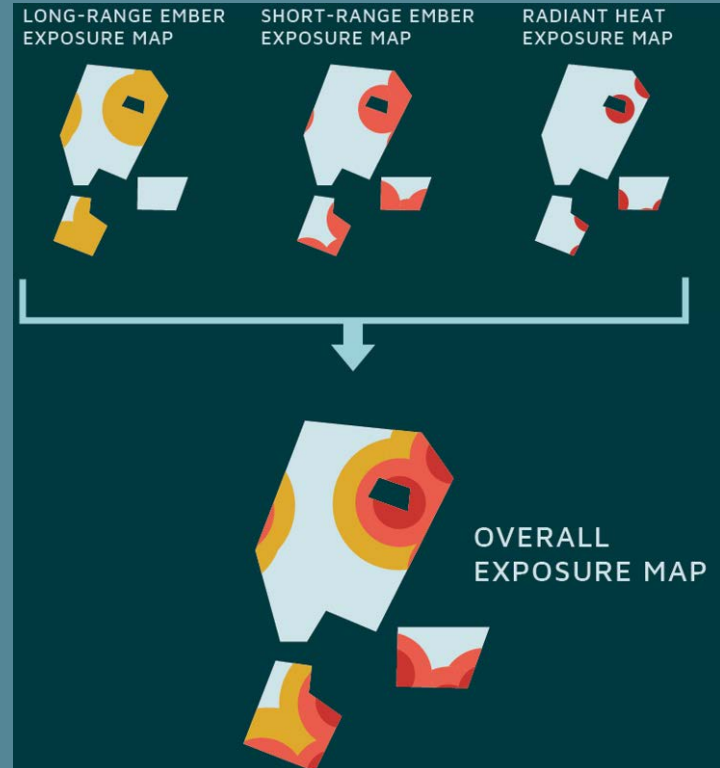
Jen.Beverly@ualberta.ca



Wildfire Exposure Assessment

A planning tool for identifying values at risk and prioritizing mitigation effort.

A method to identify and map possible wildfire entry-points into a community based on exposure to ignition mechanisms generated by nearby hazard fuels.



Chasmer Lab & ARTEMIS Lidar Lab

Contact: Dr. Laura Chasmer

Email: laura.chasmer@uleth.ca



Number of people involved:

- 2 profs + 2 affiliate profs
- 8 graduate students (looking for more)

Interests:

- Biomass/flammable environment
- C loss and depth of burn
- Ecosystem regeneration/succession
- Innovative 3D remote sensing:
house MS lidar

Courses:

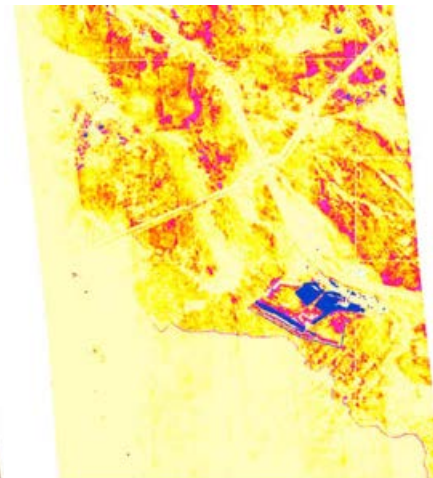
- Airborne operations; lidar; remote sensing;
ground survey (M.Sc. In Remote Sensing)

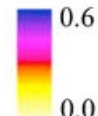
**Affiliations: FireSmart, ABoVE, HEAD3,
UW Research Labs (Petronne, Price)**



• Transect plots
 False colour composite
 Red: 1550 nm
 Green: 1064 nm
 Blue: 532 nm

Lidar (3 wavelength)
active NBR



Surface difference (m)
(2008 - 2016)

 0.6
 0.0

Peatland depth of burn
(Ft McMurray)

Fire Safety Science



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**DALHOUSIE
UNIVERSITY**

Fire and Explosion Research Lab

Halifax, Nova Scotia

Dr. Michael Pegg (michael.pegg@dal.ca) and Dr. Jan Haelssig (jan.haelssig@dal.ca)

Team of 7 students

CURRENT PROJECTS:

- Fundamentals of fire whirls
- Failure criteria of ceiling tiles in fire scenarios
- Fire spread through vertical arrays of combustible materials
- Smoldering combustion of biomass
- Multicomponent pool fires
- Fire scenario modelling using Fire Dynamics Simulator (FDS), ANSYS Fluent and OpenFOAM
- Numerical model development in OpenFOAM

COURSES:

- Advanced Transport Phenomena
- Combustion Phenomena
- Computational Methods
- Dust Explosions
- Industrial Safety & Loss Management
- Radiative Heat Transfer

RECENT INDUSTRIAL COLLABORATIONS:

- Lloyd's Register
- RJ Bartlett Engineering, Ltd.
- JENSEN HUGHES, Inc.



