



# Demystifying External Data

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# Making Accurate Actuarial Modeling Decisions

- Given the dynamic weather and market conditions within the US, it's critical for insurers to have robust and granular hazard risk models to help in their actuarial modeling and pricing decisions.
- Combining external data such as wildfire risk, earthquake risk, hurricane risk and other specific hazard perils with your company's loss data will result in better pricing and by-peril modeling.
- The two components critical to accurate risk understanding are:
  - High accuracy risk location assignment
  - Highly granular risk hazard geo-spatial models

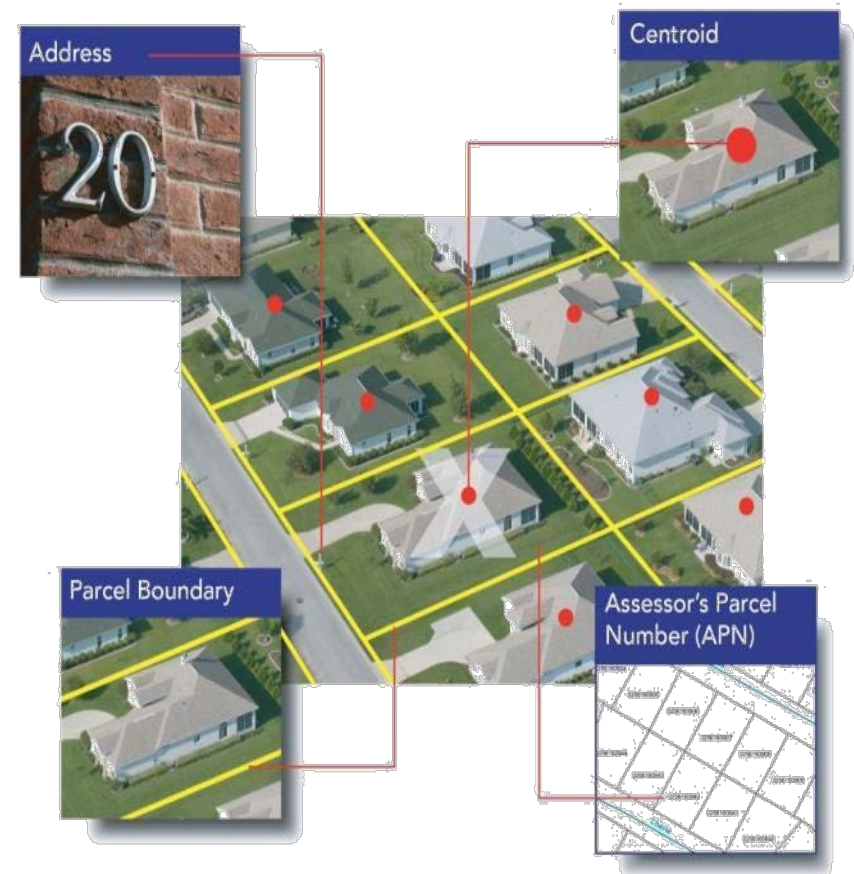
## Objectives for today's discussion:

- The need for parcel level risk assignment
- Overview of Major Loss Perils
- Hurricane Driven Storm Surge
- Flood Risk Outside FEMA Zones (Flood Risk Score/Flash Flooding Risk/Basement Flooding-Sewer Backup
- Wildfire Risk
- New Hazard Risks Solutions

# It Starts With Accuracy Locational Assignment

The most extensive and current parcel boundary map in the U.S.

- There are an estimated 144.3 million privately owned parcels in the U.S.
- CoreLogic has converted and normalized about 137.8 million parcels
- This is combined with an innovative and proprietary geo-coding engine
- Together, these tools go beyond county, zip or estimated accuracy to enable property level:
  - Geocoding accuracy
  - Risk assessment
  - Risk concentration
  - Granular and accurate results



