Building Costs & Risk Modeling to Reduce Community Wildfire Risk

Examples of Community Tools

COMMUNITY PLANNING ASSISTANCE FOR WILDFIRE

Costs to Building a Wildfire-Resistant Home

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Chief Scientist for Wildfire and Durability

Insurance Institute for Business & Home Safety

- What are the vulnerable features in a home?
- How can they be made resistant to wildfire?
- What does it cost?

Today

- Methods
- Preliminary Results by Component
- Putting it All Together
- Key Take-Aways

Today

- **Methods**
- **Preliminary Results by Component**
- **Putting it All Together**
- **Key Take-Aways**

Baseline Home

- Park County, MT
- 3 bedroom
- 2500 sq. ft.
- Approx. $350,000

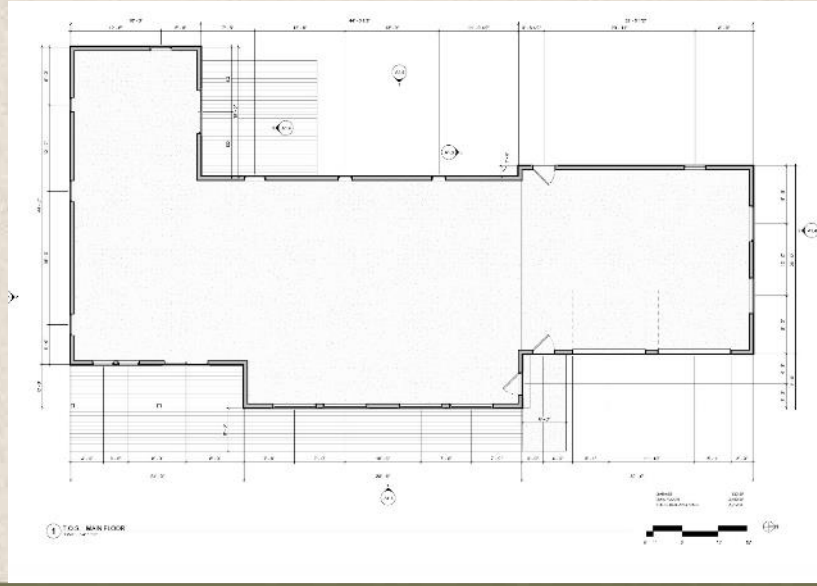
Wildfire Resistance: Embers + Radiant Heat

Cost Comparison

- New Construction: swap traditional for wildfire-resistant in 6 most vulnerable components
- Retrofit: remove and replace with wildfire-resistant components
- Cost from RSMeans:
  - National database with regional multipliers
  - Includes labor, overhead & profit
  - Allows consistency
  - Limits localized variability

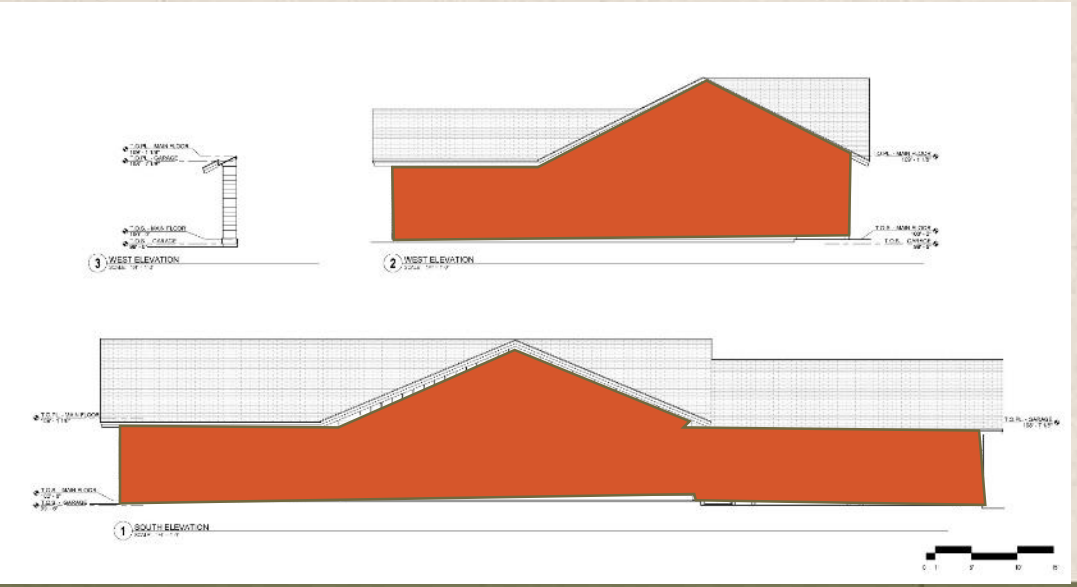
Vulnerable Components

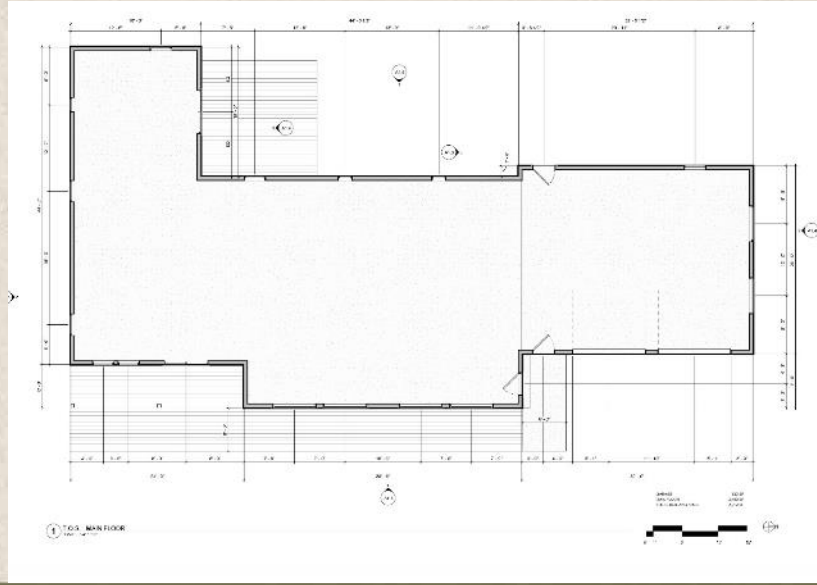
1. Roof



Vulnerable Components

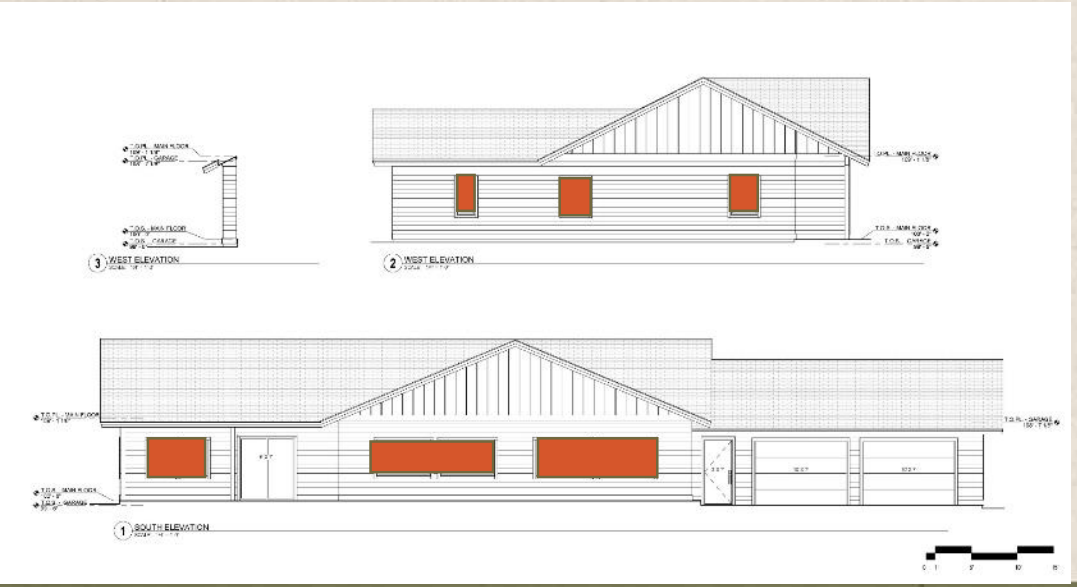
1. Roof
2. Exterior Walls

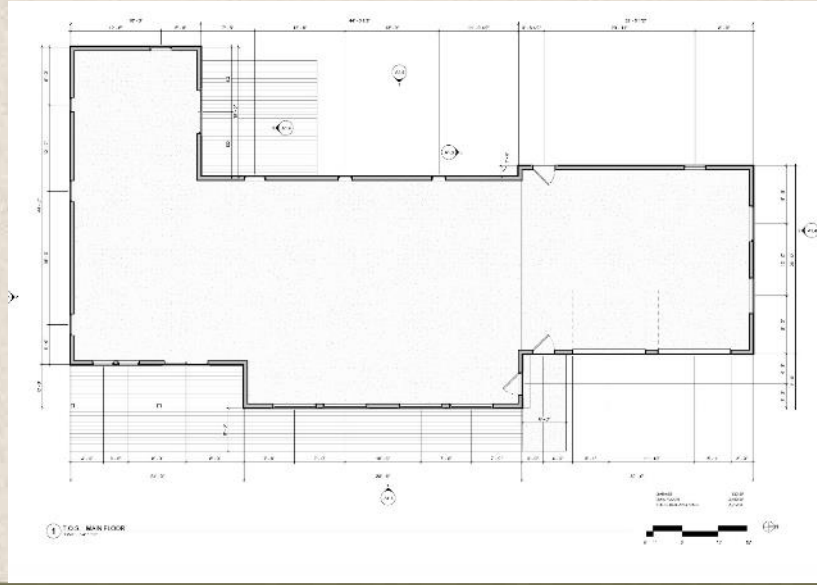




Vulnerable Components

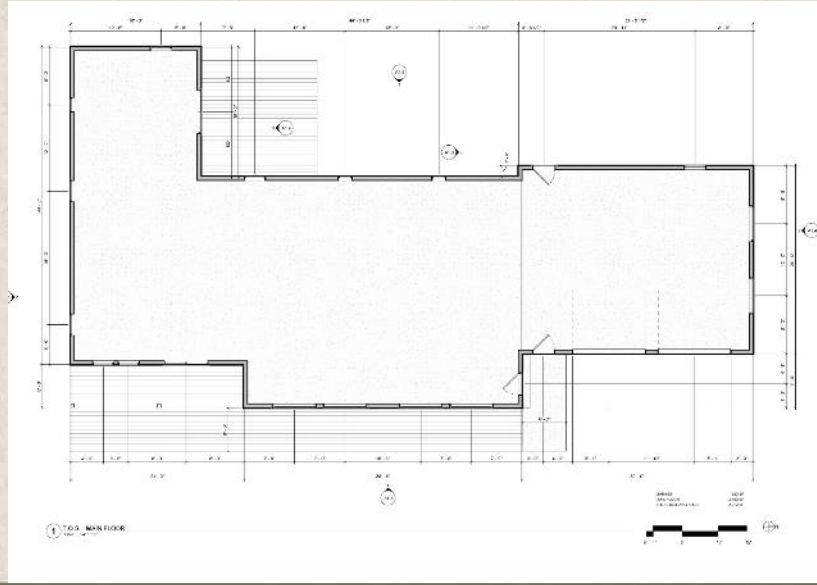
1. Roof
2. Exterior Walls
3. Windows





Vulnerable Components

1. Roof
2. Exterior Walls
3. Windows
4. Doors



Vulnerable Components

1. Roof
2. Exterior Walls
3. Windows
4. Doors

5. Deck

Vulnerable Components

1. Roof
2. Exterior Walls
3. Windows
4. Doors
5. Deck
6. Home Ignition Zone

Today

- Methods
- **Preliminary Results by Component**
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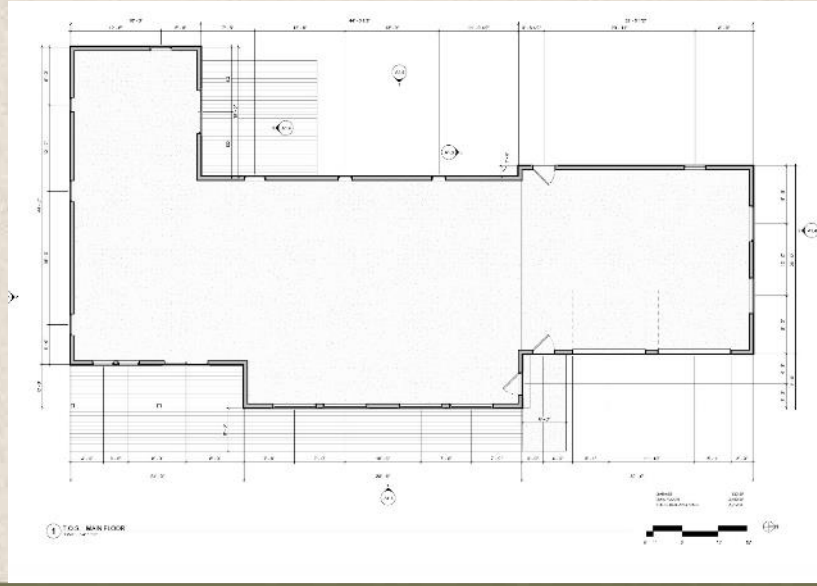
Roof


