NIST WUI FIRE DAYS 2022

Enhancing Life Safety and Reducing WUI Fire Loses
Overview of NIST WUI Days 2022

- NIST WUI Research Overview
- Agenda
- Exposures and Structure Hardening
- WUI Fires – Structure Ignition Hazard Mitigation
- WUIs – 3 Different Types of WUI Housing Densities
- Evolution of Structure/Parcel and Community Hardening
NIST WUI Research Overview

**Fed:** IWG (including FEMA, USFA, HUD)  
**States:** CA, OR, WY, CO, SC  
**Codes and Standards/ Best Practices**  
- CA Chapter 7A & Chapter 49  
- ICC IWUI  
- NFPA 1140 & Firewise

### Case Studies
- **FALL 2022**
  - CAMP #4 NETTRA – Notification/ Evacuation/ Traffic and Temporary Refuge Areas
- **2023**
  - CAMP #5 Emergency Response/ Defensive Actions and Damaged Structures
- **2024**

### Hazard Mitigation Methodology (HMM)
- **SPRING 2023**
  - NIST TN 2205  
  - Graphical User Tool

### Laboratory Research
- **SSE**
  - **SPRING & FALL 2022**
    - Sheds  
    - RVs, ADUs and Single Family
  - EMA Collaboration
  - 24 ft
  - Fences, Wood Piles
  - Emberometer
  - Sealants and Gaskets

- **2022**  
- **2023**  
- **2024**
## Agenda

### NIST WUI FIRE DAYS 2022
Research Presentations Agenda

### Day 1 — July 6, Starting at 1:00 pm Eastern

<table>
<thead>
<tr>
<th>Session</th>
<th>Time (ET)</th>
<th>Title</th>
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<tbody>
<tr>
<td>1.0</td>
<td>1:00 - 1:13</td>
<td>Opening Remarks – NIST Engineering Laboratory (EL) Director</td>
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<tr>
<td>1.1</td>
<td>1:15 - 2:00</td>
<td>Camp Fire Case Study Overview</td>
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<td>2:30 - 2:40</td>
<td>Camp Fire – Fire Progression Timeline</td>
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<td>2:40 - 2:45</td>
<td>Q&amp;A</td>
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<td>2:45 - 3:00</td>
<td>Break</td>
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<tr>
<td>1.3</td>
<td>3:15 - 3:30</td>
<td>Update on Camp Fire – NETTRA (Notification, Evacuation, Traffic, Temporary Refuge Areas) Report</td>
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<td>1.4</td>
<td>3:35 - 3:45</td>
<td>NIST Structure/Parcel/Community Fire Hazard Mitigation Methodology (SHMM)</td>
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Total Day 1: 3 h 20 min

### Day 2 — July 13, Starting at 1:00 pm Eastern

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<tr>
<td>2.1</td>
<td>1:00 - 1:20</td>
<td>Structure Separation Experiments (SSE) Overview</td>
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<td>2.2</td>
<td>1:20 - 2:00</td>
<td>SSE Phase 1 – NIST Indoor Experiments</td>
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<td>2.3</td>
<td>2:05 - 2:25</td>
<td>Update on SSE Phase 1 – NIST Outdoor Experiments</td>
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<td>2:35 - 2:45</td>
<td>Q&amp;A</td>
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<td>2:50 - 3:00</td>
<td>Break</td>
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<td>2.4</td>
<td>3:05 - 3:30</td>
<td>SSE Phase 1 – IBHS Outdoor No Wind Experiments</td>
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<td>2.5</td>
<td>3:35 - 4:00</td>
<td>Update on SSE Phase 1 – IBHS Cold-Flow Measurements</td>
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Total Day 2: 3 h 45 min