CoreLogic®



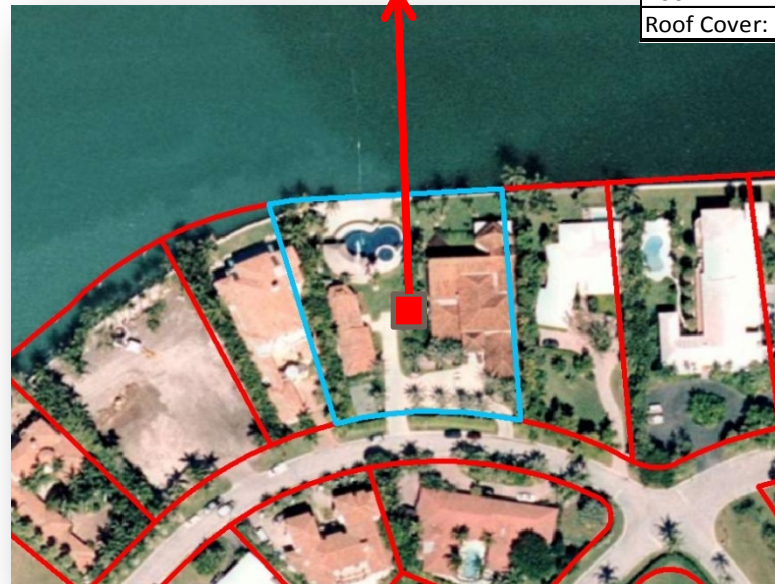
# Parcels as the Relational Link

<b>Geocode</b>	
Latitude	25.898951
Longitude	-80.126806
Address Line	276 BAL BAY DR
City/State Zip	MIAMI BEACH FL 33154
PxPoint Data Set	PARCEL
<b>Elevation, Slope, and Aspect</b>	
Elevation (Feet)	1.31
Slope (Degrees)	0
Aspect	Flat
<b>Mainland Determination &amp; Distance</b>	
Distance to Seaward Water Feature	101 feet
Seaward Water Feature Name	Biscayne Bay
Mainland: Yes or No	No
<b>Coastal Storm Surge</b>	
Risk Value	5
Risk Level	Extreme
<b>Hurricane Landfall Probability</b>	
% Tropical Storm Risk (Winds 39 - 73mph)	5.3
% Tropical Storm Risk (50-yr)	93.5
% Hurricane Risk (Cat 1-5 Storms)	1.6
% Hurricane Risk (50-yr)	56.3
% Intense Hurricane Risk (Cat 3-5 Storms)	0.4
% Intense Hurr. Risk (50-yr)	19.9
<b>Flood Risk</b>	
Flood Hazard Zone	AE
Undeveloped Coastal Barrier Area	COBRA_OUT
Special Flood Hazard Area (SFHA)	IN
<b>Damaging Winds</b>	
Straight Line Wind (SLW) Risk	Moderate
SLW Frequency	1 Event Every 4 - 6 Years
Hurricane Risk	Very High
Hurricane Frequency	1 Event Every 3 - 5 Years
Tornado Risk	Moderate
Tornado Frequency	1 Event every 5 - 8 Years
<b>Sinkhole</b>	
Risk	Low
Distance to Very High Sinkhole Risk	Greater than 10 miles
<b>Wildfire Risk</b>	
Brushfire Risk	Urban
Nearest high-risk value	Very High
Distance to High/Very High	> 1 mile

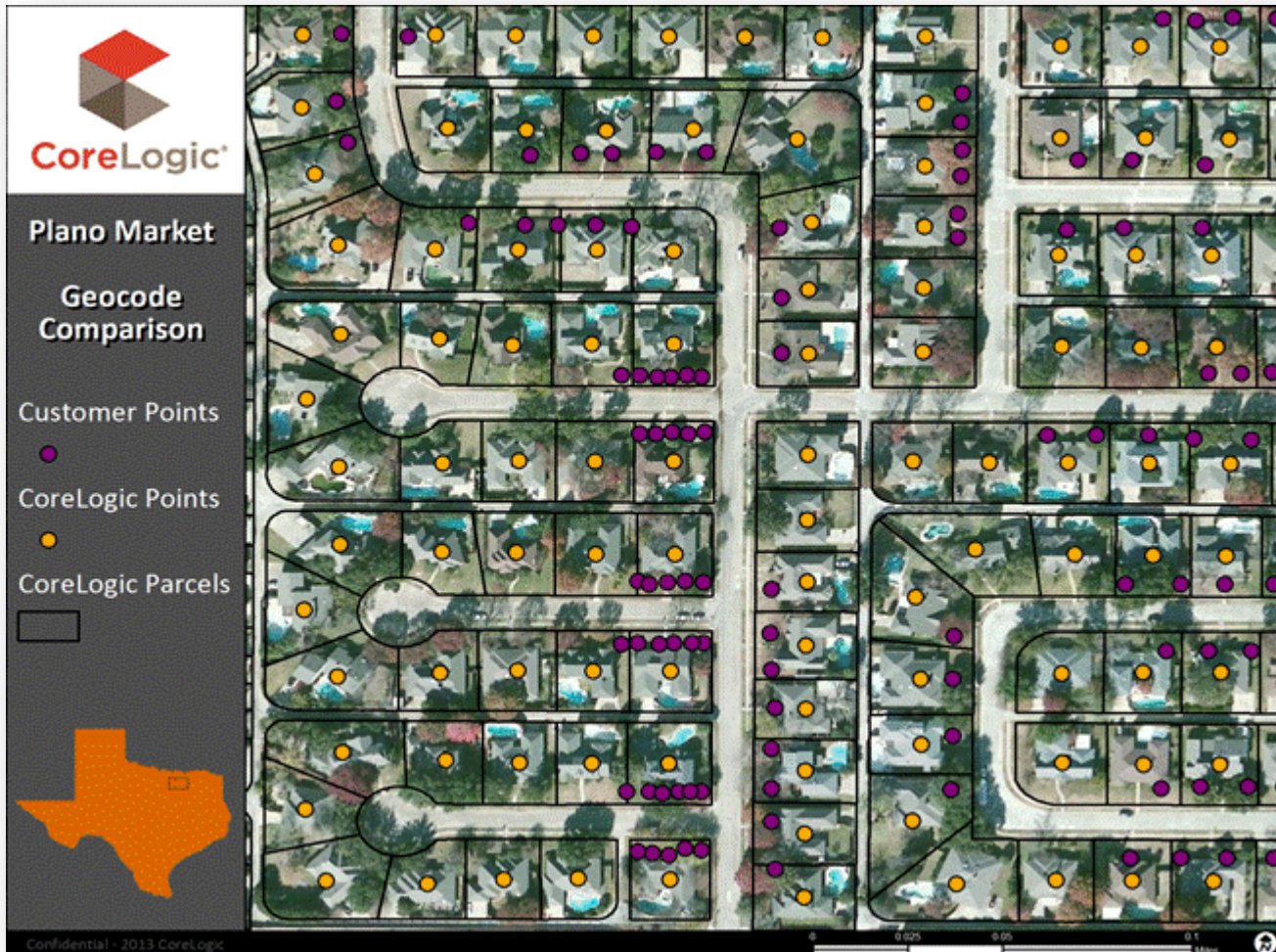
- The Parcel Identification Number (PIN) or Address links the physical parcel to real estate data; and
- Latitude/Longitude links the hazard risk and reg. compliance data to the parcel.