3 WEST ELEVATION
2 WEST ELEVATION
1 SOUTH ELEVATION


1 T.O.S. MAIN FLOOR

Roof Vulnerabilities

- Roof material, underlayment, edges

Roof Vulnerabilities

- Roof material, underlayment, edges
- Vents

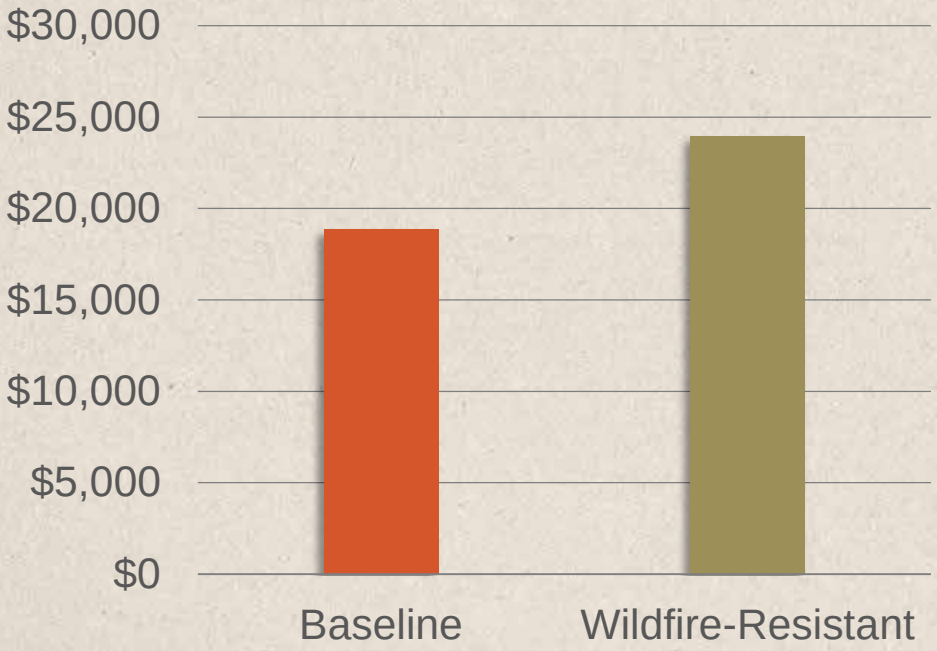
Roof Vulnerabilities

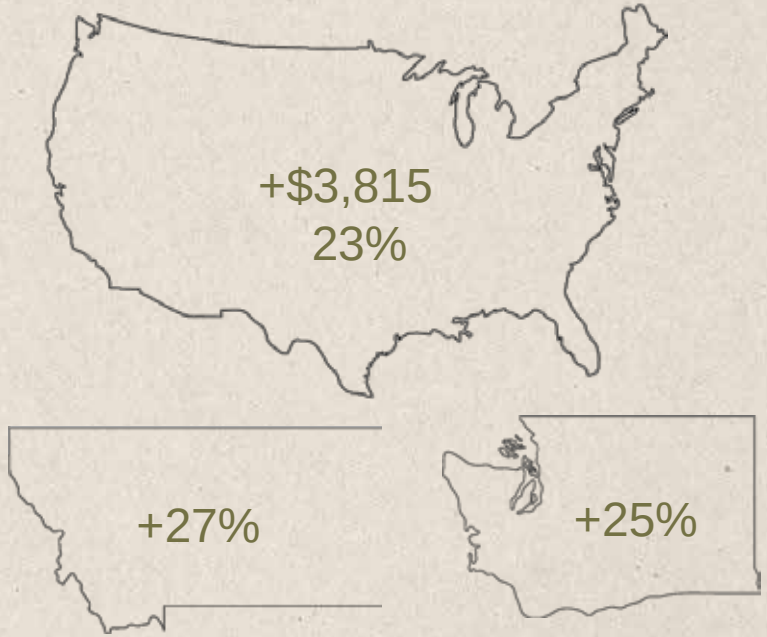
- Roof material, underlayment, edges
- Vents
- Wall-to-roof junctions

Roof Vulnerabilities

- Roof material, underlayment, edges
- Vents
- Wall-to-roof junctions
- Gutter & drip edge

Roof Cost: New Construction

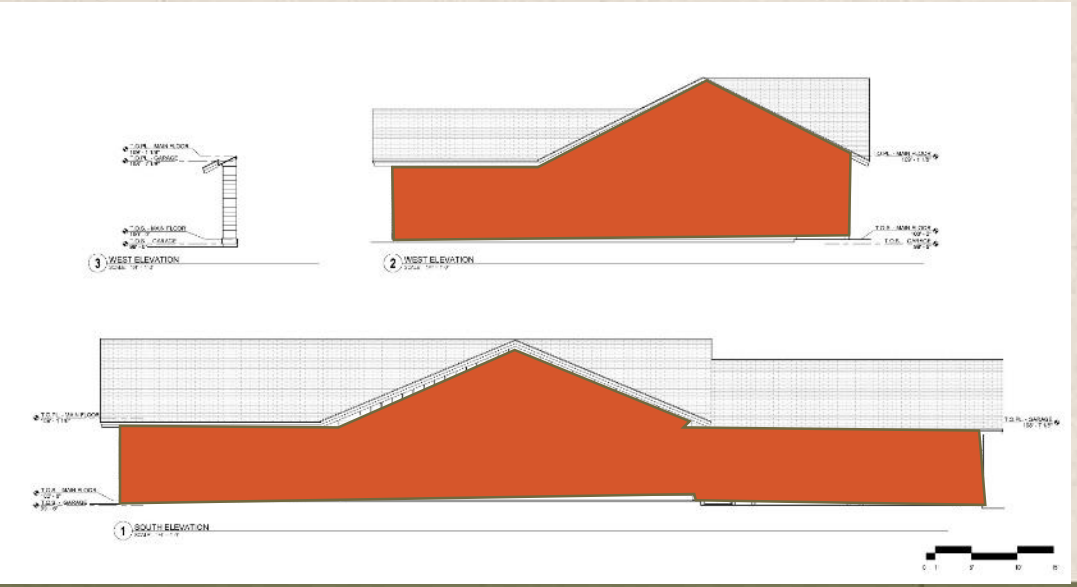


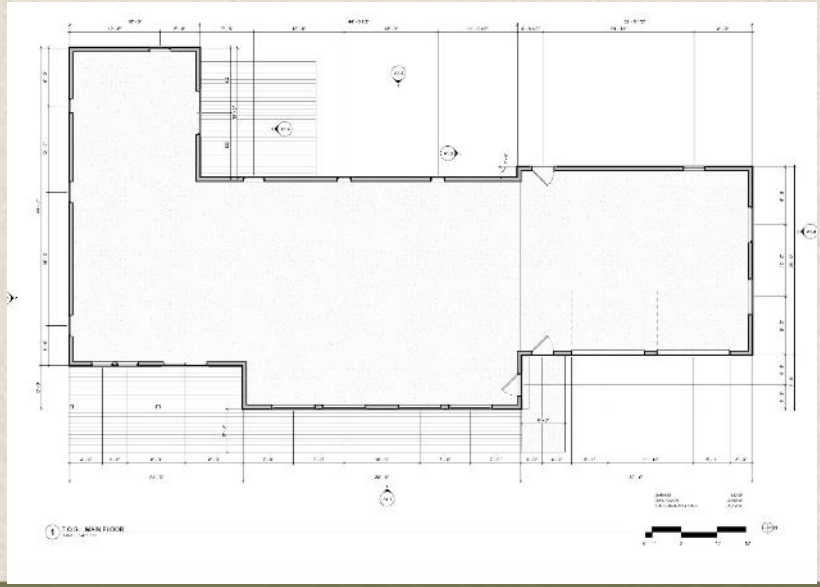


Roof Cost: Retrofit

Feature	Cost/Unit	Example Home
Vents	$400	$400
Wall-to-Roof Junctions	$18/ sq. ft	$2,200
Gutter & Drip Edge	$170/ l. ft	$3,000
Total		**$5,600**

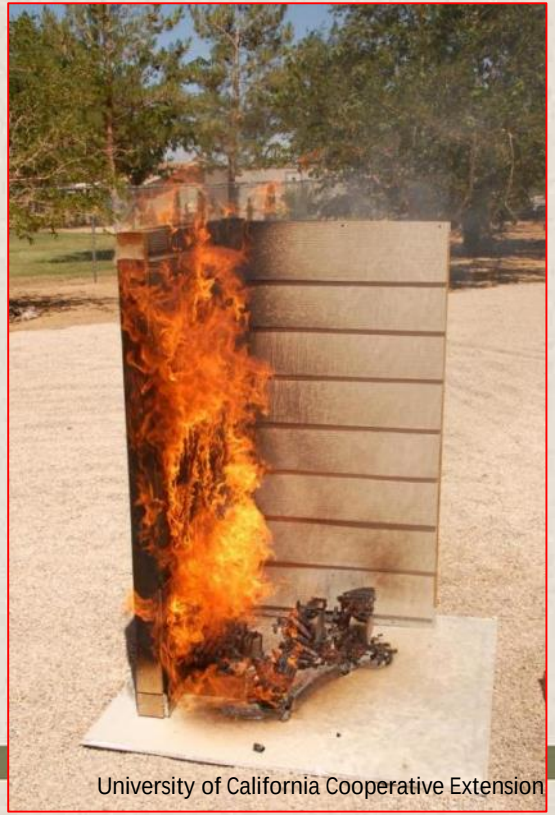
Exterior Walls





Exterior Wall Vulnerabilities

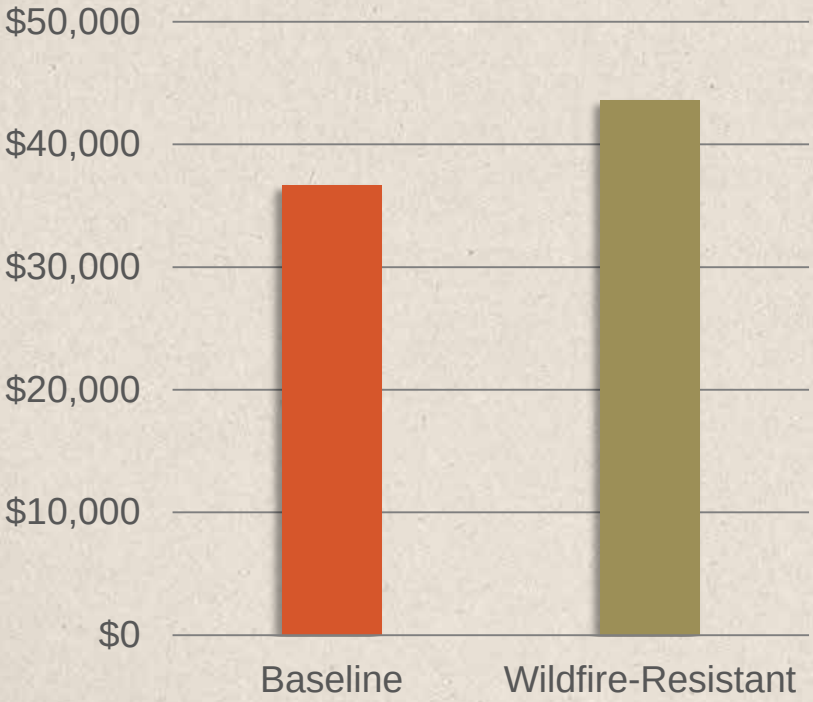
- Siding



Exterior Wall Vulnerabilities

- Siding
- Eaves- soffit

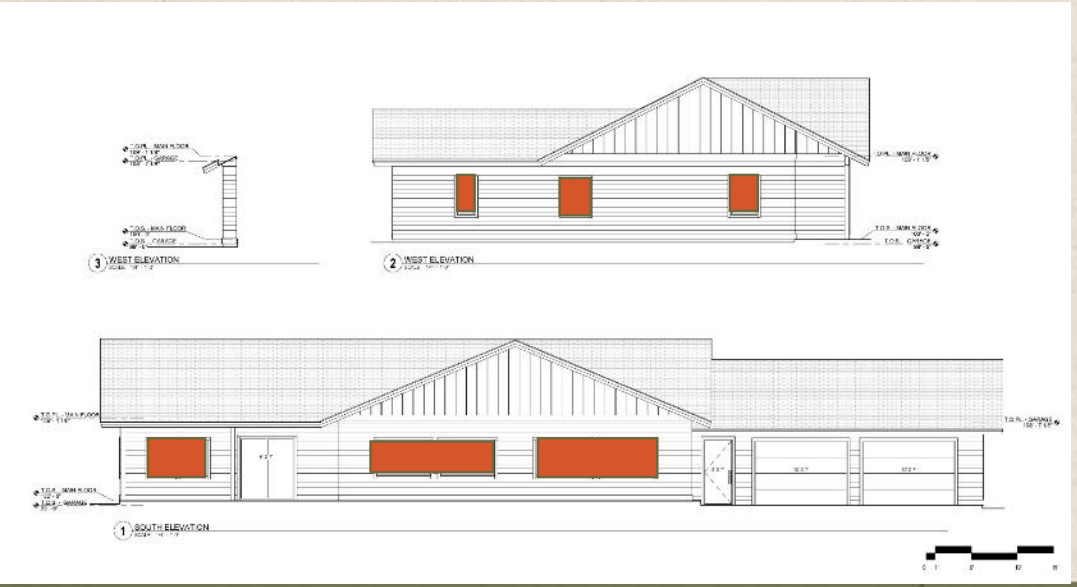
Exterior Wall Cost: New Construction



Exterior Wall Cost: Retrofit

Feature	Cost/Unit	Example Home
Siding	$14/sq. ft.	$43,000
Soffit		$5,600
Total		**$48,600**

Windows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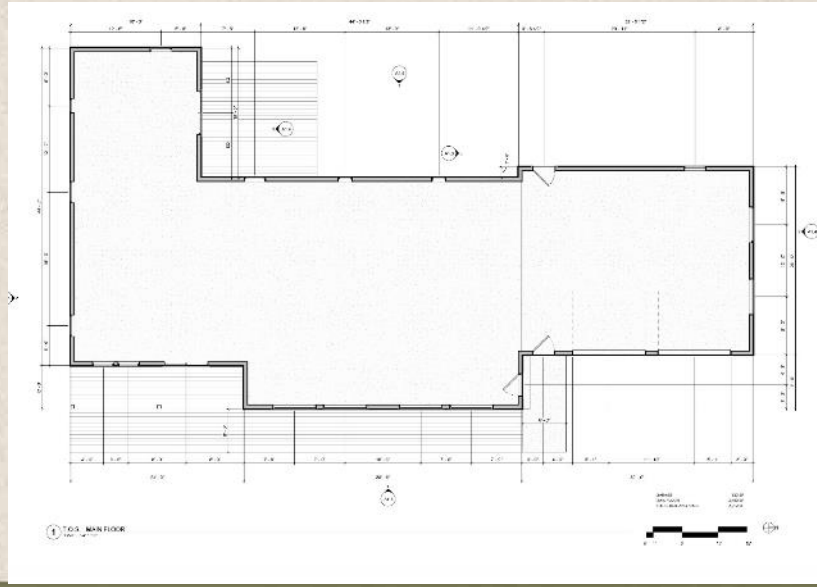
1 SOUTH ELEVATION

