

# ***NIST WUI FIRE DAYS 2022***

***Enhancing Life Safety and Reducing WUI Fire Losses***



# 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 July 2022

2022

**NIST WUI DAYS  
2022**

2023

2024

**NIST WUI DAYS  
2024**

## Case Studies

**FALL 2022**

CAMP #4 NETTRA –  
Notification/ Evacuation/ Traffic  
and Temporary Refuge Areas

CAMP #5 Emergency Response/  
Defensive Actions and Damaged  
Structures

## Hazard Mitigation Methodology (HMM)

**SPRING 2023**

NIST TN 2205

Graphical User Tool

## Laboratory Research

**SSE**

**SPRING & FALL 2022**

Sheds



NIST

RVs, ADUs and Single Family



FEMA Collaboration

24 ft



NIST



**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



HMM



CAMP



SSE



Fences, Wood Piles

Emberometer

Sealants and Gaskets



# Agenda

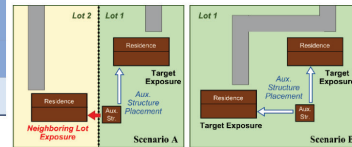
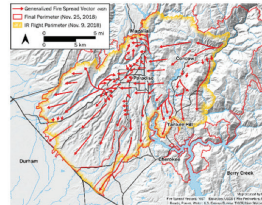
## NIST WUI FIRE DAYS 2022 Research Presentations Agenda



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

Session	Time (ET)	Title
1.0	1:00 – 1:15 (15 min)	Opening Remarks – NIST Engineering Laboratory (EL) Director
1.1	1:15 – 1:45 (30 min)	Camp Fire Case Study Overview
1.2	1:45 – 2:30 (45 min)	Camp Fire – Fire Progression Timeline
	2:30 – 2:40 (10 min)	Q&A
	2:40 – 2:45 (5 min)	Break
1.3	2:45 – 2:55 (10 min)	Update on Camp Fire – NETTRA (Notification, Evacuation, Traffic, Temporary Refuge Areas) Report
1.4	2:55 – 4:10 (75 min)	WUI Structure/Parcel/Community Fire Hazard Mitigation Methodology (HMM)
	4:10 – 4:20 (10 min)	Q&A

Total Day 1: 3 h 20 min



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

Session	Time (ET)	Title
2.1	1:00 – 1:20 (20 min)	Structure Separation Experiments (SSE) Overview
2.2	1:20 – 2:05 (45 min)	SSE Phase 1 – NIST Indoor Experiments
2.3	2:05 – 2:15 (10 min)	Update on SSE Phase 1 – NIST Outdoor Experiments
	2:15 – 2:25 (10 min)	Q&A
	2:25 – 2:30 (5 min)	Break
2.4	2:30 – 2:50 (20 min)	SSE Phase 1 – IBHS Outdoor No Wind Experiments
2.5	2:50 – 3:00 (10 min)	Update on SSE Phase 1 – IBHS Cold-Flow Measurements
	3:00 – 3:10 (10 min)	Q&A
	3:10 – 3:15 (5 min)	Break
2.6	3:15 – 4:15 (60 min)	SSE Modeling
	4:15 – 4:25 (10 min)	Q&A
2.7	4:25 – 4:45 (20 min)	SSE Phase 1 – Summary

Total Day 2: 3 h 45 min



## NIST WUI FIRE DAYS 2022 Research Presentations Agenda



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

Session	Time (ET)	Title
3.0	1:00 – 1:15 (15 min)	Parcel-level Hazard Mitigation Introduction
3.1	1:15 – 2:00 (45 min)	NIST Fences Research and Findings
	2:00 – 2:10 (10 min)	Q&A
	2:10 – 2:15 (5 min)	Break
3.2	2:15 – 2:50 (35 min)	NIST Woodpiles and Landscape Timbers Research and Findings
3.3	2:50 – 3:25 (35 min)	NIST Emberometer Research
	3:25 – 3:35 (10 min)	Q&A
	3:35 – 3:40 (5 min)	Break
3.4	3:40 – 4:00 (20 min)	HMM WUI Structure/Parcel/Community Design Considerations
3.5	4:00 – 4:10 (10 min)	Closing Remarks – NIST EL Director