PIN:	1222260022310
Property Address:	276 BAL BAY DR
Owner:	BEV SIEVERT
Land Value:	\$9,892,934
Building Value:	\$2,349,327
Market Value:	\$12,242,261
Assessed Value:	\$9,375,066
Adj Sq Footage:	9,988
Year Built:	1977
Bedrooms:	9
Baths:	10
Stories:	2
Living Units: 2	2
Adj Sq Footage:	9,988
Lot Size (Sq Ft):	46,279
Year Built:	1977
Construction:	Composite
Pool:	In Ground
Roof Cover:	Tile

Parcel Information	
PIN:	1222260022310
Address Line:	276 BAL BAY DR
City/ State/ Zip:	BAL HARBOUR FL 33154
Latitude:	25.898951
Longitude:	-80.126806

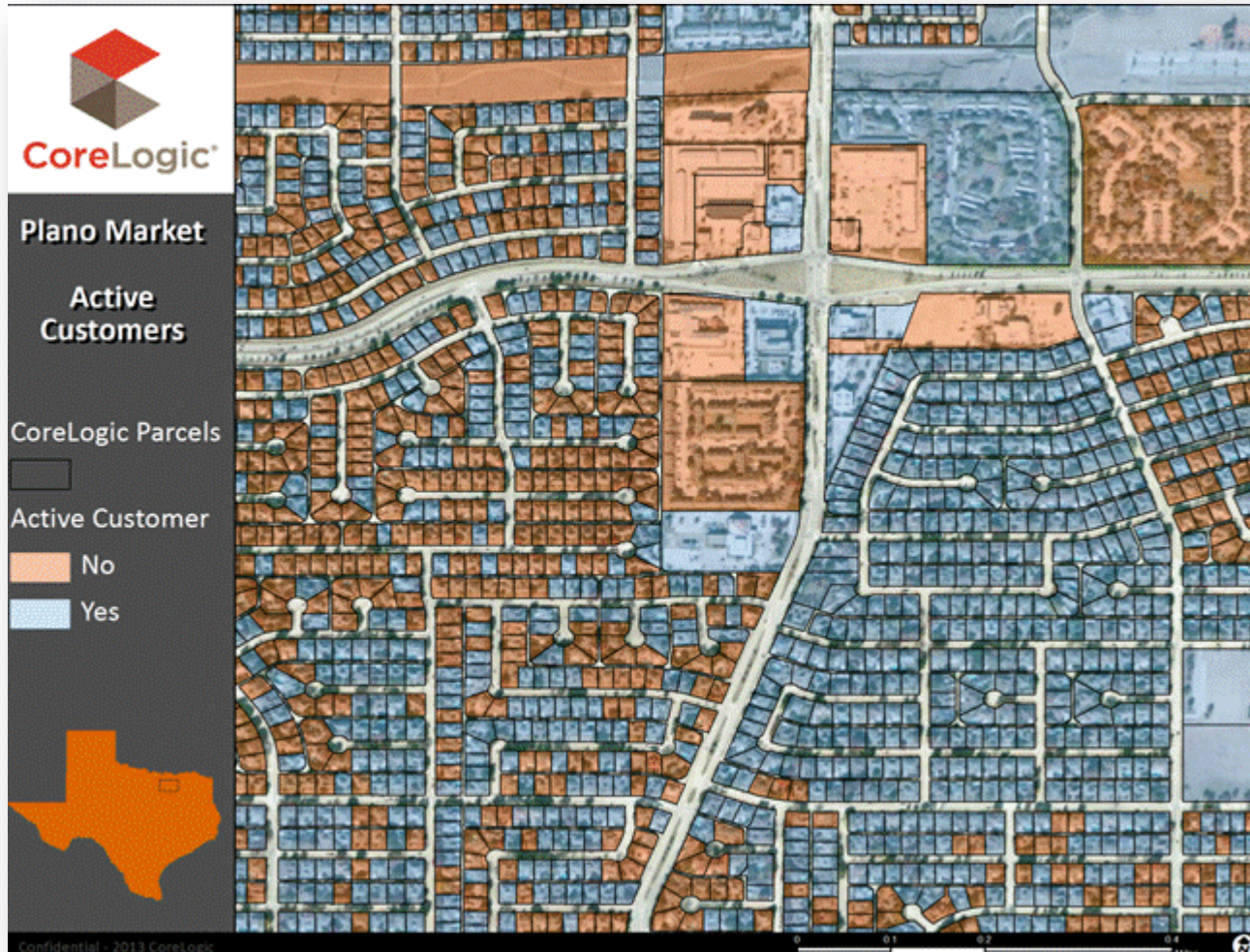


# Geocode Comparison





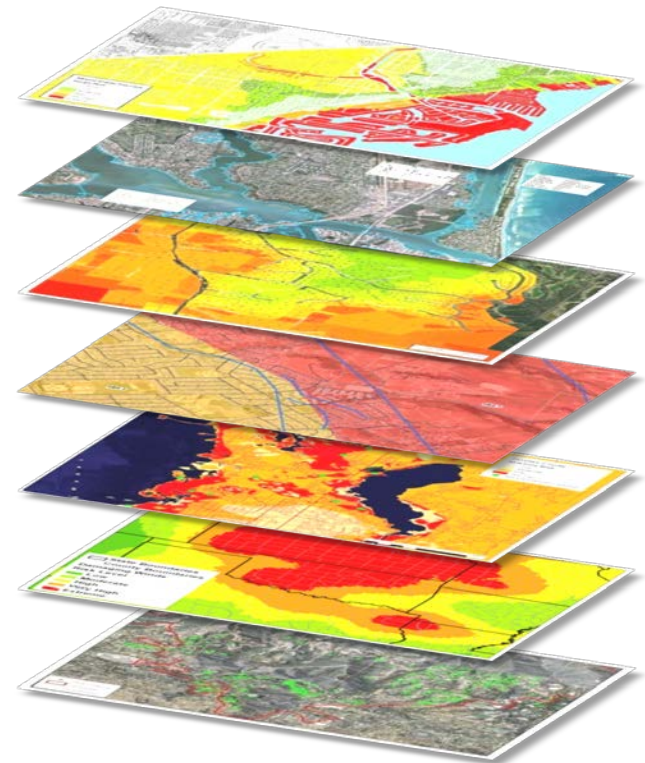
# Policy Households



# Accurate Location Enables Hazard Risk Analytics

## Scientifically Based Risk Models:

- Hurricane
  - Storm Surge (Salt Water Flooding)
  - Wind & Wind Debris
- Convective Storm