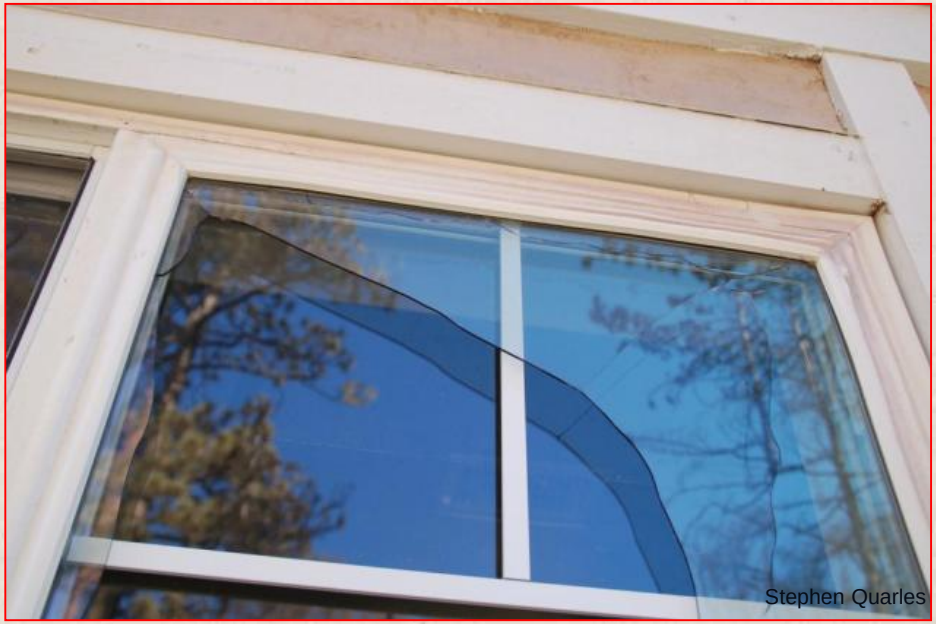

1 T.O.S. MAIN FLOOR

Window Vulnerabilities

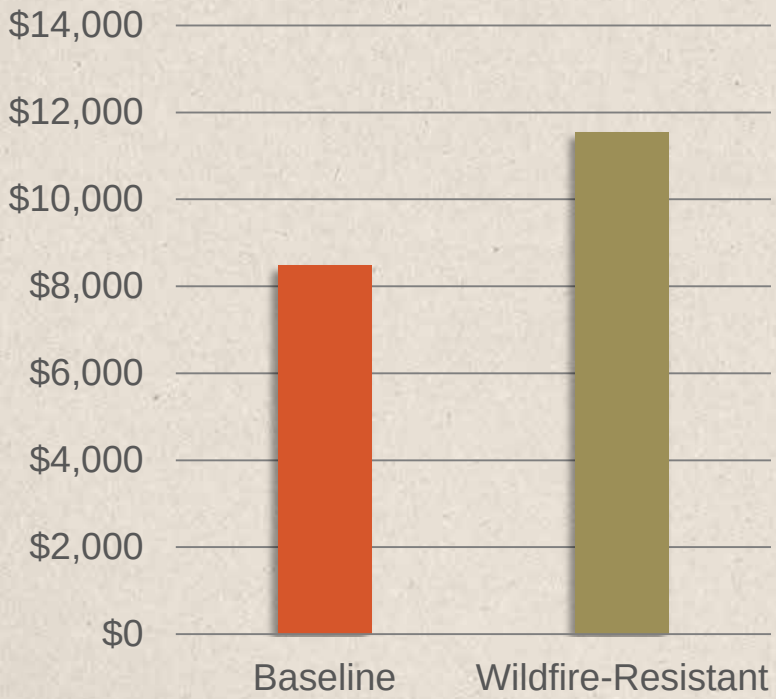
- Frame

Window Vulnerabilities

- Frame
- Glass



Window Cost: New Construction

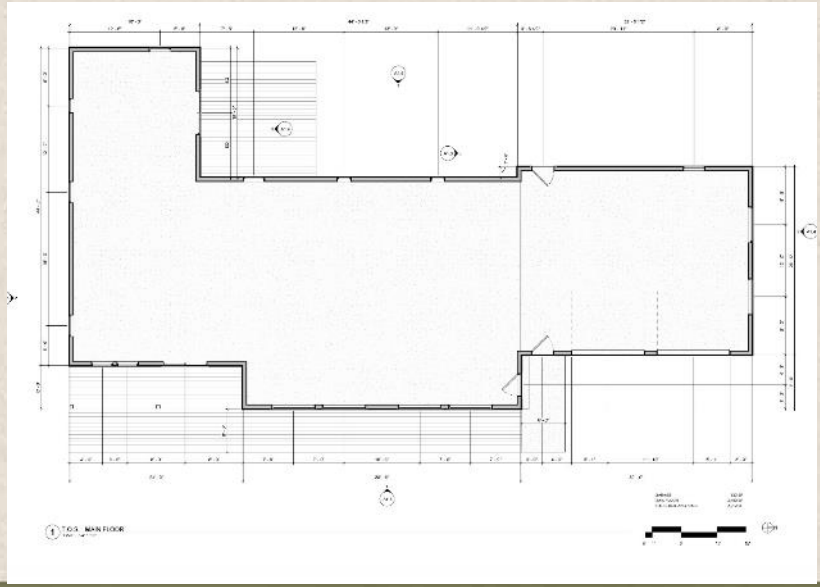


Window Cost: Retrofit

$500 - 900 per window

Doors

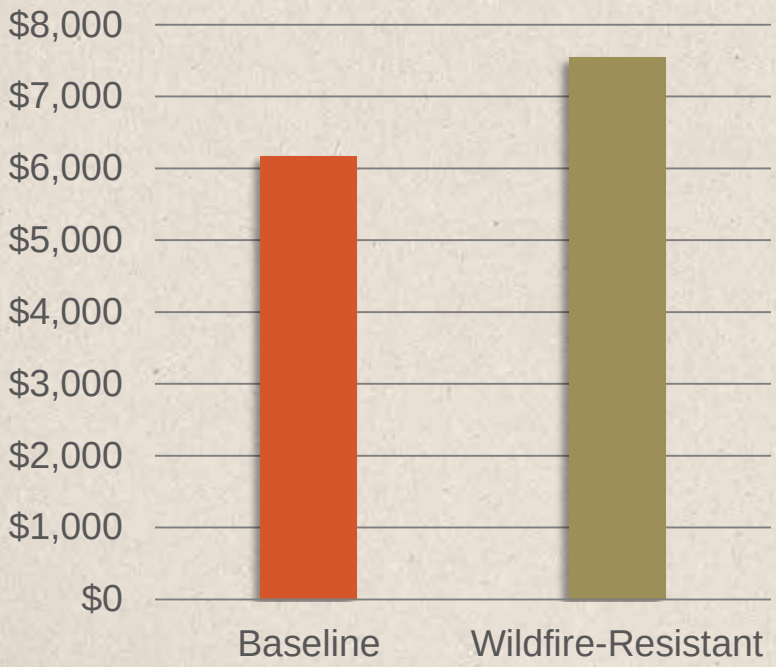

3 WEST ELEVATION
2 WEST ELEVATION
1 SOUTH ELEVATION

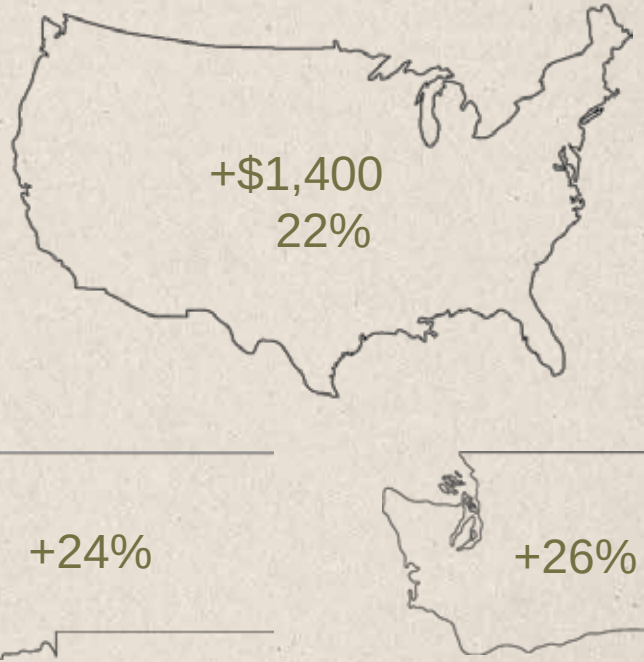

1 T.O.S. MAIN FLOOR

Door Vulnerabilities

- Frame
- Weatherstripping

Door Cost


$8,000
$7,000
$6,000
$5,000
$4,000
$3,000
$2,000
$1,000
$0
Baseline
Wildfire-Resistant


+$1,400
22%
+24%
+26%

Deck

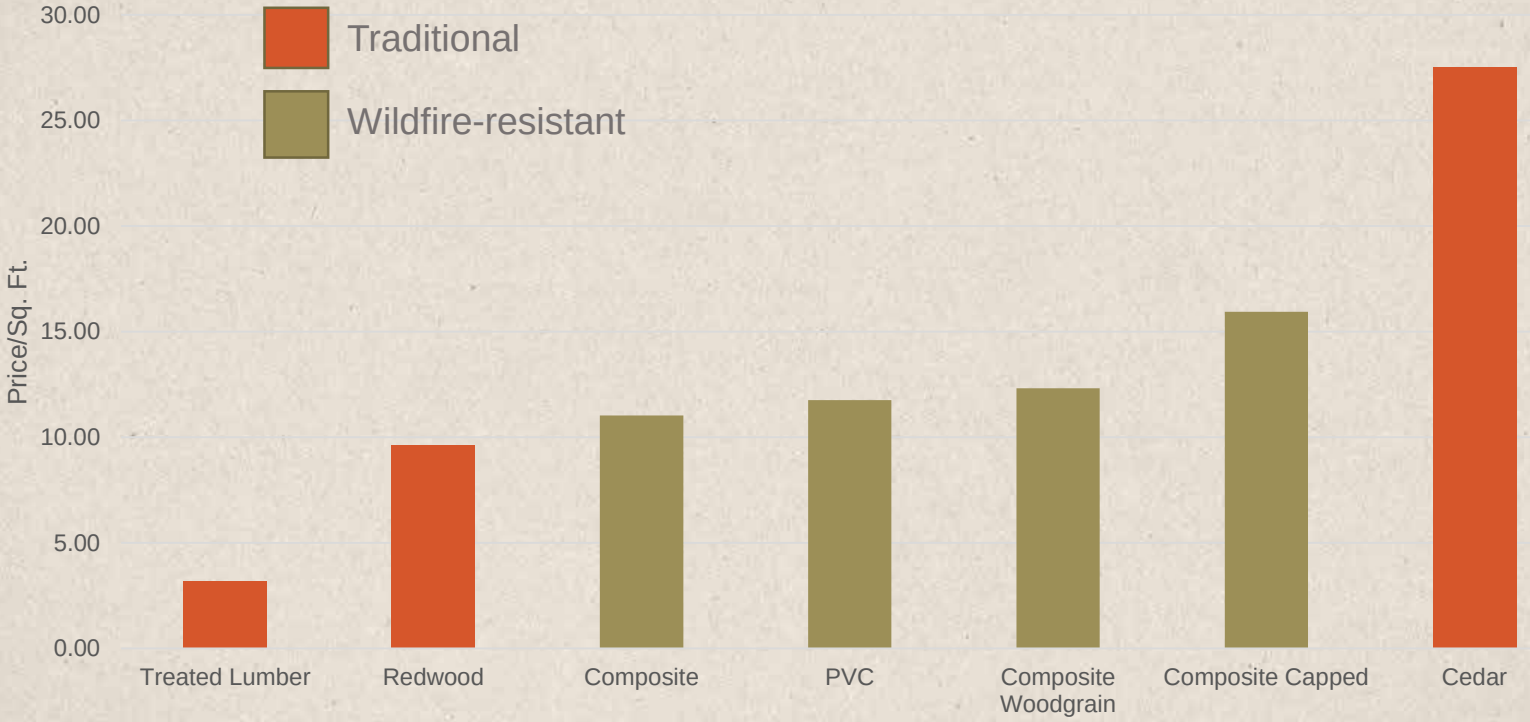
Deck Vulnerabilities

- Decking surface

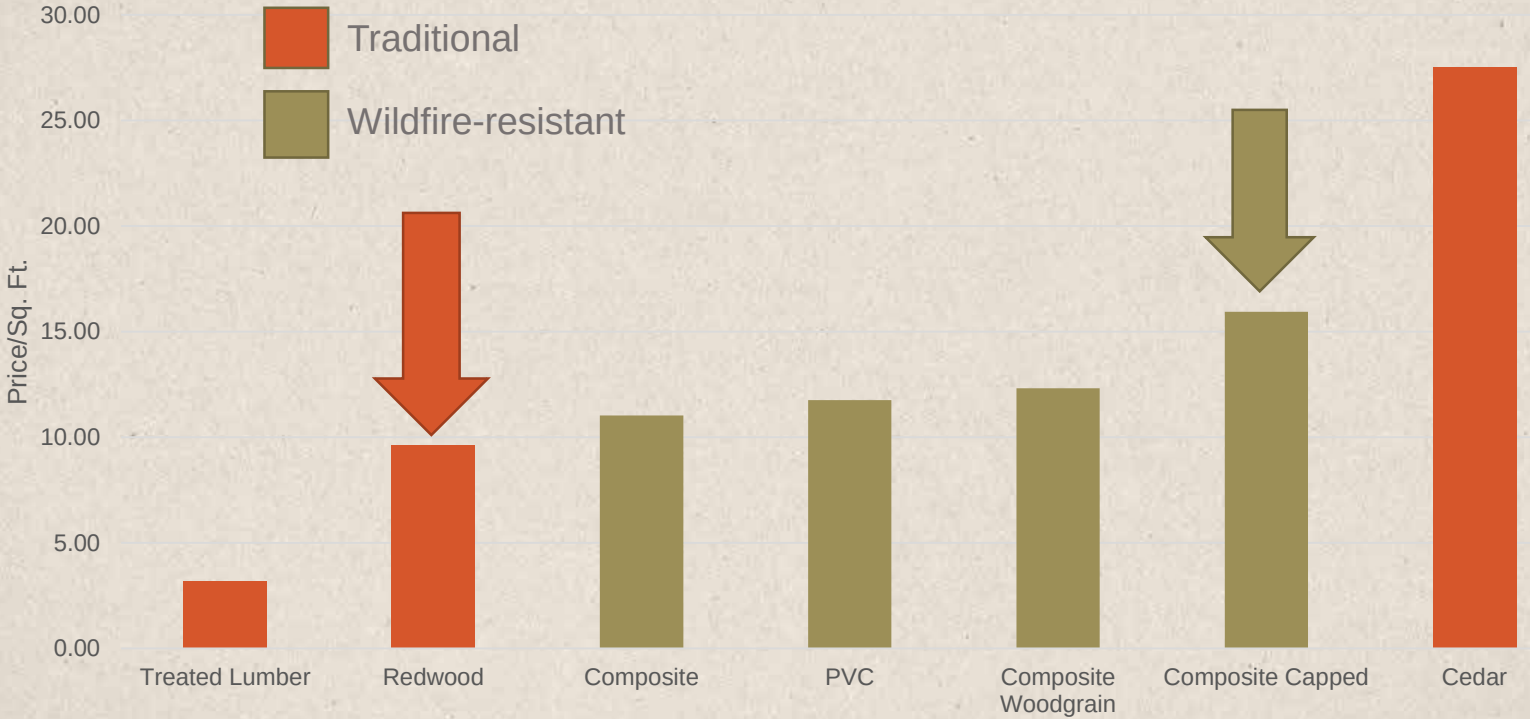
Deck Vulnerabilities

- Decking surface
- Tape

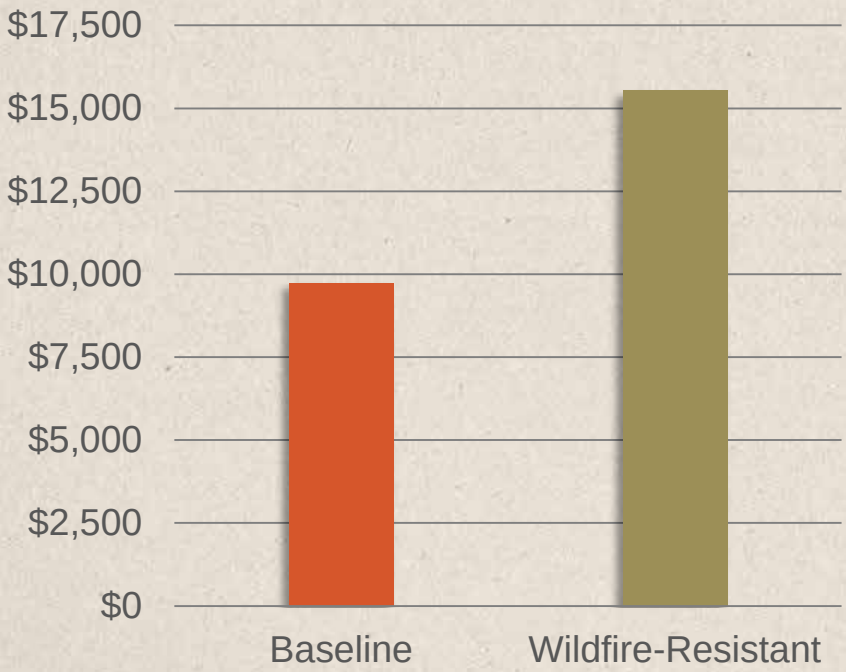
Decking Cost Options

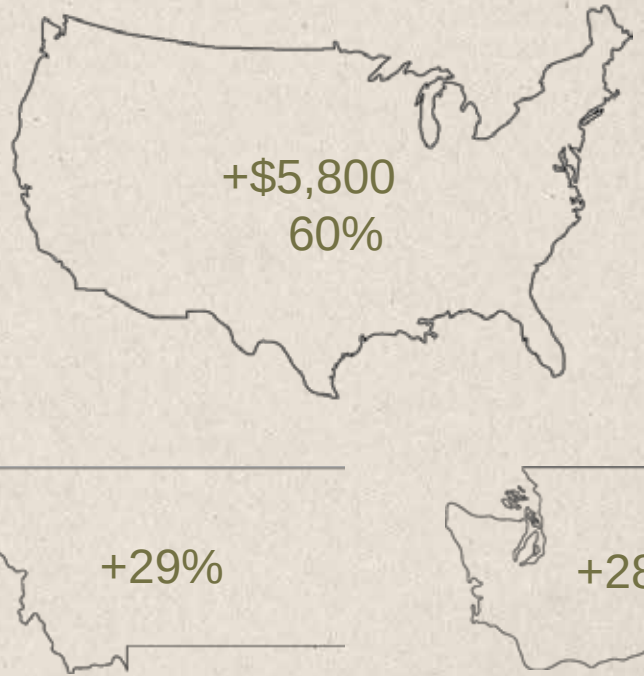


Decking Cost Options



Deck Cost


$17,500
$15,000
$12,500
$10,000
$7,500
$5,000
$2,500
$0
Baseline
Wildfire-Resistant