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**Fire Research
(Profs. Cree and Torvi)**

Research Projects:

- correlating small & full-scale fire test results
- performance of concrete containing bio & recycled materials
- performance & durability of protective clothing
- heat transfer in human skin

Collaborations:

- U Alberta, U Waterloo, Queens U, U Cergy-Pontoise (France)

Engineering Education:

- ME 478 (4th Year Elective), ME 868 (Graduate Course)
- 3 Current M.Sc. Students

Contact Information:

Email: david.torvi@usask.ca

Web: www.engineering.usask.ca

UW Fire Research Group

Group Lead: Dr. Beth Weckman | ejweckman@uwaterloo.ca

<https://uwaterloo.ca/fire-research-and-safety/>

The Team:

4 PhD, 8 MASC and undergraduate students

Research:

- Large-scale and small-scale fire testing
- Furniture and compartment fires
- Gas toxicity and smoke obscuration
- Materials fire performance
- Fire service related studies

Courses:

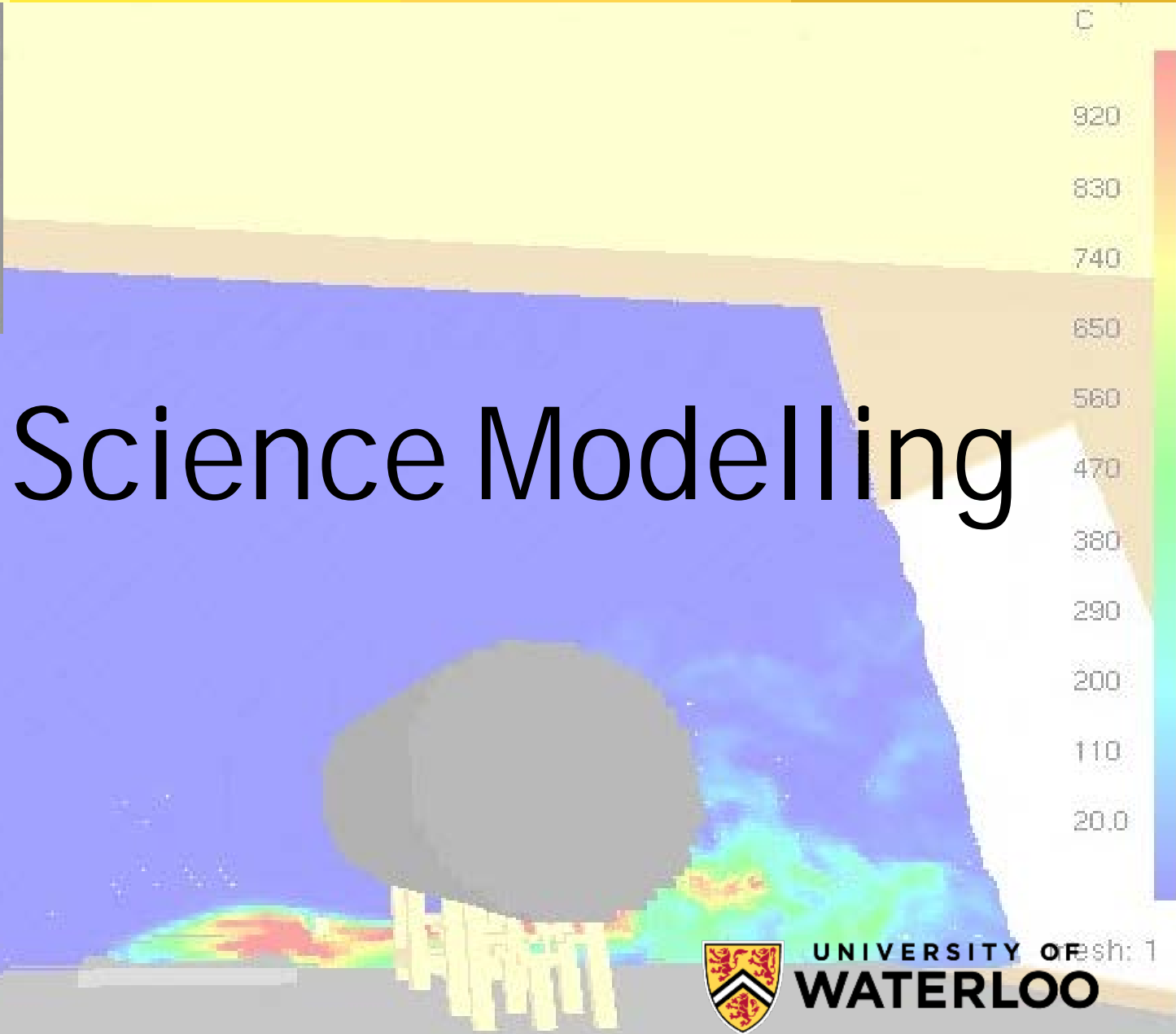
- Fire Dynamics
- Fire Testing
- Fire Risk
- Human Behaviour in Fire
- Fire Resistance
- Fire Modelling
- Advanced Enclosure Fires