  - Flooding (Riverine, Flash Flood, Sewer backup)
  - Hail & Lightning
  - Tornado & Straight-line Winds
- Geological
  - Earthquake
  - Sinkhole
- Wildfire & Fire Protection
- Single Risk Score





# Understanding Hurricane Driven Storm Surge Risk & Inland Flooding Risk





# Storm Surge Model

Multiple simulations and variables for each category of storm to derive a range of storm surge heights including:

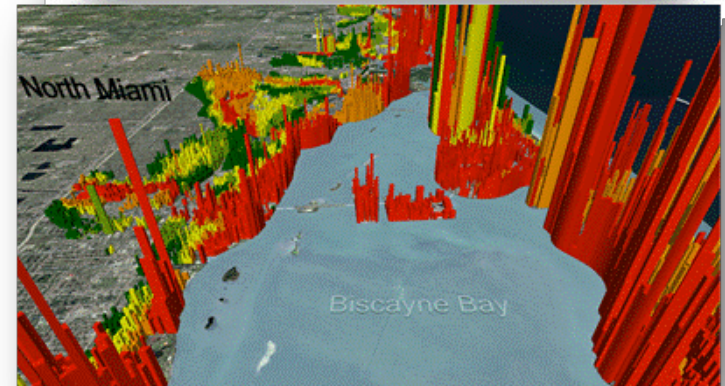
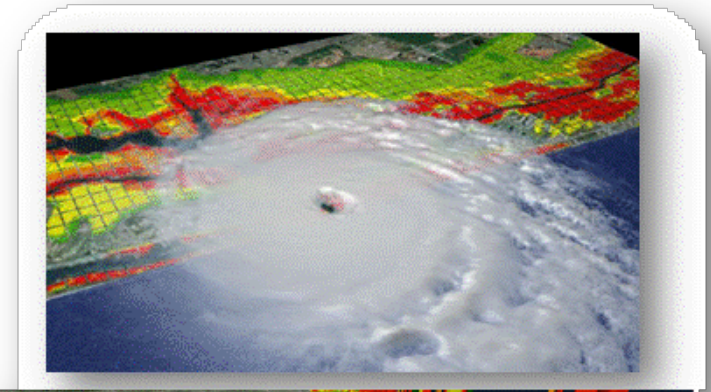
- Wind speed
- Hurricane speed
- Direction (track)
- Barometric pressure
- Tide
- Bathymetry (water depth)

## Results

- Surge height range aggregated for each category and then superimposed on elevation data.
- Barriers (impediment to flow) identified and used to truncate surge polygons.
- Final polygons attributed with risk values ranging from 1 (Low) to 5 (Extreme).