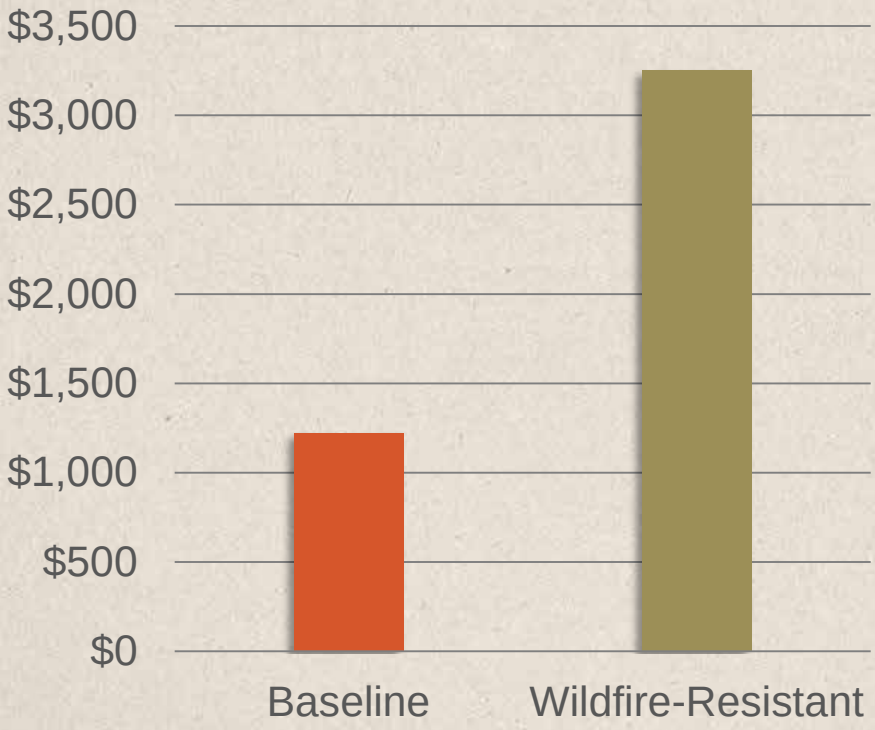

+$5,800
60%
+29%
+28%

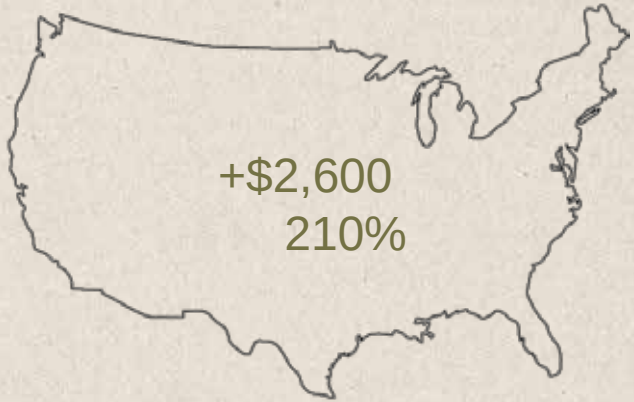
Home Ignition Zone

Home Ignition Zone Vulnerabilities

- 5-feet within structure
- Under deck surfaces

Home Ignition Zone Cost





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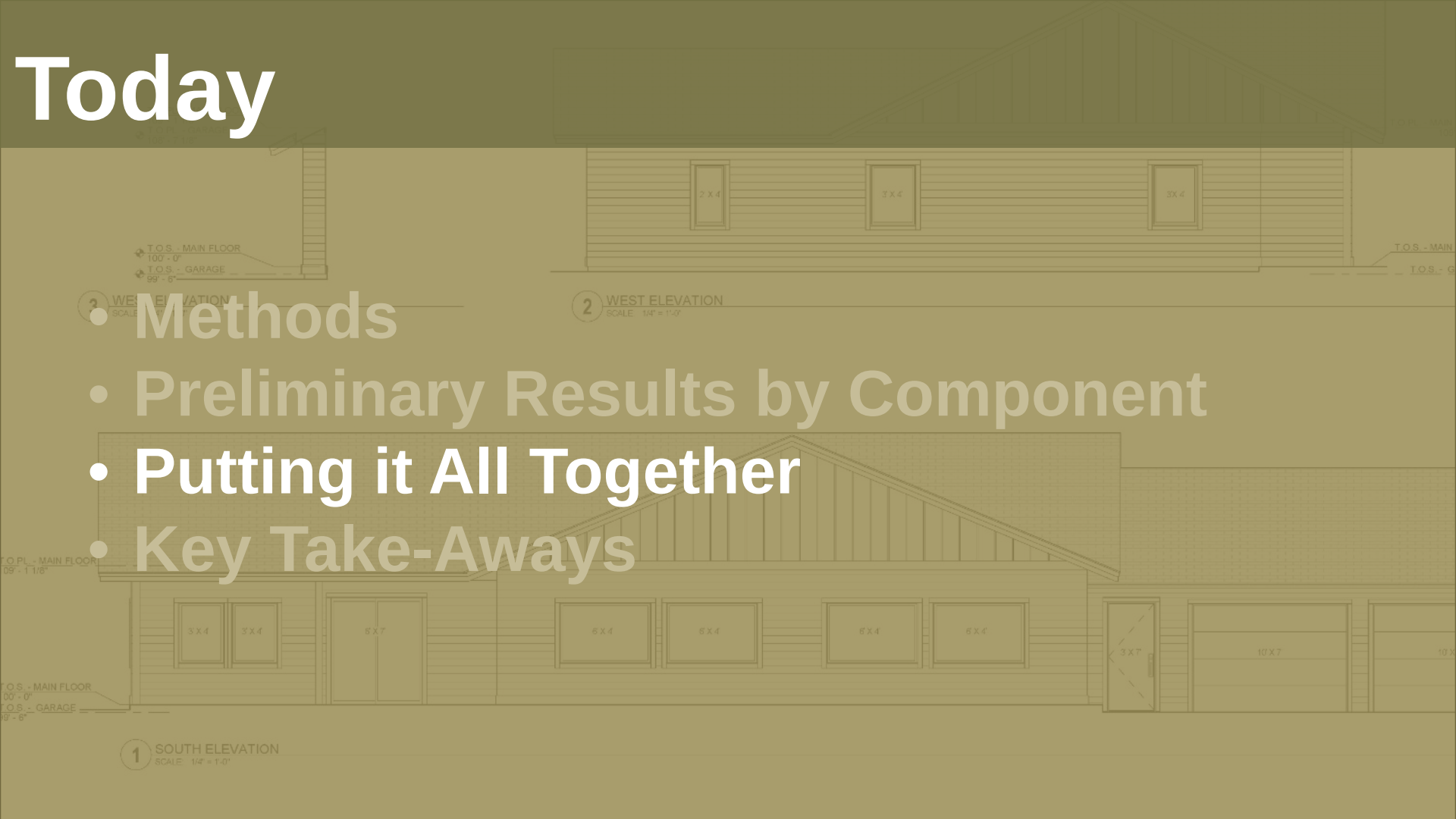
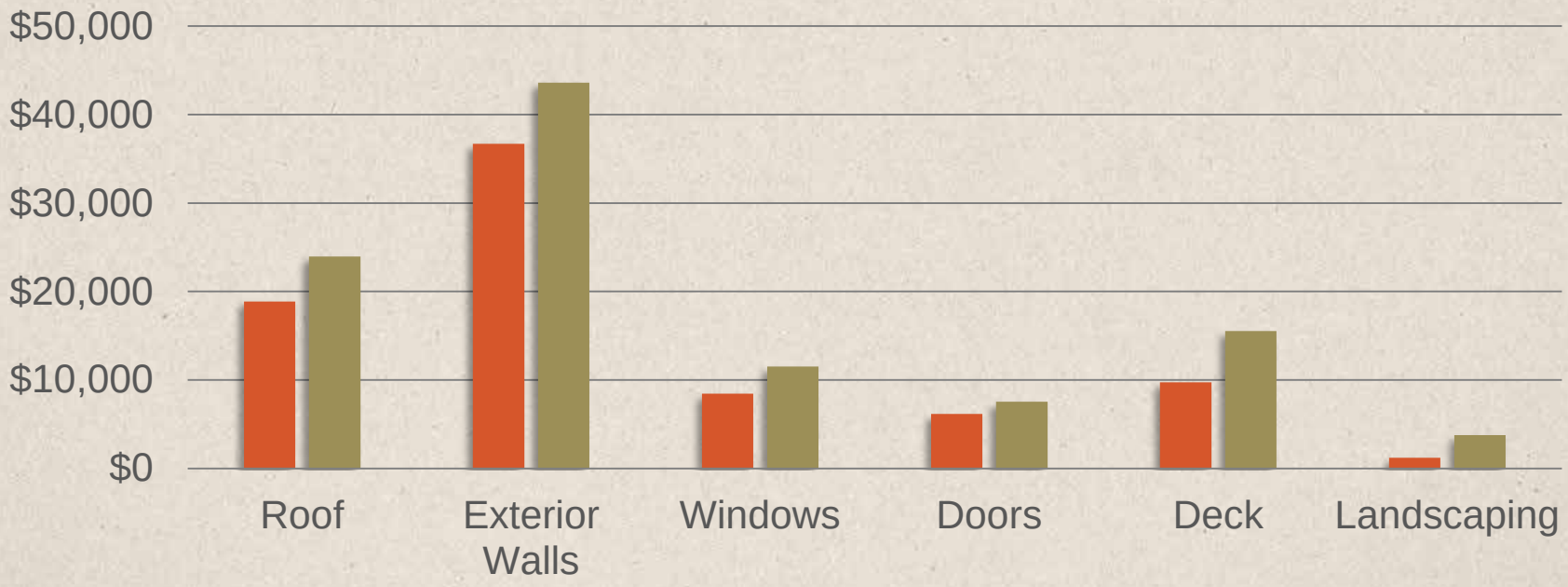
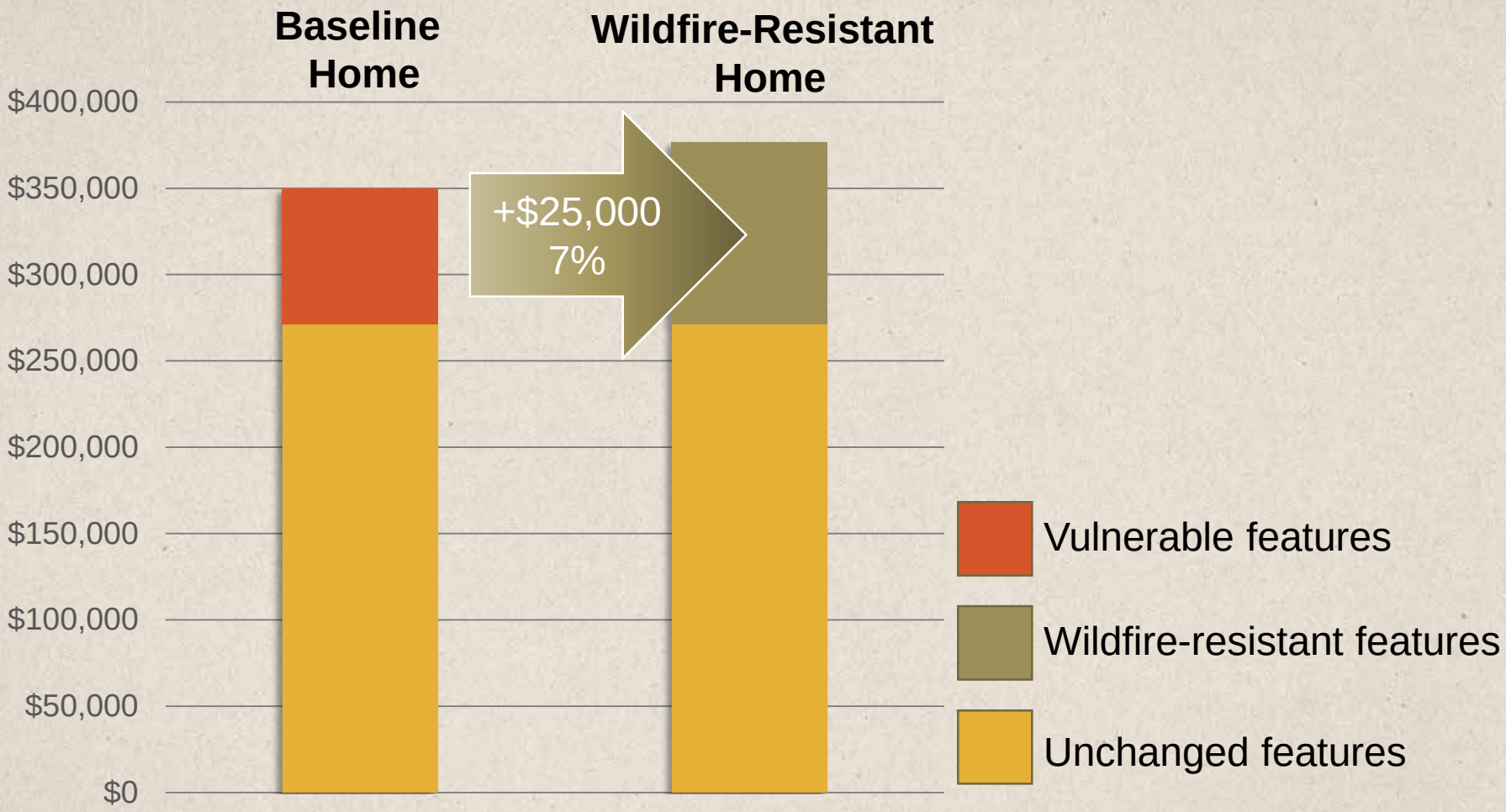