Total Day 3: 3 h 10 min



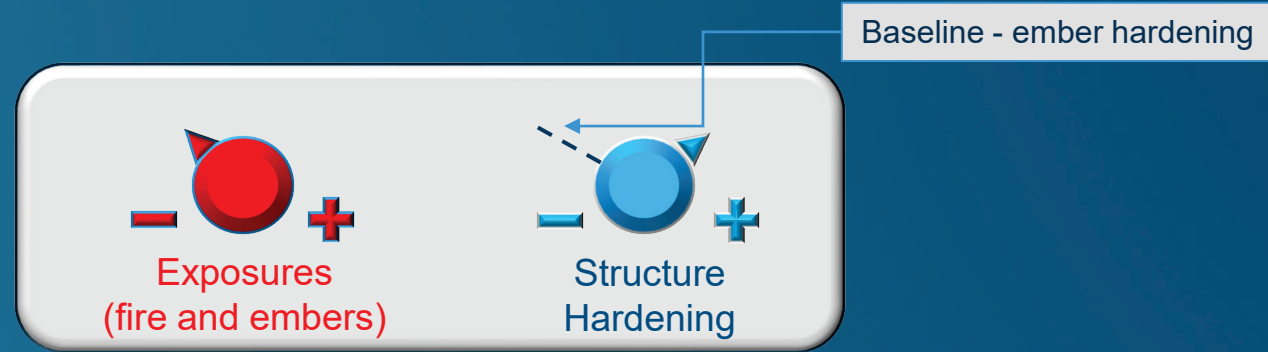
### Day 4 — July 27, Starting at 1:00 pm Eastern NIST Grantees Presentations

Session	Time (ET)	Title
4.0	1:00 – 1:10 (10 min)	WUI Fire-related NIST Grants Introduction
4.1	1:10 – 1:55 (45 min)	WUI-NITY 3: Multi-method traffic movement data collection for WUI fire evacuation modeling – Prof. Steve Gwynne Ph.D., Lund University
	1:55 – 2:05 (10 min)	Q&A
	2:05 – 2:10 (5 min)	Break
4.2	2:10 – 2:55 (45 min)	Developing AI-Based Wildfire Evacuation Behavior (AI-WEB) model – Prof. Xilei Zhao Ph.D., University of Florida
	2:55 – 3:05 (10 min)	Q&A
	3:05 – 3:10 (5 min)	Break
4.3	3:10 – 3:55 (45 min)	Measuring source terms of firebrand generation numbers for physics-based models – Prof. David Blunck Ph.D., Oregon State University
	3:55 – 4:05 (10 min)	Q&A
	4:05 – 4:10 (5 min)	Break
4.4	4:10 – 4:55 (45 min)	Quantification of firebrand production from WUI fuels for model development – Prof. Michael Gollner Ph.D., the University of California, Berkeley
	4:55 – 5:05 (10 min)	Q&A
4.5	5:05 – 5:15 (10 min)	Closing Remarks

Total Day 4: 4 h 15 min



# Exposures and Structure Hardening



UNDERHARDENED

EFFECTIVE HARDENING



EFFECTIVE HARDENING

OVERHARDENED

BCA TOOLS – utilize available exposure reduction options



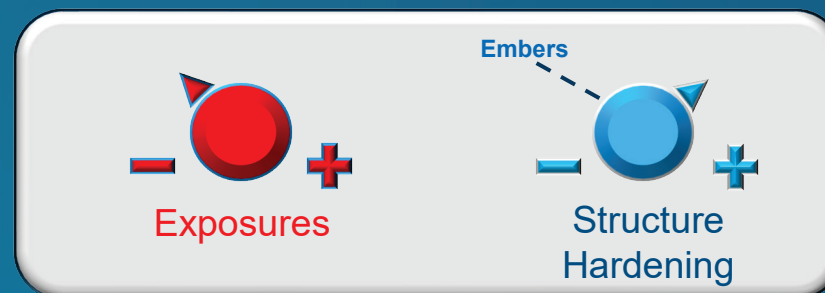
# WUI Fires – Structure Ignition Hazard Mitigation

## 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

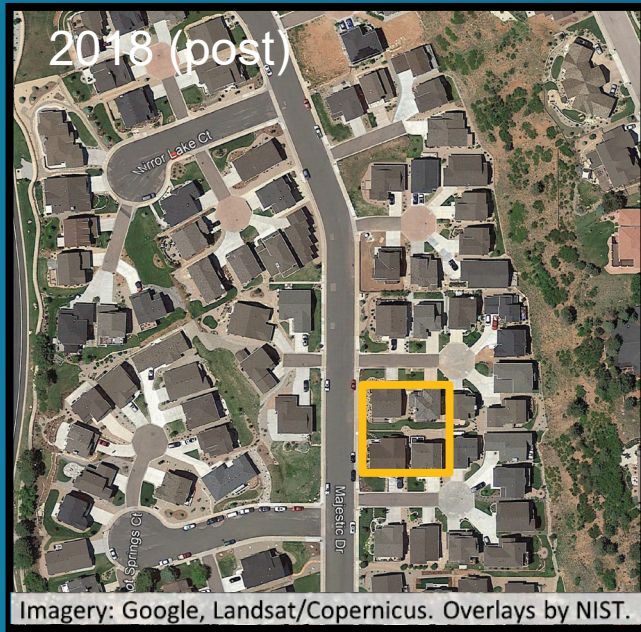
## New Buildings/Communities

- Greater exposure reduction options:
  - Community design
  - Structure spacing
- Cost effective construction/hardening
- Lifestyle/paradigm shift easier to implement