Key Affiliations: Waterloo Fire Rescue, Kitchener Fire Department, NSERC OCE, many academic, industry and government partners.





Fire Science Modelling

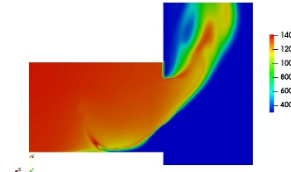
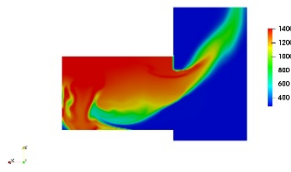
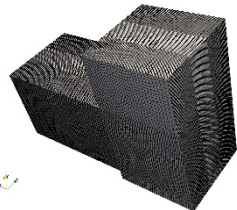
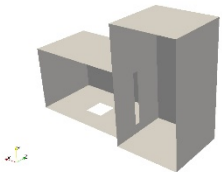


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UW Fire Modelling Group

- Prof. Cecile Devaud
- Currently 5 graduate students working in fire and turbulent combustion modelling.
- What we do in fire research:
 - Simulation of open or confined fire scenarios using FireFOAM.
 - Predictions of chemical species concentration.
 - Heat transfer calculations for wall structures.
 - Development of routines for detailed chemistry and soot.



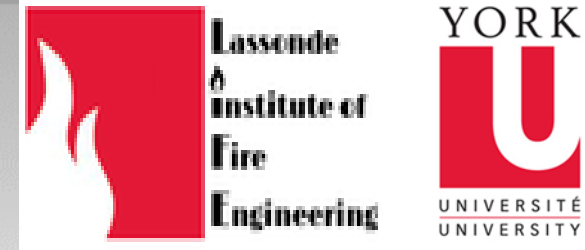
Human Behaviour in Fire Structural Fire Safety



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York University Fire Research

Yorkufire.com Group lead: John Gales ; jgales@yorku.ca



Research Students: 7 Graduate students; 4 Undergraduate students

- *UG mentorship involves semester research followed by co-op with industry partners*
- *Graduate thesis includes Fire Dynamics/Modelling (at University Waterloo); Human Behaviour in Fire and Structural Fire Resilience*

Interest Area: Human Behaviour in Fire (HBIF) ; Structural Fire

- *HBIF in Cultural centres (museums), Aging population, Stadiums, Wild land fire evacuation*
- *Structural fire in Concrete, Timber, Steel, and Heritage materials*

Principle Partners: ARUP (Americas and UK); Entuitive; and NIST (USA)

Affiliations: involve teaching HBIF, co-supervision, joint field studies



Structural Fire Safety



Canadian Cold Formed Steel Research Group

Principal Investigator: Prof. Lei Xu

lxu@uwaterloo.ca

CPH 2373G

(519) 888-4567 ×36882

Members engaged in Fire Safety Research

- Ph.D. Candidates: Terence Ma, Linbo Zhang

Current research interests in fire:

- Fire performance of cold-formed steel structures
- Stability analysis of steel framed structures subjected to variable fire loading



Western Engineering

Fire Research Group

Maged A. Youssef, P.Eng

- Professor of Civil and Environmental Engineering
- Member of ACI Committee 216
- 15+ Years of Structural Fire Safety Experience
- Email: youssef@uwo.ca

Visiting Assistant Prof. and Structural Engineer,
WorleyParsons

Salah El-Fitiyany, P.Eng

Post Doctoral Fellow and Project Engineer, Incon
Engineering

Monir A. Alhadid, Ph.D.