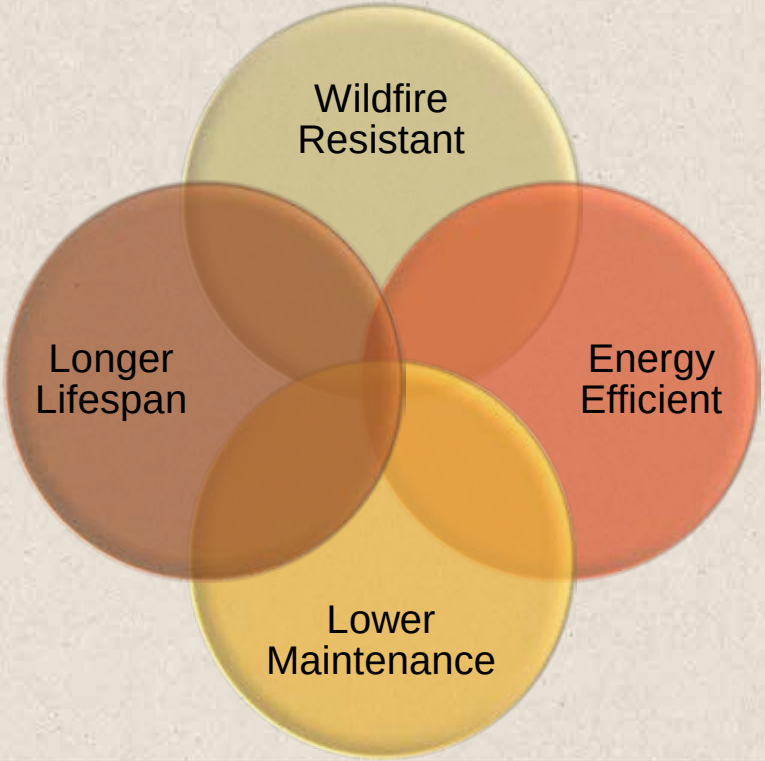
Difference by Component

Baseline : Wildfire-Resistant




Baseline Home
Wildfire-Resistant Home
$400,000
$350,000
$300,000
$250,000
$200,000
$150,000
$100,000
$50,000
$0
+$25,000
7%
Vulnerable features
Wildfire-resistant features
Unchanged features

Cost Savings from Co-Benefits



Today

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- Preliminary Results by Feature
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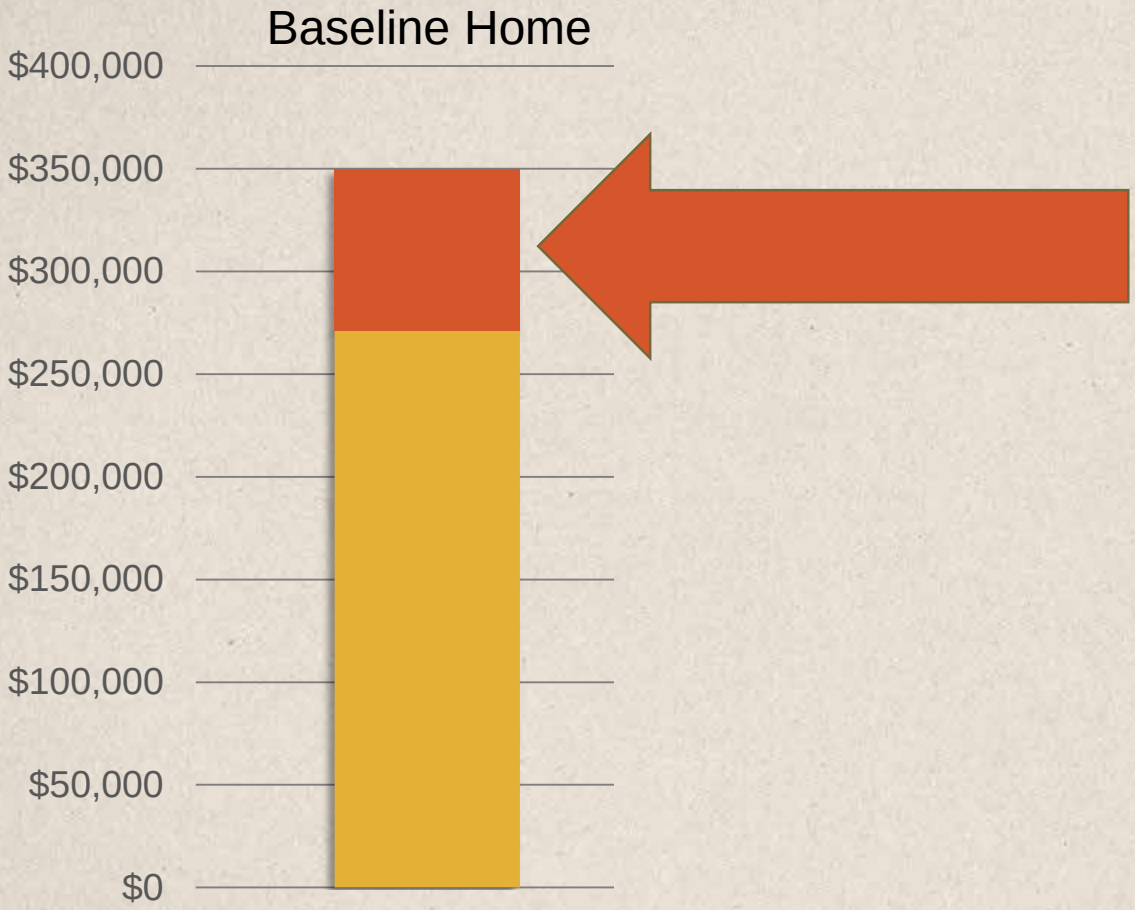
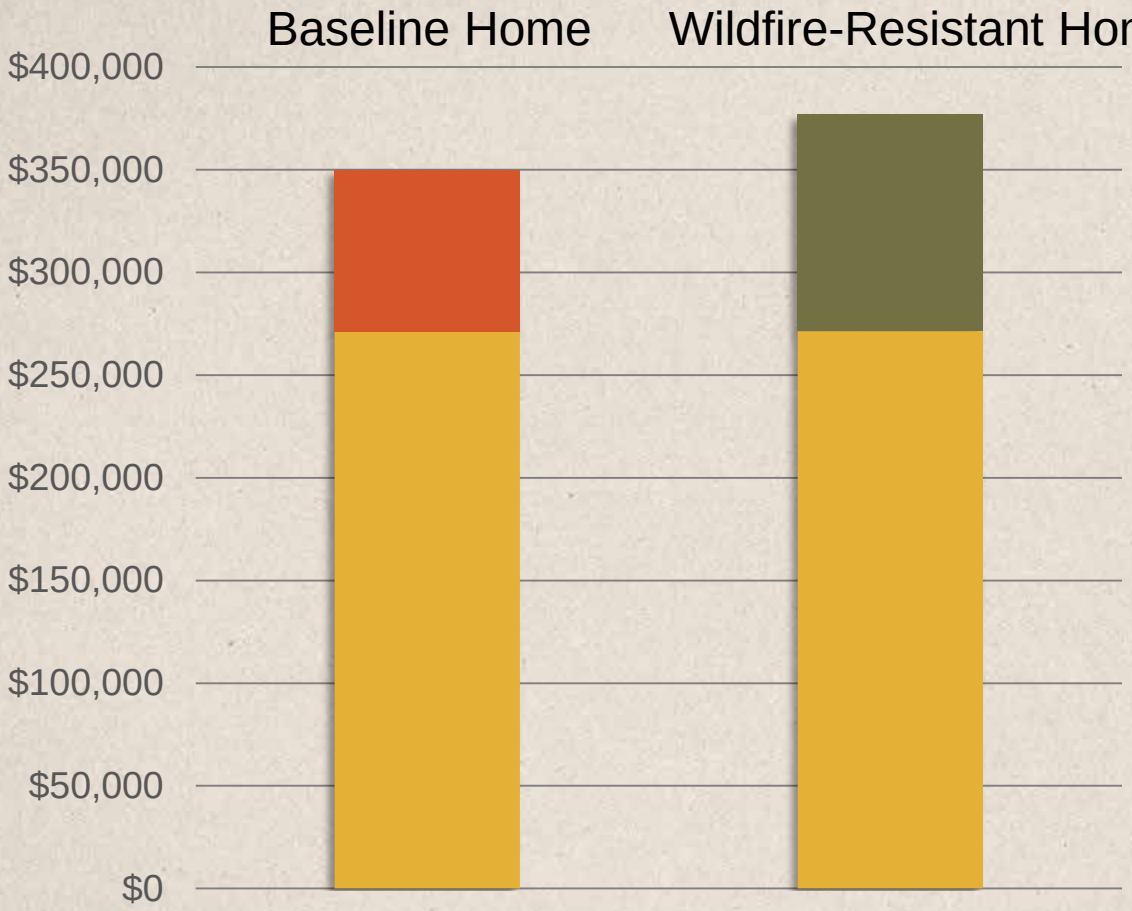
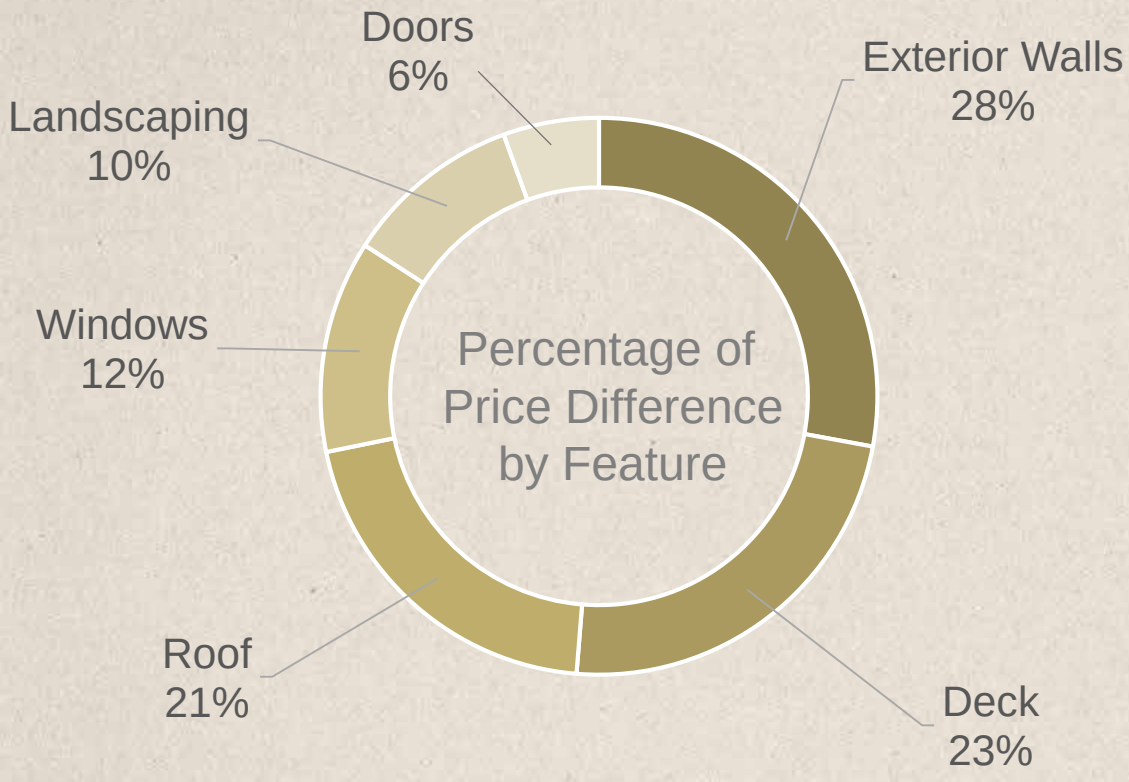
- **Key Take-Aways**



Six of the most vulnerable features make up 20-25% of a home's cost.



Making those components wildfire-resistant adds 6-10% to the total cost of the home.



Exterior walls, deck, and roof comprise the majority of increased expense.

Thank You!

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Wildfire Risk Assessments

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Fire Modeling Institute, Missoula, Montana

Today

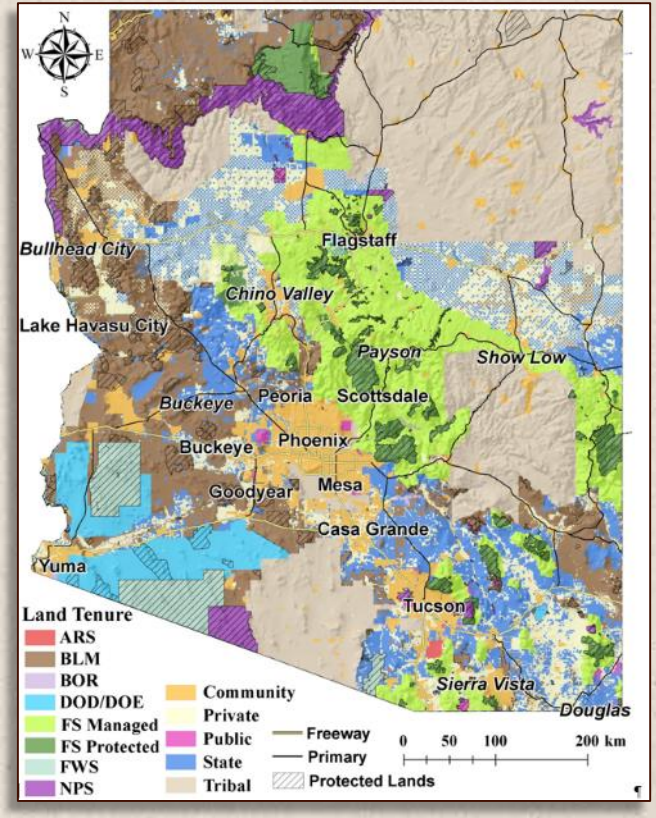
- Why use risk assessments
- Methods & data
- Products

Today

- **Why use risk assessments**
- **Methods & data**
- **Products**

Managing Wildfire Across Boundaries

- Cross-boundary fire management is key to achieving the Cohesive Strategy goals
  - Fire adapted communities
  - Restore and maintain resilient landscapes
  - Safe and effective wildfire response
- Mapping risk from large wildfires and partitioning it among landowners and communities is a complicated problem
- New concepts and tools are needed to build a common understanding of cross-boundary risk



The Role of Wildfire Risk Assessments

- Pre-Fire Planning
  - Treatment prioritization and strategic fuels management
  - Identifying stakeholders
  - Community planning (WUI codes, regulations, CWPP)
- Wildfire Response
  - Delineation of wildfire response zones
  - Effective communication between agency officials, incident management teams, and the public
- Overall: consideration of wildfire in land use planning and land management

