WILDFIRE: A RETROSPECTIVE 
OF THE 2017 AND 2018 WILDFIRE CATASTROPHES

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SEVERE WILDFIRES ARE THE NEW (AB)NORMAL

Average Annual Loss (AAL) from North American wildfires

- More houses in high risk areas
- Climate change
- Aggressive firefighting in 20th century → excessive burnable vegetation

1964 - 1990 2011-2018

$23B in insured losses to date

WHY?


$600 million

$3.7 billion

Average Annual Loss

• More houses in high risk areas
• Climate change
• Aggressive firefighting in 20th century → excessive burnable vegetation

Key Drivers:
- Triggered by extreme weather, Santa Ana/Diablo winds
- Ember Transport and Accumulation
- Topography and Structure Spacing

Perimeter – CAMP FIRE 2018

CAMP AND WOOLSEY FIRES

- November, 2018
- 15,000+ structures destroyed
- Camp: Most destructive in California history
- $9-13 billion insured damage (RMS estimate)
- 80 fatalities
- Conditions: strong winds, dry vegetation, abnormally high temperatures.
MODELED DAMAGEABLE SMOKE FOOTPRINT – WOOLSEY FIRE 2018

Key Statistics:
• Started: July 23, 2018
• Structures destroyed: 1,100
• Acreage burned: 230,000
• Fatalities: 2
• Cause: Sparks of auto trailer with flat tire.
• Insured damage: $922 million (prelim; PCS)
• Prior Fires in Immediate Vicinity: Jones Fire, 1999: (950 destroyed structures)

Redding-area fires over the last 20 years.

Take-aways from Carr fire

Fire jumped Sacramento River on third day.
- Highlights spotting and ember risk
- Aided by extreme weather conditions
  - Burnable vegetation 99th percentile
  - High wind speeds
  - July was hottest month ever recorded in California and unusually warm in Redding
  - 23 days of 100°+
  - Hottest Day = 113°

Mendocino Complex fires - 2018

Key Statistics:
• Started: July 27th, 2018
• Acres burned: 460,000 (largest fire in California history)
• Residences destroyed: 300
• Prior fires nearby: 2017 (Redwood Valley Fire, 564 destroyed residences)
**RATIONALE FOR DEVELOPMENT OF A NORTH AMERICA WILDFIRE MODEL**

**Recent Events**
- 7 events >$1B in previous three years

**Avoid Surprises with Probabilistic Accumulations**
- Deterministic tools not sufficient

**Focus on risks in “body” of EP curve that affect earnings**
- Relatively high frequency peril, claims data for calibration

**Industry Compatible Event Definition**
- Accommodate temporal & spatial contracts terms

**MODEL HAZARD FRAMEWORK**
- What is burning?
  - Ranked (Anderson) fuel type (FUEL)
- What is the terrain where the property is?
  - Slope (SLOPE)
- How fast is the fire spreading?
  - Rate of spread (ROS)
- How intensely is it burning?
  - Energy release component (ERC)
- Where are the embers accumulating?
  - Ember index (EMBER)
- What is the concentration of smoke?
  - Cumulative concentration of smoke (SMOKE)

**Factors Influencing Wildfire Risk**
- Fuel Type
- Heat Intensity
- Slope
- Smoke
- Rate of Fire Spread
- Distance to Flammable Vegetation

**CONTRIBUTIONS FROM EMBERS**
- Without the presence of a flaming fire front, embers still attack and ignite structures.
- Can cause damage far beyond the burn perimeter.

**The Highlights**
- Explicit Ember and Smoke simulations.
- Urban Conflagration (rare and severe).
- Features developed with world’s leading fire experts.
- Seamless handling of complex spatial and temporal reinsurance terms
  - Hours clause (i.e. “168 hours”)
  - Spatial clause (i.e. “100 mile radius”)

**The Model**
- Coverage: United States & Canada
- 18 million simulated fires
- High resolution geo/hazard
  - fire, smoke, ember, fuel, slope, aspect, wind, moisture
- Mitigation Features
  - Defensible space, roofing, cladding, decking, venting
- Underwriting Tools
  - Pricing, scoring, historical ignitions, burn probability, hazard zone, accumulation

> $30 billion in North America Wildfire cat event losses since 2014
SMOKE MODELING

- What is burning?
- How fast is burning?
- How much smoke/pollutant is being emitted?
- Where will the winds take the emitted smoke?

Concentration Model

- Generate a downwind footprint for smoke concentrations
- Understand what concentrations of smoke will result in a claim payout

Smoke Footprint

- Simulated Smoke Emission and Dispersion
- Calibrated based on smoke claims data
- Smoke can be a source of loss both inside and outside fire perimeter
- Informs evacuation

CONTRIBUTIONS OF SMOKE DAMAGE

MODEL IS WELL VALIDATED, HISTORICALLY AND SCIENTIFICALLY

- RMS Modeled (50,000 year)

WILDFIRE VULNERABILITY FRAMEWORK

Site Hazard Data
- Slope
- Distance to Vegetation
- Fuel Type

Occupancy
- Construction
- Number of Stories
- Year Built
- Floor Area

Ember Accumulators
- Roof Characteristics
- Cladding/Deck Infrastructure
- Community Factors

EXAMPLE MITIGATION MEASURES

- Roof Characteristics
- Cladding and Windows
- Distance-to-Vegetation (User-Defined)
- Slope (User-Defined) & Slope Setback

A HOLISTIC WILDFIRE SOLUTION

- Continental Data Resilience
- Industry Partnerships
- Flexible Financial Solutions
- Better Accumulation Management
- Consistency Between UW and Modeling
- Precise Risk Selection & Pricing
- Quality Mitigation Impacts