Ph.D. Candidates

Murad Ilomame & Malek Lazhari

M.E.Sc. Candidates

Robert Kuehnen & Amer Sabsabi

Rational Performance Design Tools
for structures undergoing fire exposure

Condition Assessment & Rehabilitation
strategies for fire-damaged structures

Seismic & Fire Performance
for public safety following natural disasters

Improved Cladding Safety
during fire propagation

Structural Fire Engineering Course
for professional development of
practitioners



Structural Fire Safety Research at Queen's University

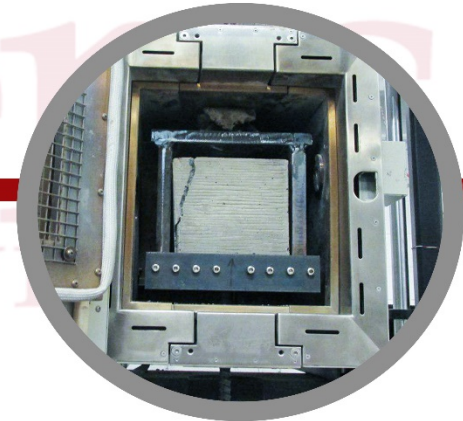
- Head contact person and email address:
Dr. Mark Green (greenm@queensu.ca)
- Five members engaged in fire safety related research including two postdoctoral fellows and graduate students.
- Current fire safety research interests:
 - Fire resilience of sustainable buildings and construction materials: GFRP reinforcing bars and recycled aggregate concrete
 - Fire performance of aged reinforced concrete structures
 - Numerical modelling of structural elements in fire
 - Fire and structural collapse
- Key affiliations with other fire safety group/networks:
National Research Council of Canada, York University, BRE Centre for Fire Safety Engineering (Edinburgh), IIT Roorkee, IC-IMPACTS



Material testing: GFRP
at high temperatures



Full-scale
fire test at NRC



Finite element modelling

Protective Clothing and Textiles



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Protective Clothing and Equipment Research Facility (PCERF)

Departments of Human Ecology & Mechanical Engineering, University of Alberta

Contact Info:

Jane Batcheller, jane.batcheller@ualberta.ca

Patricia Dolez, pdolez@ualberta.ca

<https://pcerf.ualberta.ca>

Fire Safety-Related Research Interests:

- Protective clothing against heat and flame
- Flash fire testing
- Steam & hot liquid protection
- Comfort
- Aging of FR fabrics
- Protection against arc flash
- Protection against toxic chemicals

Fire Safety-Related Course:

HECOL 470-570 – Advanced Materials
for Protective Clothing

The Team:

3 Professors

3 Emeritus professors

1 Research engineer

Students & postdoc



Fire Safety Networks:

ISO TC 94/SC 13 - Protective Clothing

ISO TC 94/SC 14 - Firefighters' Personal Equipment

CAN/CGSB 155 - Protective Clothing

The Institute of Textile Science

Fire Service and Community Safety



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SURREY FIRE SERVICE



FIRE CHIEF LEN GARIS

LWGARIS@SURREY.CA

WWW.SURREY.CA

15 MEMBERS ENGAGED IN FIRE SAFETY RELATED RESEARCH

CURRENT FIRE SAFETY RESEARCH INTERESTS:

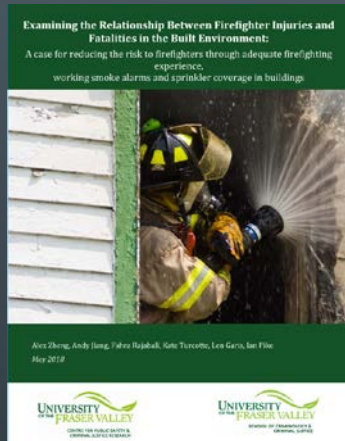
- DETERMINANTS OF INJURY & DEATH IN CANADIAN FIREFIGHTERS
- EXAMINING THE RELATIONSHIP BETWEEN FIREFIGHTER INJURIES AND FATALITIES IN THE BUILT ENVIRONMENT
- OPIODS

KEY AFFILIATIONS:

- UNIVERSITY OF THE FRASER VALLEY
- BRITISH COLUMBIA INJURY RESEARCH AND PREVENTION UNIT
- STATISTICS CANADA
- MICROSOFT
- FRASER HEALTH (PROVINCIAL HEALTH AUTHORITY)
- ROYAL CANADIAN MOUNTED POLICE

EDUCATIONAL PROGRAMS:

- HOME SAFE – HOME SAFETY EDUCATION AND SMOKE ALARM INSTALLATIONS
- BUSINESS, NEIGHBORHOOD, AND PERSONAL EMERGENCY PREPAREDNESS
- SENIORS FIRE AND FALL PREVENTION



Canadian Fire Research



Other Universities

Memorial
ETS
Laval
Carleton
Lakehead
UOIT
Toronto
UNBC
BCIT



Thank you!

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