Today

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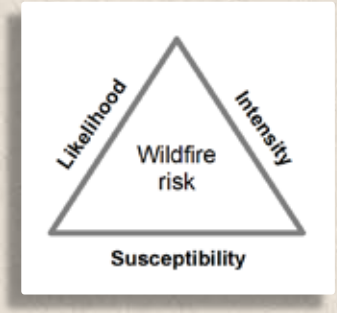
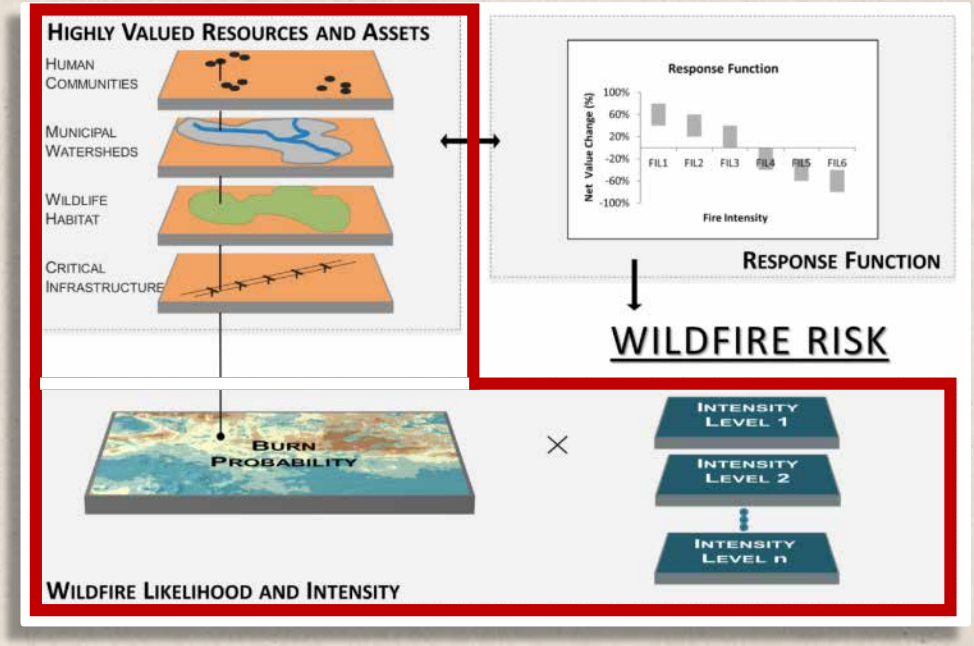
What is a Wildfire Risk Assessment?

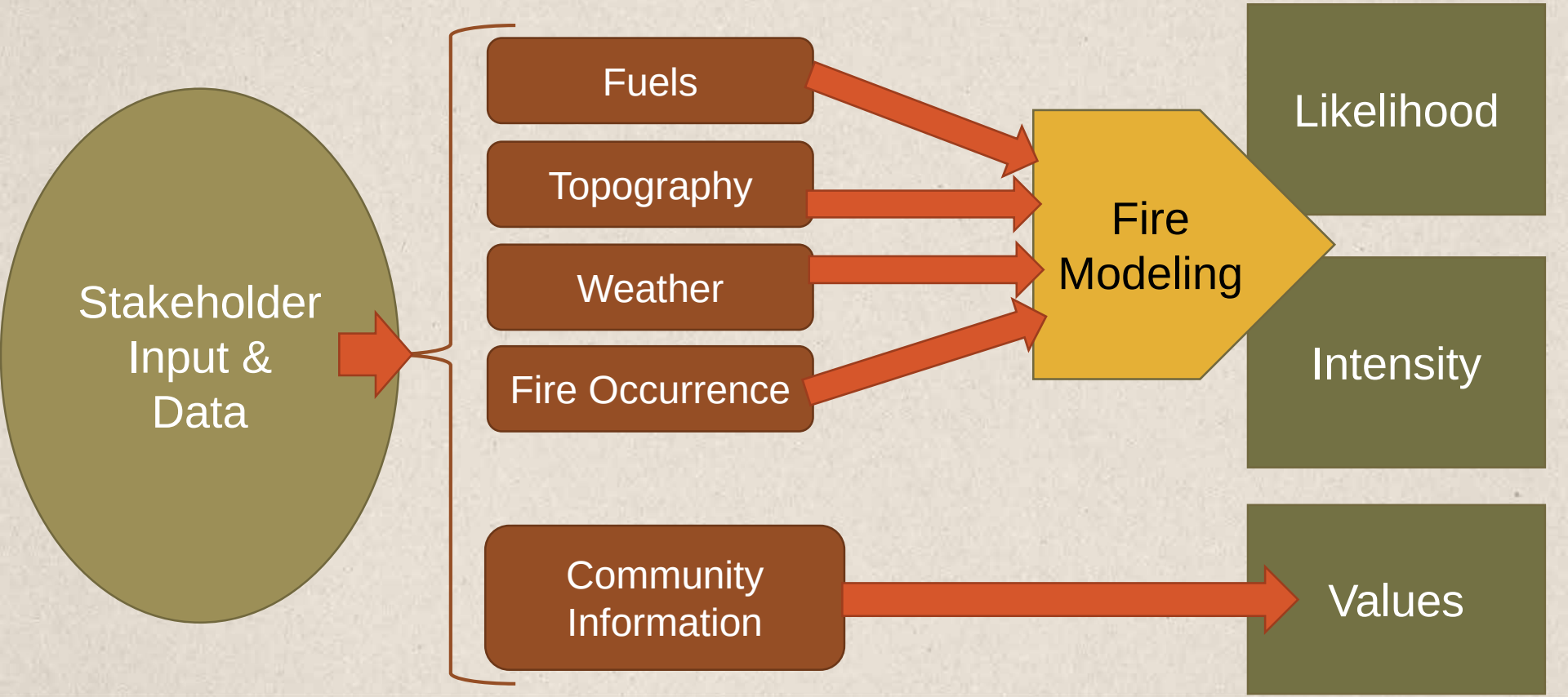
- Wildfire Risk: A measure of the probability and consequences of uncertain future wildfire events.



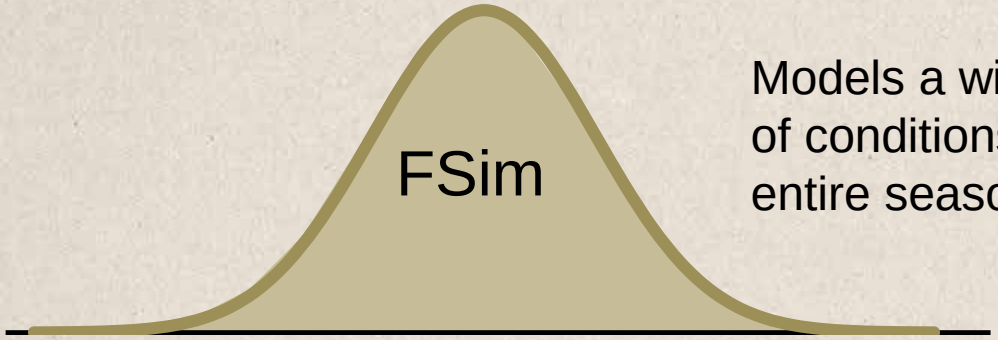
- Wildfire Hazard: A physical situation with potential for negative consequences from wildfire.
- Wildfire Exposure: The spatial intersection of wildfire hazard with something of value.



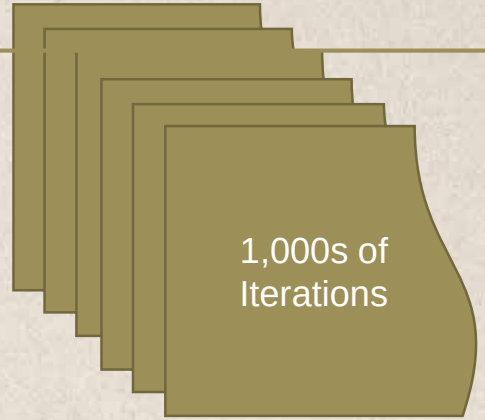
Methods: Gather Input Data

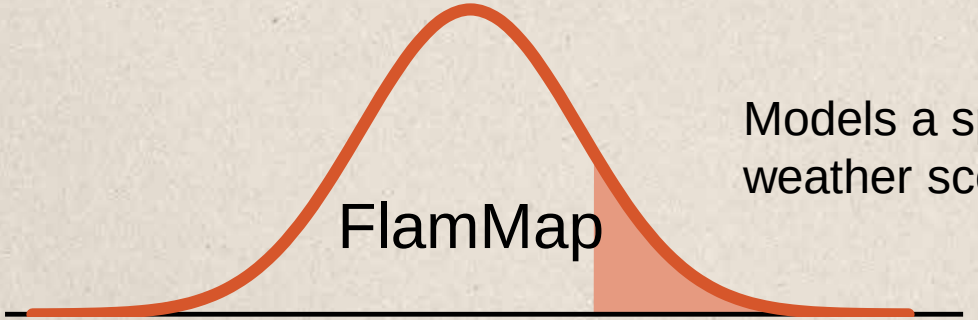


Methods: Fire Modeling

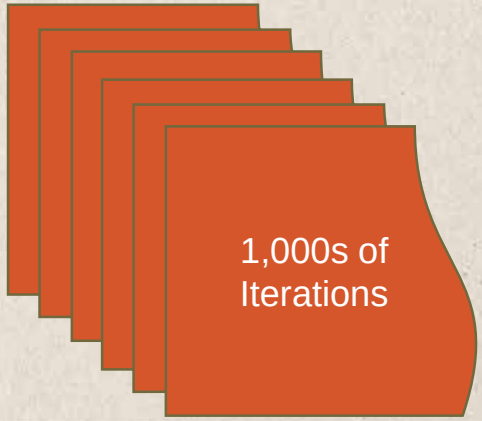


Models a wide range of conditions over an entire season



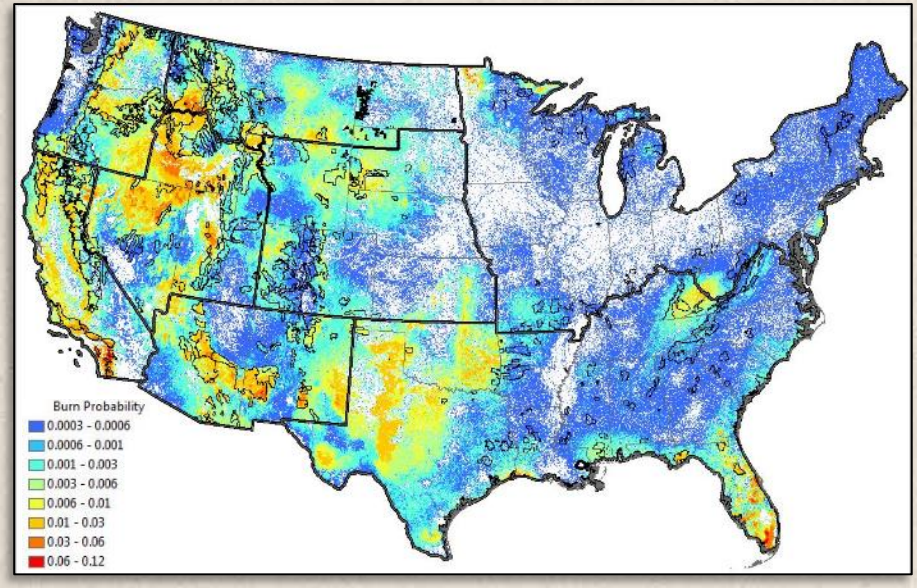


Models a specific weather scenario

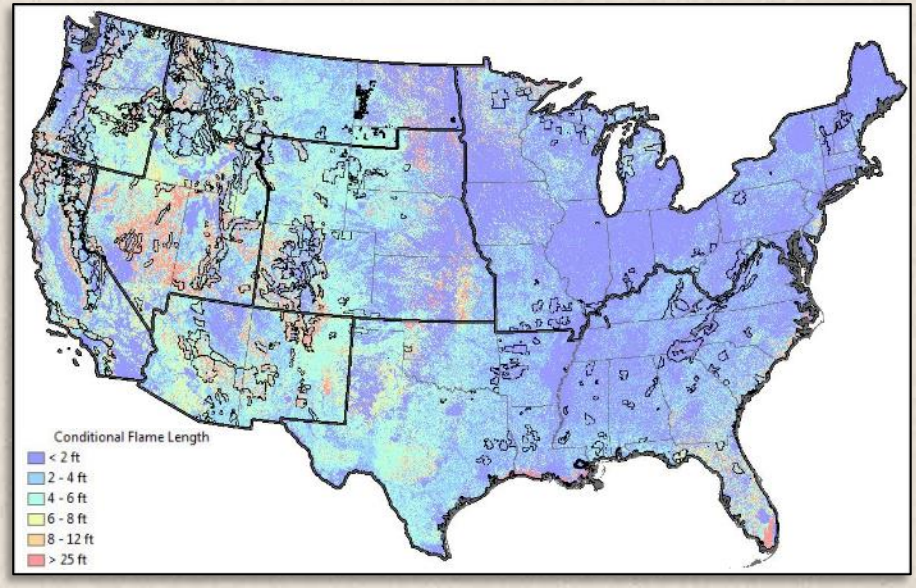


Methods: Fire Modeling

National FSim Modeling



Likelihood



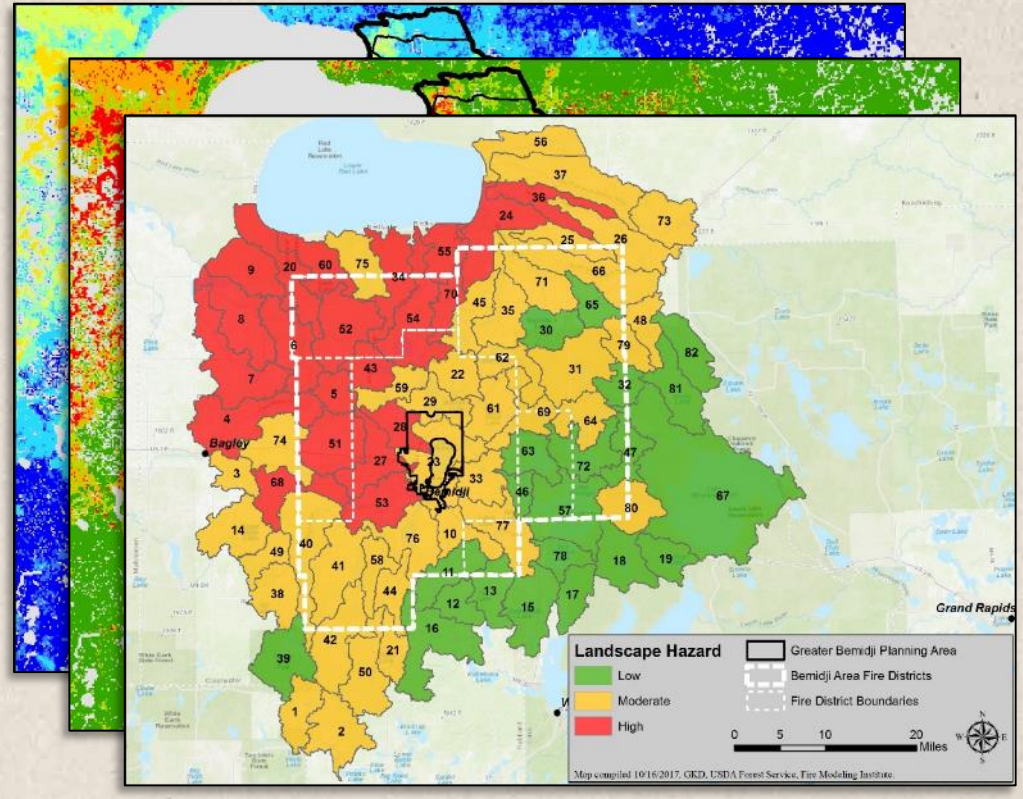
Intensity

Short and others. 2016. Spatial dataset of probabilistic wildfire risk components for the conterminous United States. Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2016-0034