### Day 3 — July 20, Starting at 1:00 pm Eastern

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<td>3.0</td>
<td>1:00 - 1:13</td>
<td>Parcel level Hazard Mitigation Introduction</td>
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<td>3.1</td>
<td>1:15 - 2:00</td>
<td>NIST Engineered Research and Findings</td>
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<tr>
<td></td>
<td>2:35 - 2:45</td>
<td>Q&amp;A</td>
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<td>2:50 - 3:00</td>
<td>Break</td>
</tr>
<tr>
<td>3.2</td>
<td>3:05 - 3:25</td>
<td>NIST Woodlands and Landscape Timbers Research and Findings</td>
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<td>3.3</td>
<td>3:35 - 4:00</td>
<td>NIST Embryometer Research</td>
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<td>3.4</td>
<td>4:05 - 4:15</td>
<td>Q&amp;A</td>
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<td>3.5</td>
<td>4:20 - 4:30</td>
<td>Break</td>
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<td>3.6</td>
<td>4:40 - 4:45</td>
<td>HHM WUI Structure/Parcel/Community Fire Hazard Mitigation Methodology (SHMM)</td>
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<td>3.7</td>
<td>4:50 - 4:55</td>
<td>Design Considerations</td>
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<td>3.8</td>
<td>5:00 - 5:10</td>
<td>Closing Remarks – NIST EL Director</td>
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Total Day 3: 3 h 10 min

### Day 4 — July 27, Starting at 1:00 pm Eastern

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<tr>
<td>4.0</td>
<td>1:00 - 1:10</td>
<td>WUI Fire-related NIST Grants Introduction</td>
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<td>4.1</td>
<td>1:10 - 1:35</td>
<td>NIST Engineered Research and Findings – Prof. Steve Gwyne Ph.D., Lund University</td>
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<td>1:45 - 2:05</td>
<td>Q&amp;A</td>
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<td>2:05 - 2:10</td>
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<tr>
<td>4.2</td>
<td>2:10 - 2:35</td>
<td>Developing AI-Based Wildlife Evacuation Behavior (AI-WEB) model – Prof. Xue Tao Ph.D., University of Florida</td>
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<tr>
<td>4.3</td>
<td>2:35 - 3:00</td>
<td>Update on SSE Phase 1 – IBHS Cold-Flow Measurements</td>
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<td>4.4</td>
<td>3:10 - 3:35</td>
<td>Measuring source terms of firebrand generation numbers for physics-based models – Prof. David Burns Ph.D., Oregon State University</td>
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<td>3:45 - 4:05</td>
<td>Q&amp;A</td>
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<tr>
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<td>4:05 - 4:10</td>
<td>Break</td>
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<tr>
<td>4.5</td>
<td>4:15 - 4:40</td>
<td>Quantification of firebrand production from WUI fuels for model development – Prof. Michael Golker Ph.D., the University of California, Berkeley</td>
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<td>4.6</td>
<td>4:45 - 5:05</td>
<td>Q&amp;A</td>
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<td>4.7</td>
<td>5:10 - 5:15</td>
<td>Closing Remarks</td>
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Total Day 4: 4 h 15 min
Exposures and Structure Hardening

Exposures (fire and embers) vs. Structure Hardening

- UNDERHARDENED
- IGNITION
  - High Exposures
  - Low Structure Hardening

- NO IGNITION
  - High Exposures
  - High Structure Hardening

- EFFECTIVE HARDENING

Baseline - ember hardening

Low Exposures

- EFFECTIVE HARDENING

- OVERHARDENED

BCA TOOLS – utilize available exposure reduction options
WUI Fires – Structure Ignition Hazard Mitigation

Existing Buildings/Communities

- Limitations to exposure reduction - existing Structure Separation Distance (SSDs)
- Limited ignition resistance

- Transition from parcel to multiparcel hazard assessment and mitigation needed
- Lifestyle - paradigm shift needed
- Large building stock – cost effective hardening/funds needed

New Buildings/Communities

- Greater exposure reduction options:
  - Community design
  - Structure spacing
- Cost effective construction/hardening
- Lifestyle/paradigm shift easier to implement
Community Differences
Interface/Intermix, housing density

Waldo Canyon Fire, Interface
2018 (post)

Witch Fire, Interface
2019 (post)

Camp Fire, Intermix
2018 (post)

equal scale images – 0.85 acres
Evolution of Structure/Parcel and Community Hardening

Early Experiments
- Limited exposure to structure coupling
- Limited ambient wind
- No ember hardening

Early Building Codes (2008-2020)
- **Defensible Space**
- Some exposure to structure coupling
- Some ember hardening

Structure/Parcel/Community HMM (2022)
- **Goal: Stand alone structures**
- Comprehensive exposure to structure coupling for **Fire and Embers**
- **Multiparcel fuels**
  - Housing density (H, M, L)
- **Community hardening**