Wildfires
Exploring the Impact of More Frequent and Severe Wildfires

Commitment Beyond Numbers

Linda Brobeck, FCAS, MAAA, CSPA
Jing Liu, FCAS, MAAA
August 22, 2019
About the Presenters

**Linda Brobeck, FCAS, MAAA, CSPA**
- Pinnacle Actuarial Resources, Inc.
- Director and Consulting Actuary
- San Francisco

**Jing Liu, FCAS, MAAA**
- Pinnacle Actuarial Resources, Inc.
- Consulting Actuary
- San Francisco
Outline of Presentation

• Trends
• Consequences to property insurance market
• Legislative and regulatory responses
• Modeling
• Public data sources
• Opportunities
Wildfire Trends

ACRES BURNED

Source: National Interagency Fire Center
Wildfire Trends

ECONOMIC LOSSES

Source: © 2018 Munich Re, NatCatSERVICE
Causes of Wildfire Trends

**Climate**
- Native climate
- Drought
- Rising temperatures
- Snowmelt timing
- Seasonal winds

**Exposure**
- Homes in forest area
- Wildland-Urban Interface (WUI)
- Increased population and home prices

**Ignition**
- Radiant exposure
- Man-made causes
- Lightning
- Failing infrastructure

Courtesy of NASA

Courtesy of pxhere

Courtesy of max pixel
Wildland Urban Interface

- Wildland-Urban Interface (WUI): A zone of transition between wildland and human development
Top 10 States At High To Extreme Wildfire Risk

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Estimated number of properties at risk</th>
<th>Percent of properties at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>California</td>
<td>2,048,800</td>
<td>28%</td>
</tr>
<tr>
<td>2</td>
<td>Texas</td>
<td>715,300</td>
<td>26%</td>
</tr>
<tr>
<td>3</td>
<td>Colorado</td>
<td>366,200</td>
<td>17%</td>
</tr>
<tr>
<td>4</td>
<td>Arizona</td>
<td>234,600</td>
<td>15%</td>
</tr>
<tr>
<td>5</td>
<td>Idaho</td>
<td>171,200</td>
<td>14%</td>
</tr>
<tr>
<td>6</td>
<td>Washington</td>
<td>154,900</td>
<td>14%</td>
</tr>
<tr>
<td>7</td>
<td>Oklahoma</td>
<td>152,900</td>
<td>14%</td>
</tr>
<tr>
<td>8</td>
<td>Oregon</td>
<td>148,800</td>
<td>9%</td>
</tr>
<tr>
<td>9</td>
<td>Utah</td>
<td>133,100</td>
<td>9%</td>
</tr>
<tr>
<td>10</td>
<td>Montana</td>
<td>133,000</td>
<td>8%</td>
</tr>
</tbody>
</table>

Source: Verisk Wildfire Risk Analytics used data from Fire Line®, Verisk’s wildfire risk management tool.
Top 10 States For Wildfires

<table>
<thead>
<tr>
<th>Rank</th>
<th>State</th>
<th>Number of fires</th>
<th>Rank</th>
<th>State</th>
<th>Number of acres burned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Texas</td>
<td>10,541</td>
<td>1</td>
<td>California</td>
<td>1,823,153</td>
</tr>
<tr>
<td>2</td>
<td>California</td>
<td>8,054</td>
<td>2</td>
<td>Nevada</td>
<td>1,001,966</td>
</tr>
<tr>
<td>3</td>
<td>North Carolina</td>
<td>3,625</td>
<td>3</td>
<td>Oregon</td>
<td>897,263</td>
</tr>
<tr>
<td>4</td>
<td>Georgia</td>
<td>2,572</td>
<td>4</td>
<td>Oklahoma</td>
<td>745,097</td>
</tr>
<tr>
<td>5</td>
<td>Florida</td>
<td>2,249</td>
<td>5</td>
<td>Idaho</td>
<td>604,481</td>
</tr>
<tr>
<td>6</td>
<td>Oregon</td>
<td>2,019</td>
<td>6</td>
<td>Texas</td>
<td>569,811</td>
</tr>
<tr>
<td>7</td>
<td>Arizona</td>
<td>2,000</td>
<td>7</td>
<td>Colorado</td>
<td>475,803</td>
</tr>
<tr>
<td>8</td>
<td>Washington</td>
<td>1,743</td>
<td>8</td>
<td>Utah</td>
<td>438,983</td>
</tr>
<tr>
<td>9</td>
<td>Oklahoma</td>
<td>1,707</td>
<td>9</td>
<td>Washington</td>
<td>438,834</td>
</tr>
<tr>
<td>10</td>
<td>Minnesota</td>
<td>1,344</td>
<td>10</td>
<td>Alaska</td>
<td>410,683</td>
</tr>
</tbody>
</table>