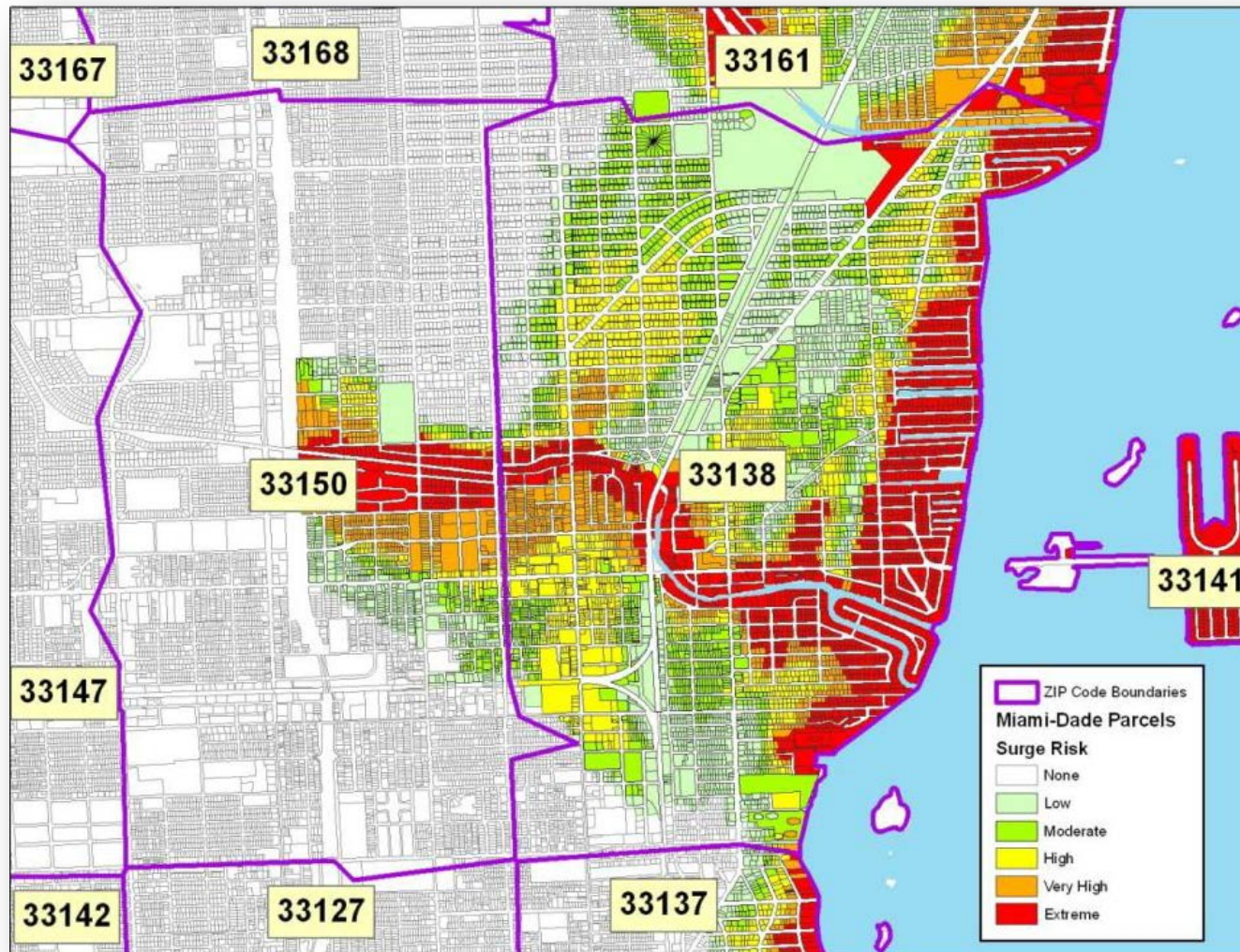
## Scoring

- Extreme Risk : category 1 to category 5 storm (highest overall risk – most frequently inundated)
- Very High Risk: cat 2 through cat 5
- High Risk: cat 3 through cat 5
- Moderate Risk: cat 4 through cat 5
- Low Risk: category 5 storm



Category	Properties Affected	Residential Structure Value
Extreme	52,047	\$42,535,623,065
Very High	26,961	\$11,082,548,764
High	77,916	\$20,909,148,284
Moderate	48,304	\$11,626,346,481
Low	239,910	\$13,978,466,882