# Community Differences

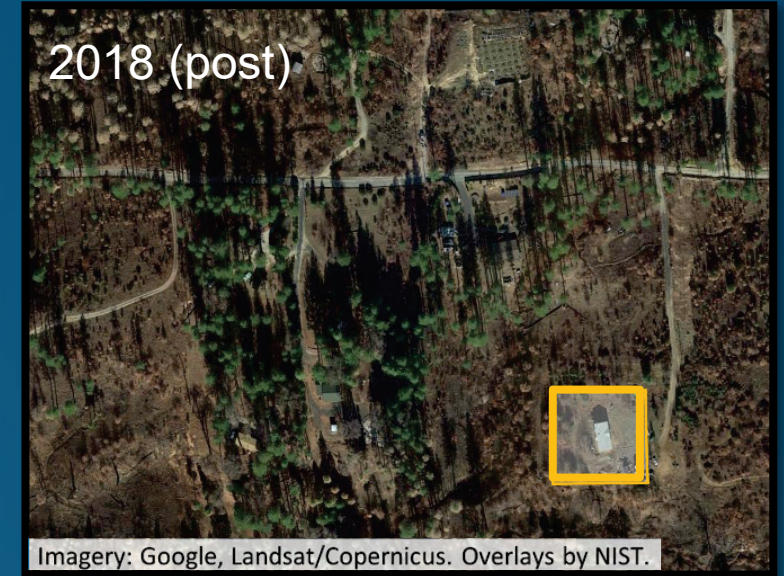
## Interface/Intermix, housing density



Waldo Canyon Fire, Interface



Witch Fire, Interface



Camp Fire, Intermix

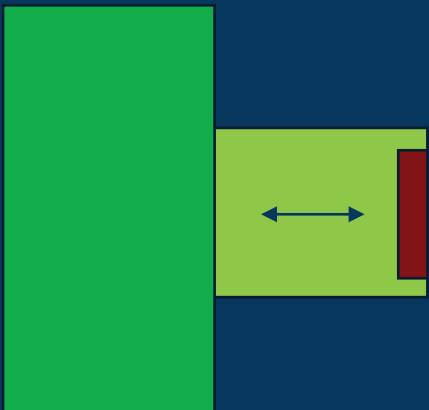
*equal scale images – 0.85 acres*



# Evolution of Structure/Parcel and Community Hardening

## Early Experiments

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

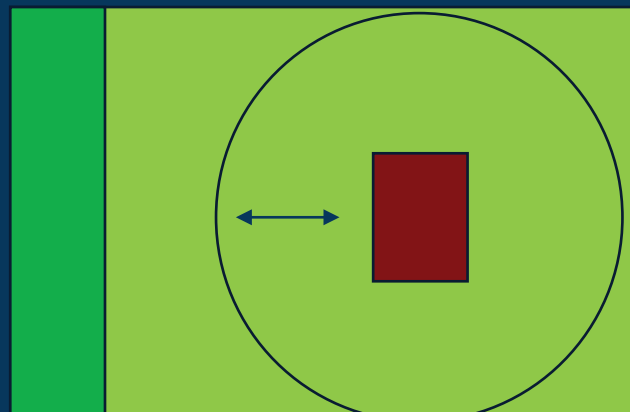


“House in the woods”



## Early Building Codes (2008-2020)

- Defensible Space
- Some exposure to structure coupling
- Some ember hardening

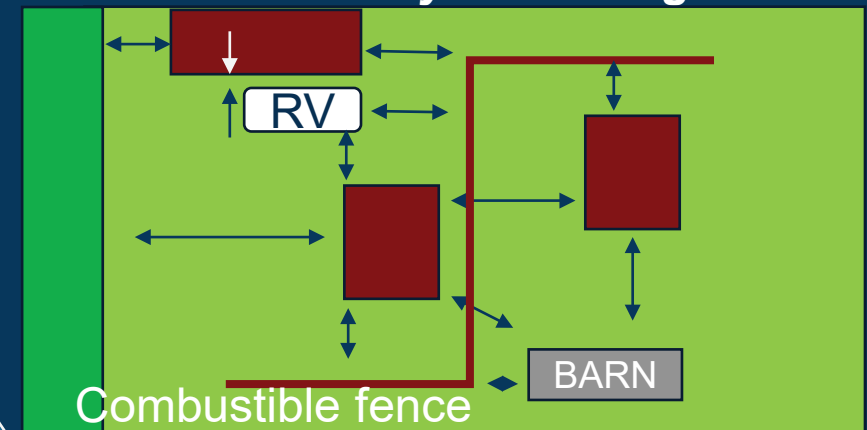


“Parcel and zones”



## 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**



“Multiparcel spatial analysis”