Source: National Interagency Fire Center.
## Trends in Wildfires by the Numbers

### Top 10 Costliest Wildland Fires In The United States ($ millions)

<table>
<thead>
<tr>
<th>Rank</th>
<th>Date</th>
<th>Name, Location</th>
<th>Dollars when occurred</th>
<th>In 2018 dollars</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Nov. 8-25, 2018</td>
<td>Camp Fire, CA (3)</td>
<td>$8,500 - $10,500</td>
<td>$8,500 - $10,500</td>
</tr>
<tr>
<td>2</td>
<td>Oct. 8-20, 2017</td>
<td>Tubbs Fire, CA (3)</td>
<td>7,500 - 9,500</td>
<td>7,700-9,700</td>
</tr>
<tr>
<td>3</td>
<td>Nov. 8-22, 2018</td>
<td>Woolsey Fire, CA (3)</td>
<td>3,000 - 5,000</td>
<td>3,000 - 5,000</td>
</tr>
<tr>
<td>4</td>
<td>Oct. 8-20, 2017</td>
<td>Atlas Fire, CA (3)</td>
<td>2,500 - 4,500</td>
<td>2,600-4,600</td>
</tr>
<tr>
<td>5</td>
<td>Dec 4 - 23, 2017</td>
<td>Thomas Fire, CA (3)</td>
<td>1,500 - 3,500</td>
<td>1,530-3,600</td>
</tr>
<tr>
<td>6</td>
<td>Oct. 20-21, 1991</td>
<td>Oakland Hills Fire, CA</td>
<td>1,700</td>
<td>2,851</td>
</tr>
<tr>
<td>7</td>
<td>Oct. 21-24, 2007</td>
<td>Witch Fire, CA</td>
<td>1,300</td>
<td>1,552</td>
</tr>
<tr>
<td>8</td>
<td>Jul. 23-Aug. 30, 2018</td>
<td>Carr Fire, CA (3)</td>
<td>$1,000 - 1,500</td>
<td>$1,000 - 1,500</td>
</tr>
<tr>
<td>9</td>
<td>Oct. 25-Nov. 4, 2003</td>
<td>Cedar Fire, CA</td>
<td>1,060</td>
<td>1,417</td>
</tr>
<tr>
<td>10</td>
<td>Oct. 25-Nov. 3, 2003</td>
<td>Old Fire, CA</td>
<td>975</td>
<td>1,304</td>
</tr>
</tbody>
</table>

Source: Insurance Information Institute, catastrophe risk modelers, reinsurance companies, the California Department of Insurance, the Property Claim Services® (PCS®) unit of ISO®, a Verisk Analytics® company, and the U.S. Bureau of Economic Analysis.
Consequences to Property Insurance Market

Homeowners Loss and ALAE ratio for Companies Primarily in California

Source: AM Best Schedule P data of Companies with CA DWP greater than 80% of its total HO DWP
Consequences to Property Insurance Market

2017 California wildfires: 53K+ Claims, $12.5B Losses

Source: CDI estimates as of May 21, 2018.
Consequences to Property Insurance Market

The headlines...

‘Sticker shock’ for California wildfire areas: Insurance rates doubled, policies dropped

SACBEE.COM

BY DALE KASLER, RYAN SABALOW, AND PHILLIP REESE

JULY 18, 2019 02:40 AM, UPDATED JULY 19, 2019 03:24 AM
Consequences to Property Insurance Market

The headlines...

AM Best Downgrades...
Consequences to Property Insurance Market

The headlines...

Auto-Owners Insurance Signs Agreement to Acquire Capital Insurance Group
Consequences to Property Insurance Market

The headlines...

**SACBEE.COM**

**Insurer goes bust from Camp Fire with millions in claims unpaid. How will it affect Paradise homeowners?**

**BY DALE KASLER AND MICHAEL FINCH II**

**DECEMBER 03, 2018 12:00 PM, UPDATED DECEMBER 04, 2018 12:52 AM**
Consequences to Property Insurance Market

• Reinsurers have made changes:
  – Raising premium for wildfire exposed areas
  – Changing terms and conditions to policies
  – Reducing exposure (splitting wildfire risk out as a separate program)
  – Retrocessional price hikes
  – Investing in their own wildfire models

• CAT Bonds priced at significant discount after 2017-2018 fires
California Legislative and Regulatory Responses