# Storm Surge Risk at the Parcel Level

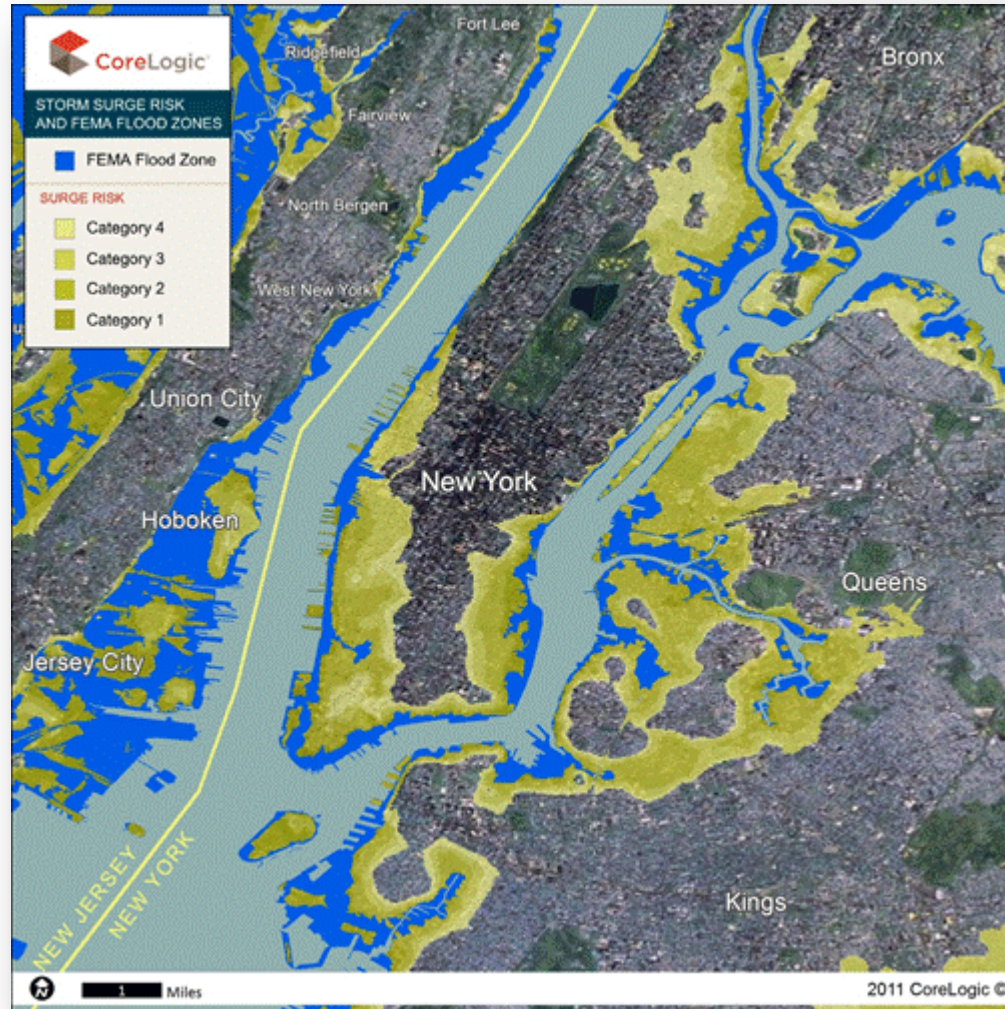


# 2013 Storm-Surge Inundation Versus Fresh-Water Flooding

Metro Areas	Total Properties Exposed to Flood or Surge Inundation	Total Properties in Both a SFHA and a Surge Zone	% of Properties in Both a SFHA and a Surge Zone	Total Properties Located Only in a FEMA SFHA	% of Properties Located Only in a FEMA SFHA	Total Properties Located Only in a Surge Zone	% of Properties Located Only in a Surge Zone
Miami, FL	615,756	120,524	19.6	375,846	61.0	119,386	19.4
New York, NY	475,195	136,924	28.8	27,767	5.8	310,504	65.3
Tampa, FL	328,270	109,100	33.2	27,225	8.3	191,945	58.5
Virginia Beach, VA	306,717	37,295	12.2	774	0.3	268,648	87.6
New Orleans, LA	240,384	136,214	56.7	1,465	0.6	102,705	42.7
Cape Coral, FL	199,426	75,802	38.0	1,406	0.7	122,218	61.3
Bradenton, FL	140,249	37,940	27.1	2,023	1.4	100,286	71.5
Wilmington, NC	116,968	24,453	20.9	2,273	1.9	90,242	77.2
Charleston, SC	85,730	42,905	50.0	4,246	5.0	38,579	45.0
Naples, FL	78,270	42,468	54.3	2,167	2.8	33,636	43.0



# FEMA Flood Zones vs. Storm Surge Inundation



# Elements of Flood Risk Score



River Flooding



Coastal Flooding

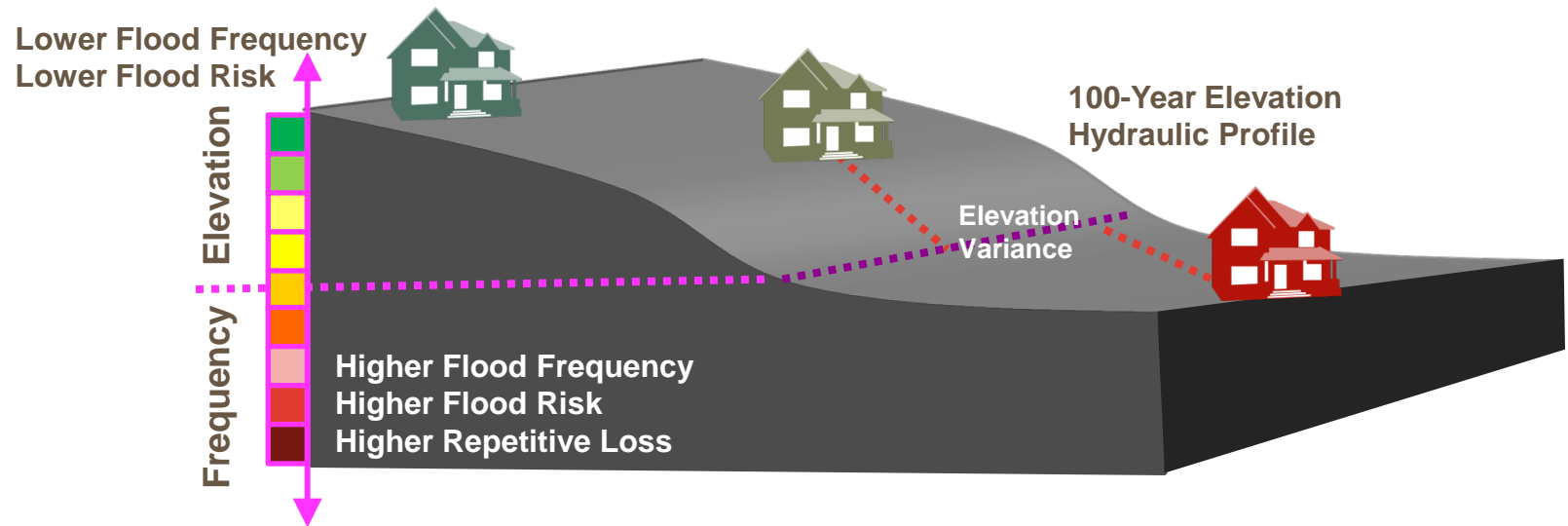


Pond and Lake Flooding

- Flood Elevation
- Flood Frequency
- Property Elevation
- Distance to Flood Source
- Flood Zone Geometry
- Watershed Hydrology
- Riverine and Coastal Hydraulics
- Coastal Impact
- Levee Impact
- Dam Impact
- Localized Flood Hazards