Short, Karen C. 2017. Spatial wildfire occurrence data for the United States, 1992-2015 [FPA_FOD_20170508]. 4th Edition. Forest Service Research Data Archive. https://doi.org/10.2737/RDS-2013-0009.4

Methods: Calculate and Summarize Outputs

- **Pixel-based outputs**
  - Likelihood
  - Intensity
- **Derived metrics**
  - Hazard
  - Exposure
  - Fireshed
- **Summarize to polygons**
  - Watersheds
  - Political Units
  - Neighborhoods

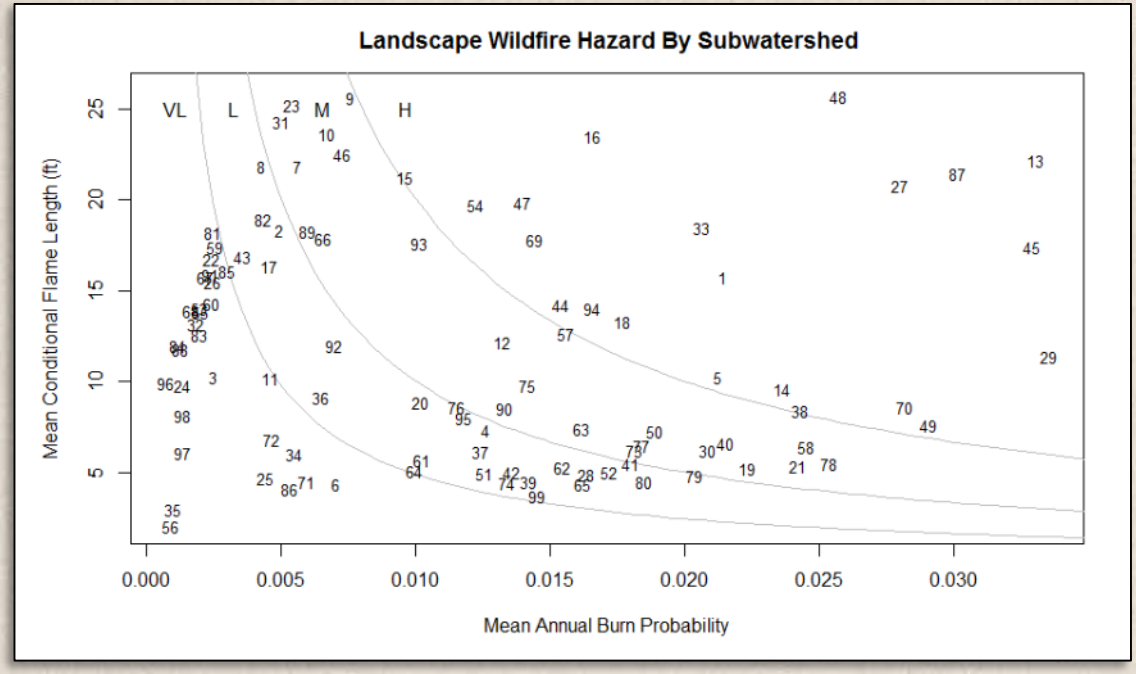


Today

- Why use risk assessments
- Methods & data
- **Products**

Landscape Assessment

Watershed scale (12-code HUC) – FSim Modeling



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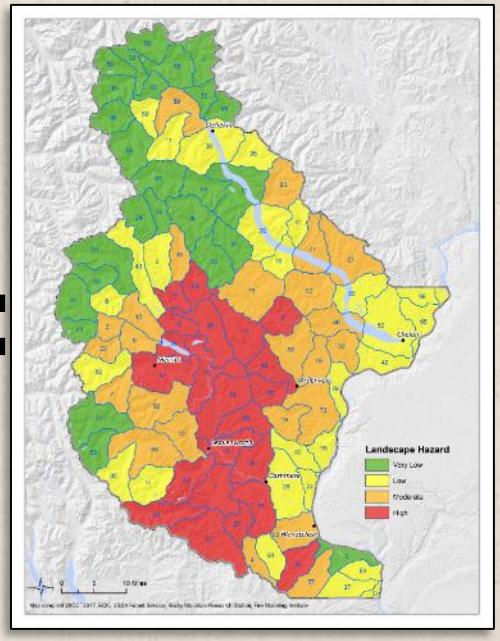
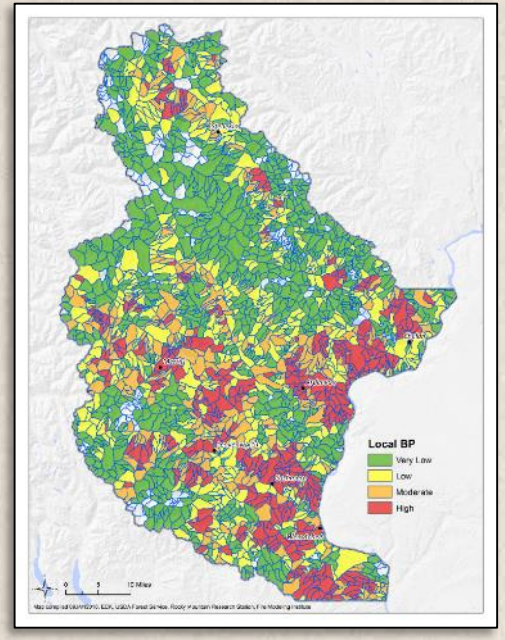


Likelihood Intensity Hazard

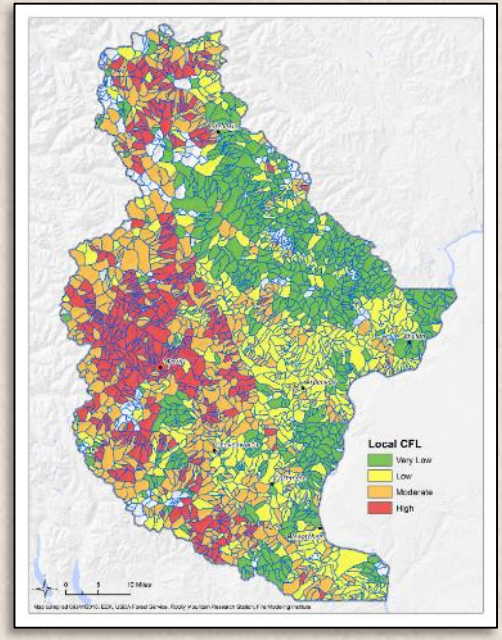
Local Assessment

Smaller watershed scale (catchments) – FlamMap Modeling



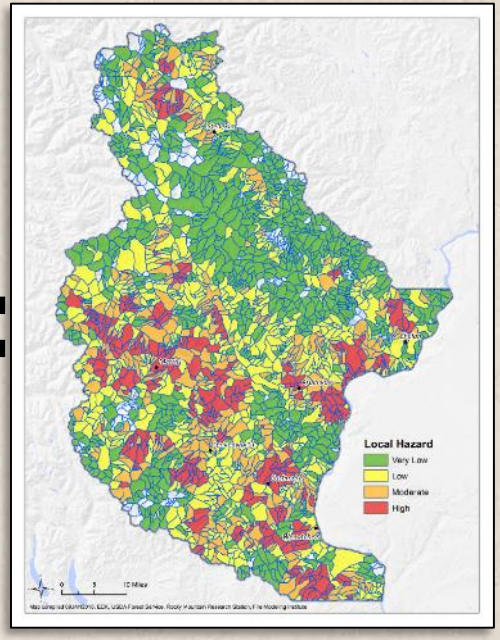
Likelihood

X



Intensity

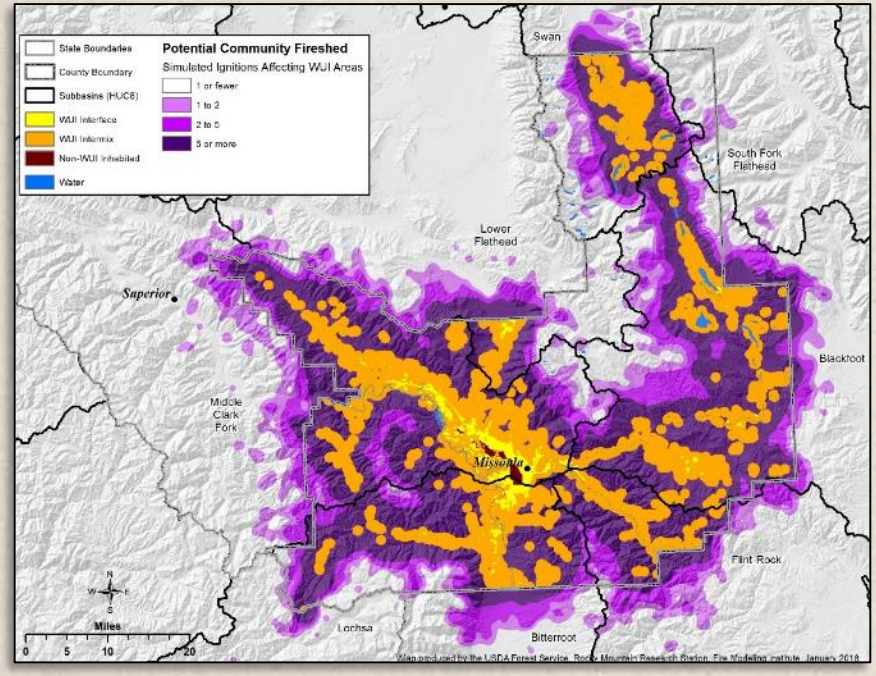
=

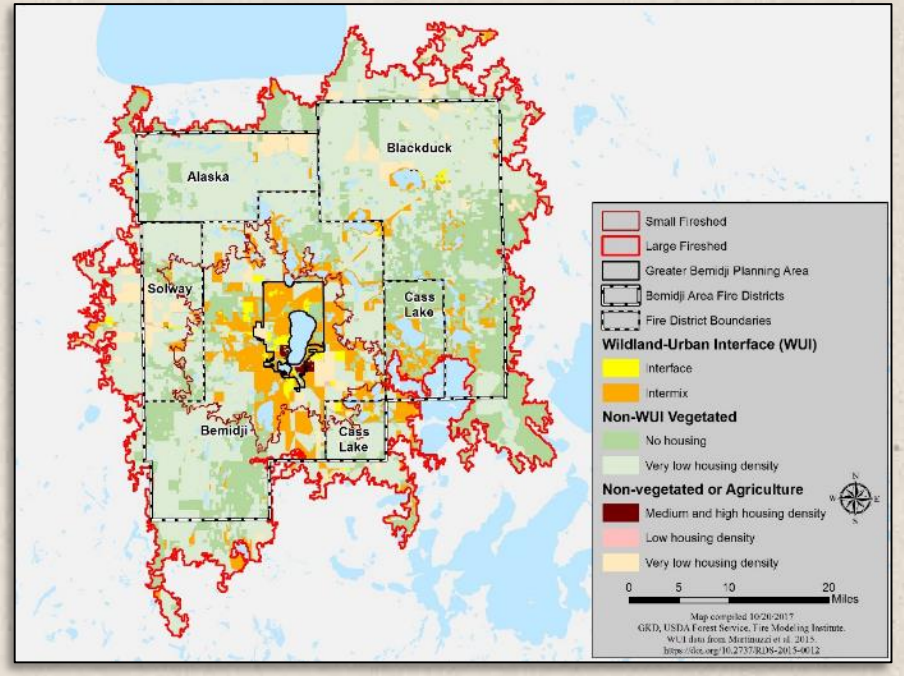


Hazard

Community Fireshed

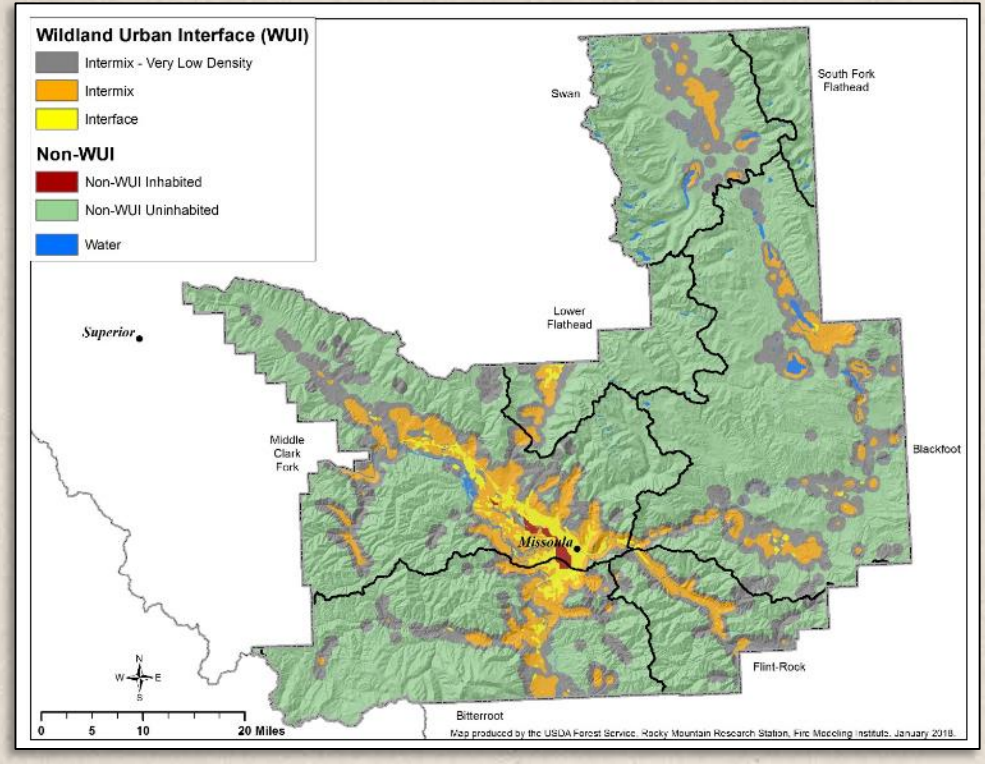
- The potential source area for wildfires that could impact the community
- Similar in concept to a watershed