- **SB 824**
  - Limits cancellations and non-renewals
  - Requires admitted insureds to report information to be used by commissioner in report on wildfire risk
- **SB 894**
  - Extends coverage beyond policy limits
- **SB 917**
  - Requires coverage of mudslides that fire found to be proximate cause
- **AB 1772**
  - Extends time to rebuild from two to three years
- **AB 740**
  - Creates California Catastrophic Wildfire Victims Fund
Commission on Catastrophic Wildfire Cost and Recovery

Findings:

• Admitted insurers increasing rates
• Admitted insurers tightening underwriting guidelines
• Increasing consumer complaints about policy cancellation
• Probable increase use of surplus lines market and FAIR Plan
• Potential of availability and affordability issues
Commission on Catastrophic Wildfire Cost and Recovery

Recommendations:

• Preserve risk-based pricing approach
• Improve FAIR
• Set home/community fire risk reduction standards, and require insurers to write in these areas
• Require insurers to implement tiered mitigation credit based on level of home hardening
• Mandate offering of “Difference in Condition” policies
• Require Fire Risk Underwriting Models to be filed and approved
Timeline of Introduction of Catastrophe Models

Wildfire models are relatively immature

- Hurricane
- Earthquake
- Workers Comp, Terrorism
- Wildfire (topological, ISO)
- Wildfire (weather, others)

- Late 1980s
- 2000
- 2001
- 2003
- 2018
Wildfire Models

- Older versions did not accurately predict locations of fire

- Newer models incorporate
  - Advances in science and technology, i.e., machine learning
  - New/more variables, i.e., interaction of weather, vegetation and terrain
  - Considers individual property characteristics
Wildfire Models - Challenges

- Limited historical industry loss history
- Growth in WUI
- Climate change
- Human influences
- Lacks the robust model and regulatory framework compared to Florida hurricane models
Public Data Sources

- USGS GeoMAC Wildland Fire Support [www.geomac.gov](http://www.geomac.gov)
  - Near real-time fire perimeter data sowing acreage burned
  - Historical information dating back to 2002
  - U.S. Dept. of Agriculture Forest Service and U.S. Dept. of Interior
  - Wildland Fire Leadership Council (WFLC)
  - Suite of geospatial databases that describe conditions across U.S. for resource management planning and analysis
- National Fire Incident Reporting System (NFIRS)
- National Fire Protection Association (NFPA)
National Fire Incident Reporting System (NFIRS)

- “EN-FURS”
- Circa 1972, Public Law 93-498 established the National Fire Prevention and Control Administration
- Mandate to collect national data led to establishment of NFIRS
- Piloted in 1976 in six states; now all states participate
- NFIRS is the world’s largest collection of incidents to which fire departments respond
- Volunteer participation; estimated 44% of U.S. fires to which fire departments respond are captured
- Data from individual state systems can be converted and stored for national use

Source: NFIRS 5.0: Complete Reference Guide found in the Homeland Security Digital Library
National Fire Protection Association (NFPA)

- www.NFPA.org
- “The leading information and knowledge resource on fire, electrical and related hazards.”

Data, research, and tools

To keep you in the know, NFPA studies fire data in detail to provide insights about the overall fire problem, firefighter fatalities and injuries, major fire causes, fire protection systems, and many other topics. Through the Fire Protection Research Foundation we work with organizations around the world to investigate emerging fire safety hazards and solutions.

- U.S. fire problem
- Building and life safety
- Detection and signaling
- Electrical
- Emergency responders
- Hazardous materials
- Suppression
- Wildland urban interface
- Proceedings
- Data solutions
- National Fire Data System
Community Efforts

- www.nfpa.org
- www.fireadapted.org
- www.wildlandfirersg.org
Opportunities Exist

• New agencies formed targeting insureds who have hard time finding coverage

• Startup modeling firms releasing wildfire models to compete with traditional modeling companies

• Existing cat model vendors are releasing updates to enhance forecasting capabilities

• Firms providing risk management products and services to help property owners mitigate wildfire exposure
Questions?
Join Us for the Next APEX Webinar

Thursday, September 19
2:00 p.m. ET
Registration is Open

Digging Into the Modeling Lifecycle
Final Notes

• We’d like your feedback and suggestions!
  • Please complete our survey

• For copies of this APEX presentation
  • Visit the Resource Knowledge Center at Pinnacleactuaries.com
Thank You for Your Time and Attention

Linda Brobeck
lbrobeck@pinnacleactuaries.com

Jing Liu
jliu@pinnacleactuaries.com