# Basic Concept of Flood Risk Scoring

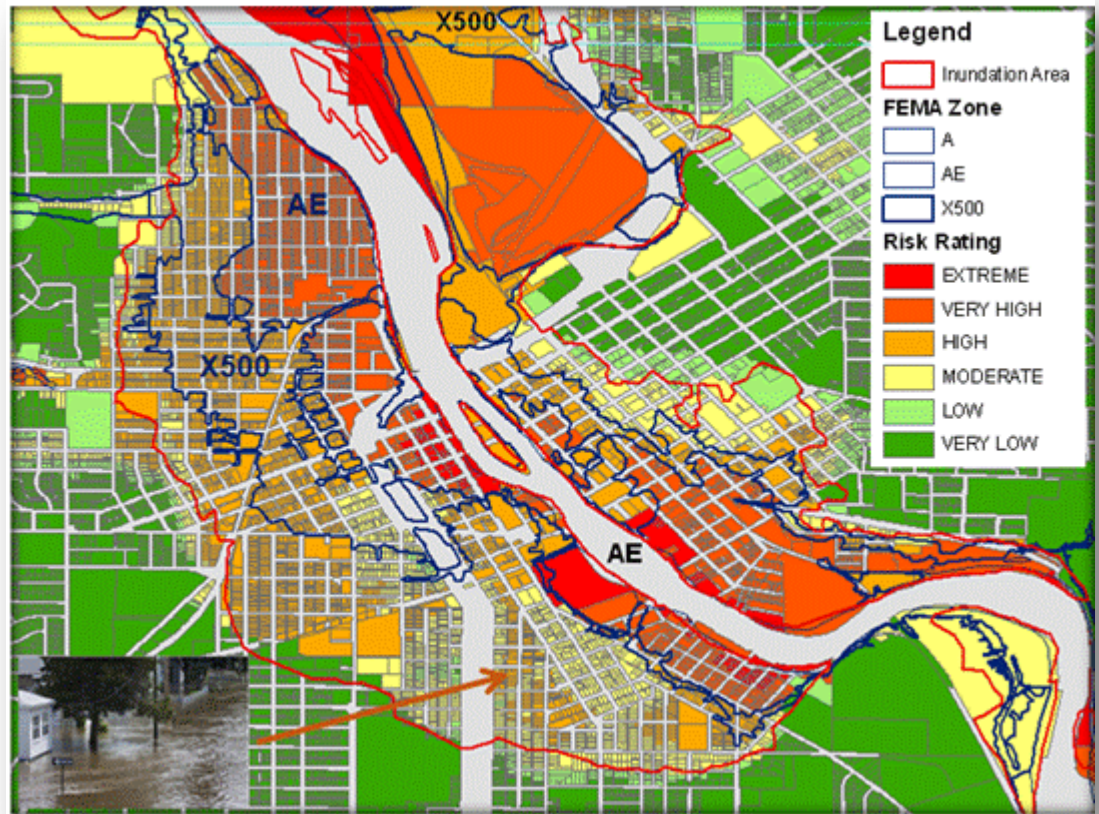


- Create comprehensive spectrum of flood risk classifications
  - ◆ Above & below 100 -year flood elevation, up to 5,000-year flood event
  - ◆ 10-100 score
- Compare unknown (targeted property elevation) to known risk point (100-year flood elevation)
  - ◆ Derive risk scores based on elevation variances (elevation difference between 100-year elevations and property elevations)
- The challenge: To build the 100-year flood surface/profile to cover national rivers, lakes, coastal zones, and other water bodies