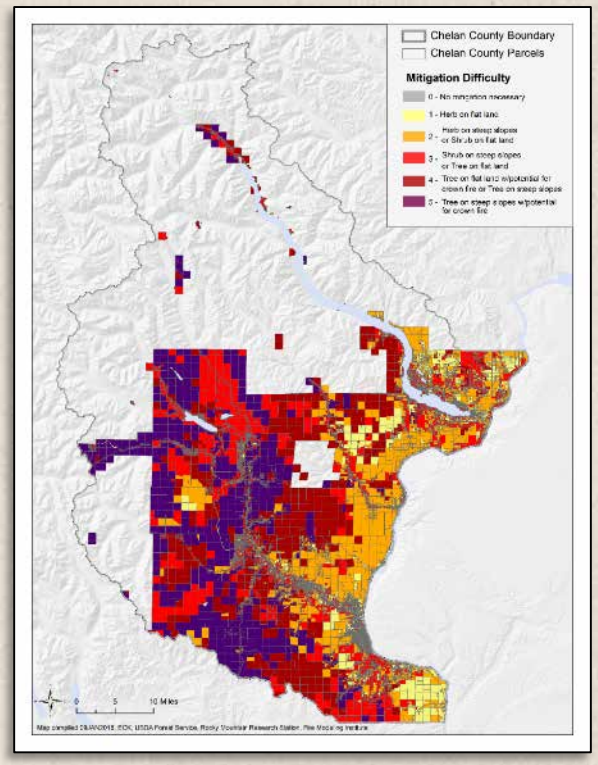


Other Related Products

Wildland Urban Interface



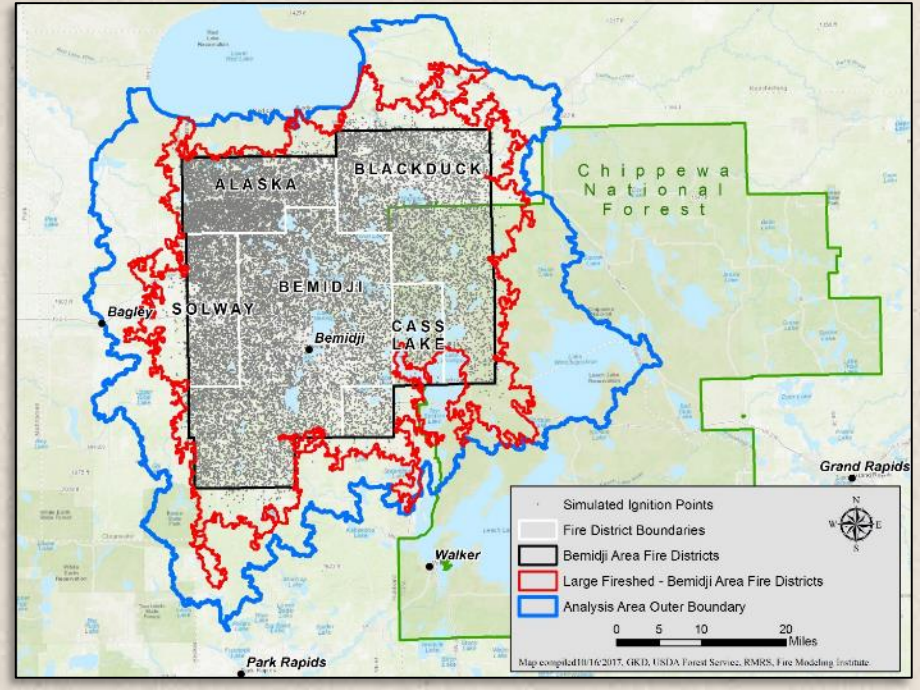
Mitigation Difficulty Map

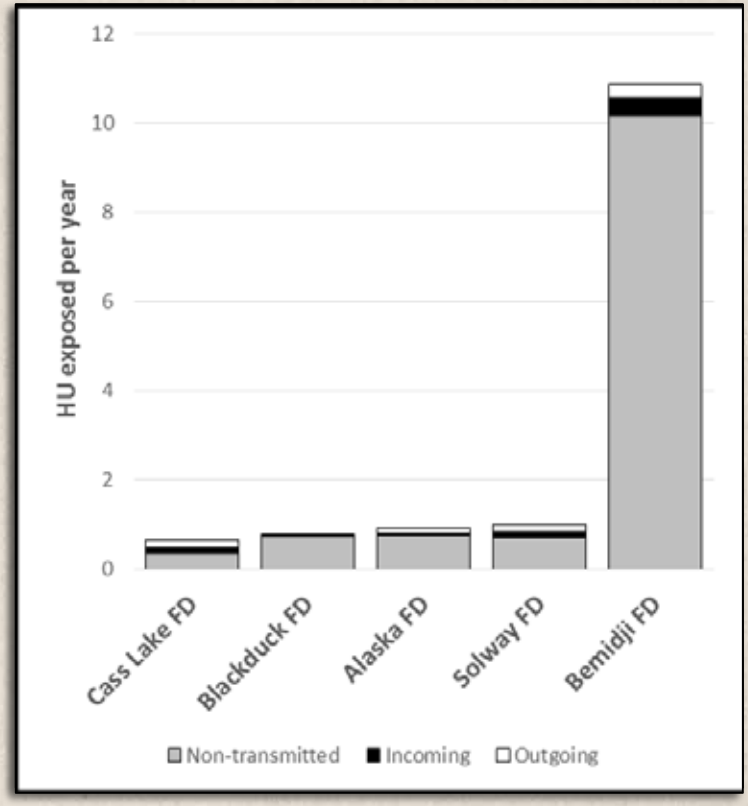


Based on The 2010 wildland-urban interface of the conterminous United States. https://www.nrs.fs.fed.us/data/WUI/

Other Related Products

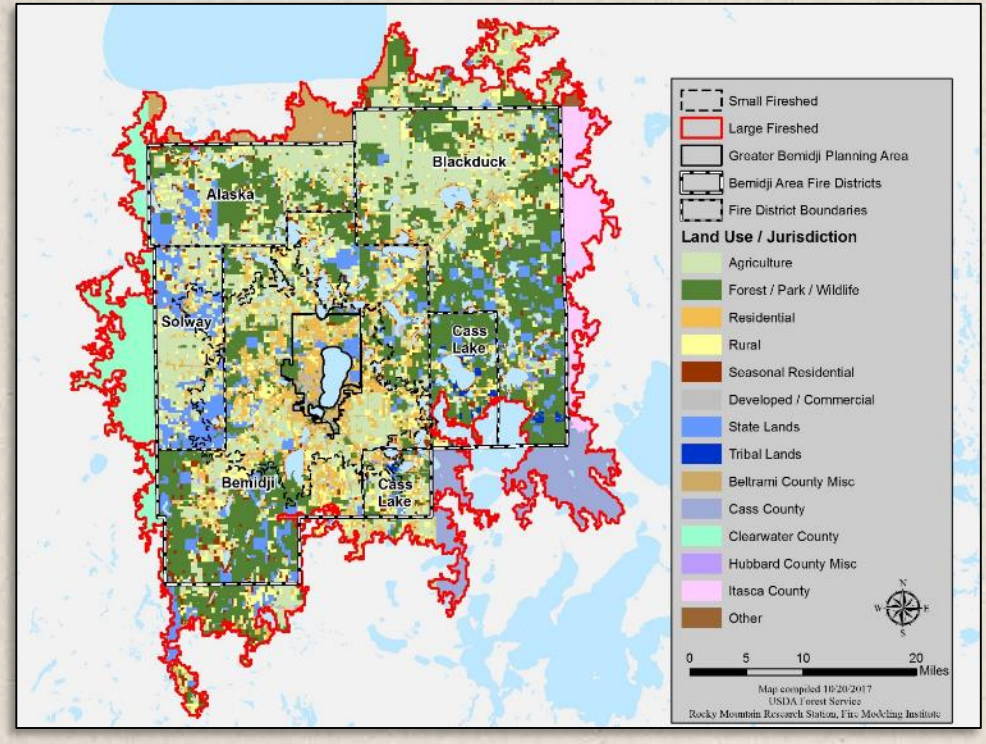
Wildfire Exposure and Transmission Analysis

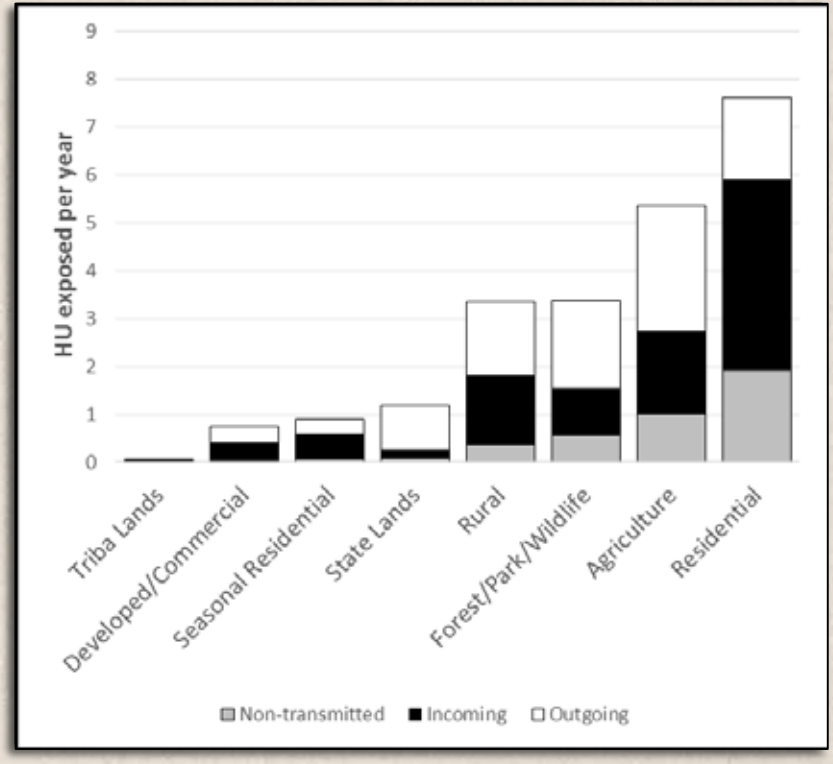




Other Related Products

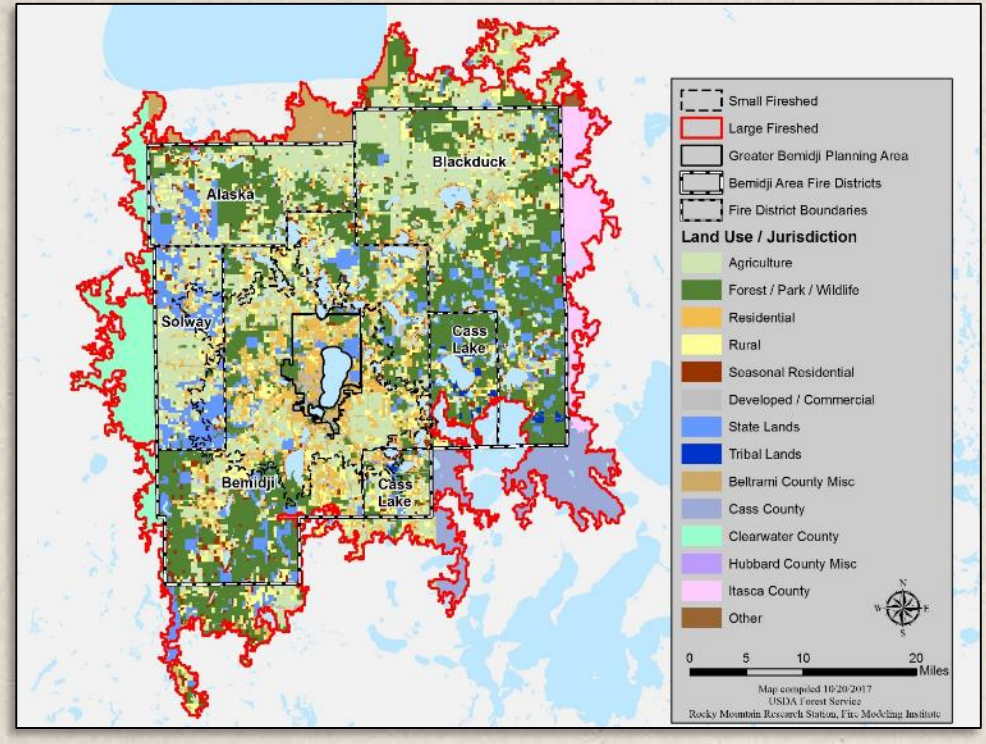
Wildfire Exposure and Transmission Analysis

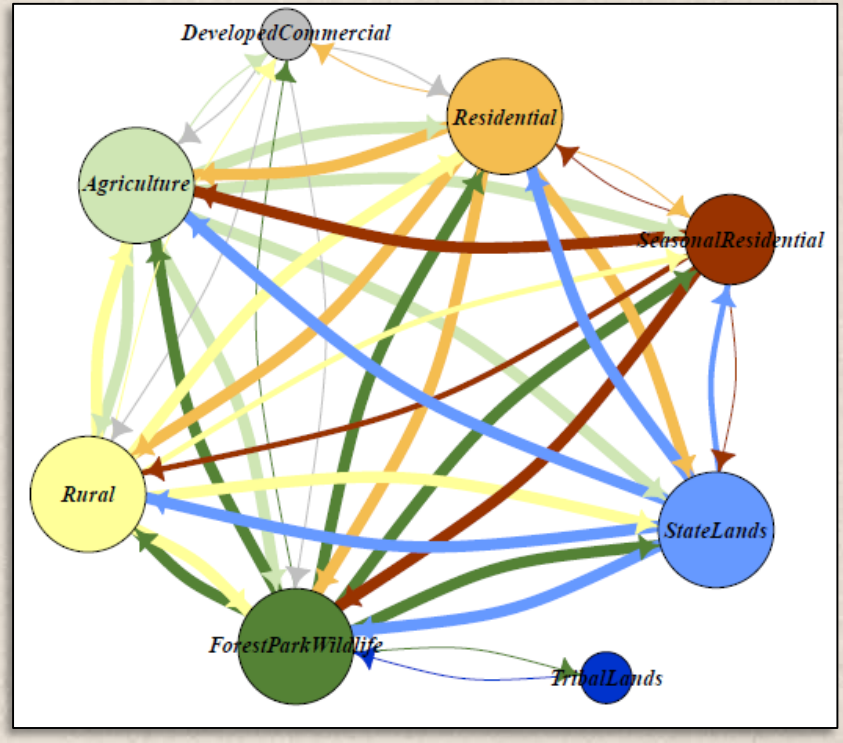




Other Related Products

Wildfire Network Analysis





Resources

- **Risk assessment information**
  - Scott and others. 2013. A wildfire risk assessment framework for land and resource management. RMRS-GTR-315. https://www.fs.usda.gov/treesearch/pubs/44723
  - Scott and Thompson. 2015. Emerging concepts in wildfire risk assessment and management. In RMRS-P-73. https://www.fs.usda.gov/treesearch/pubs/49444
- **National fire occurrence and FSim modeling data**
  - Short, Karen C. 2017. Spatial wildfire occurrence data for the United States, 1992-2015 [FPA_FOD_20170508]. 4th Edition. https://doi.org/10.2737/RDS-2013-0009.4
  - Short and others. 2016. Spatial dataset of probabilistic wildfire risk components for the conterminous United States. https://doi.org/10.2737/RDS-2016-0034
- **WUI mapping information and data**
  - https://www.nrs.fs.fed.us/data/WUI/
- **Community Planning Assistance for Wildfire (CPAW)**
  - https://planningforwildfire.org/

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Thank You!

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