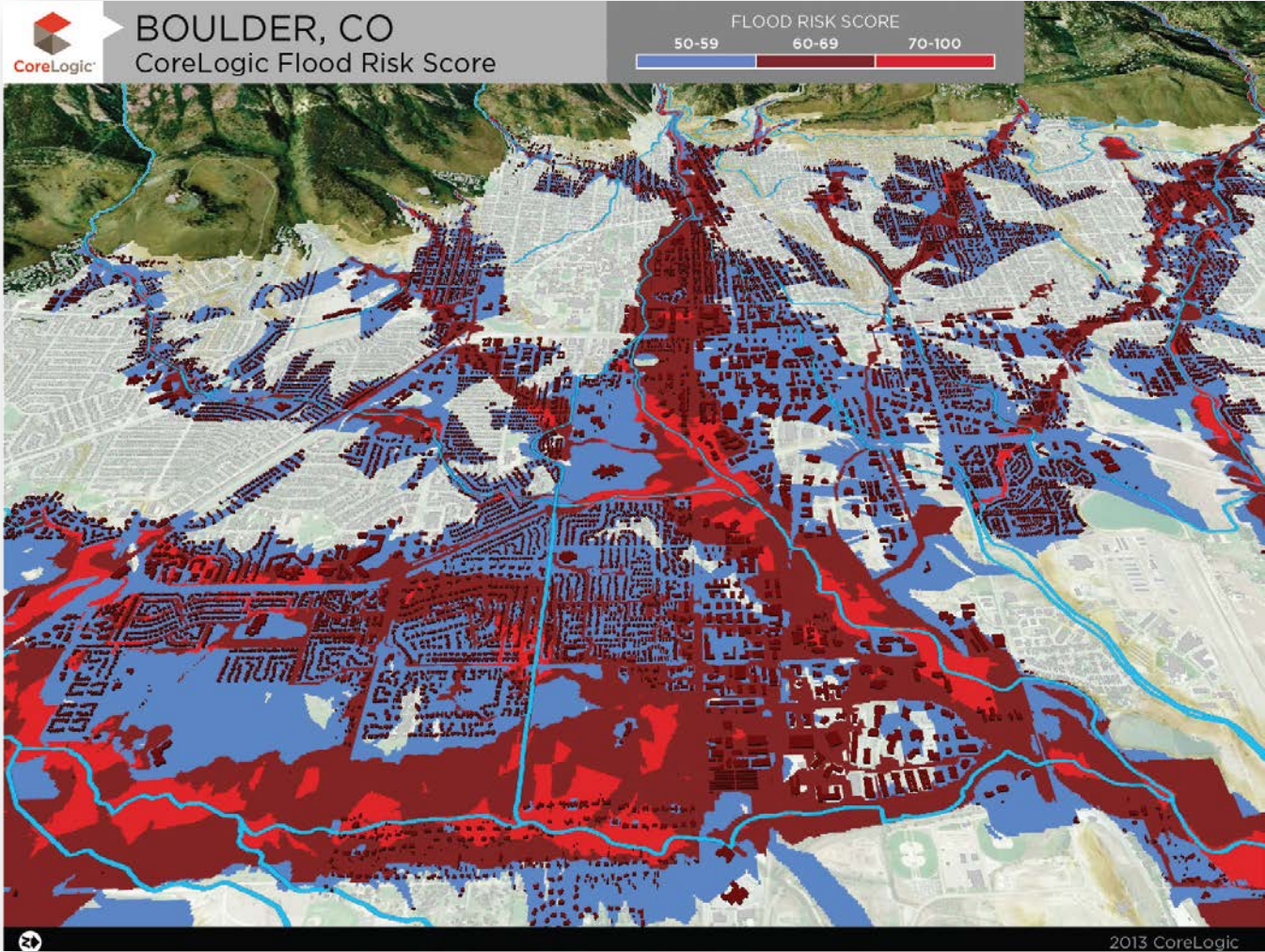


# Flood Risk Score Analysis: The 2008 Midwest Flood in Cedar Rapids

- This is an example FRS analysis
- The land parcels were colored by flood risk rating
- Property risk lined up with the inundation boundary from FEMA nicely
- A large number of properties beyond X500 were rated as “Moderate and Higher” risk



# Flood Risk Score Analysis: Boulder





# Flash Flooding Events



800 S Elmhurst Rd, Des Plaines, IL 60016, CITGO  
Gas Station: 42.036988, -87.941149, July 23, 2011



100 Lenker Rd, Harrisburg, Dauphin, Pennsylvania  
17111, 40.25985,-76.824266, Tropical Storm Lee, Sept



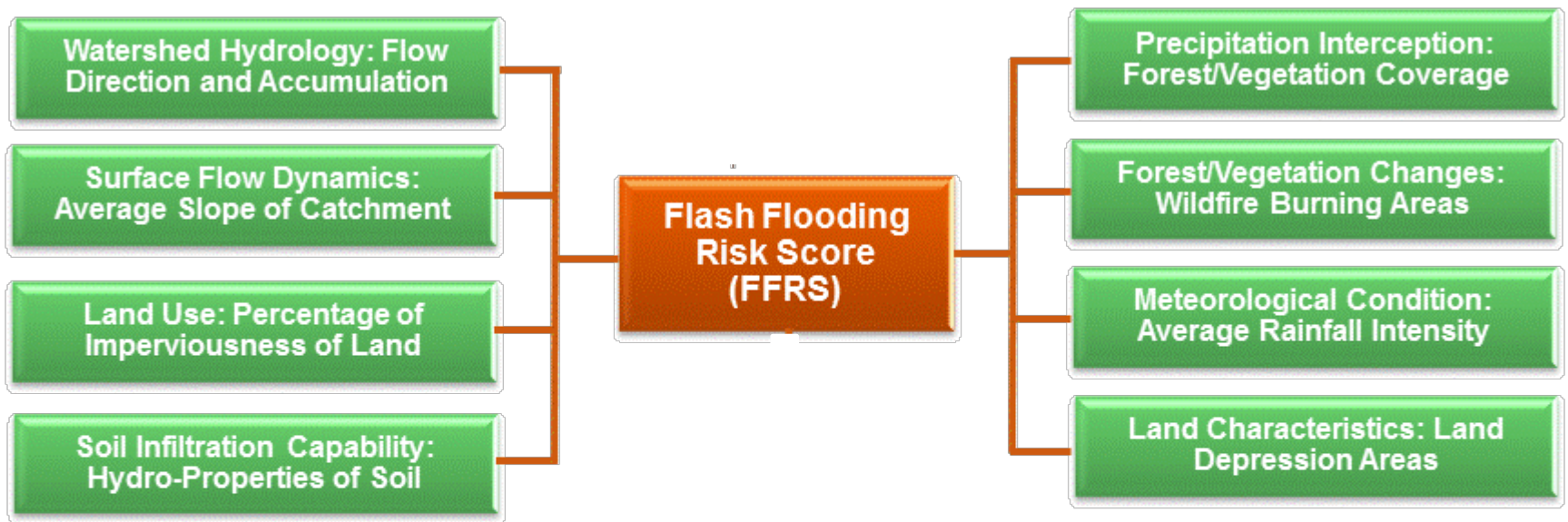
665 South 7th Street, Springfield, IL 62703,  
39.795332, -89.646762, May 26, 2010



315 N Cedar Bluff Rd, Knoxville, TN 37923,  
35.920337, -84.092169, Feb 26, 2011



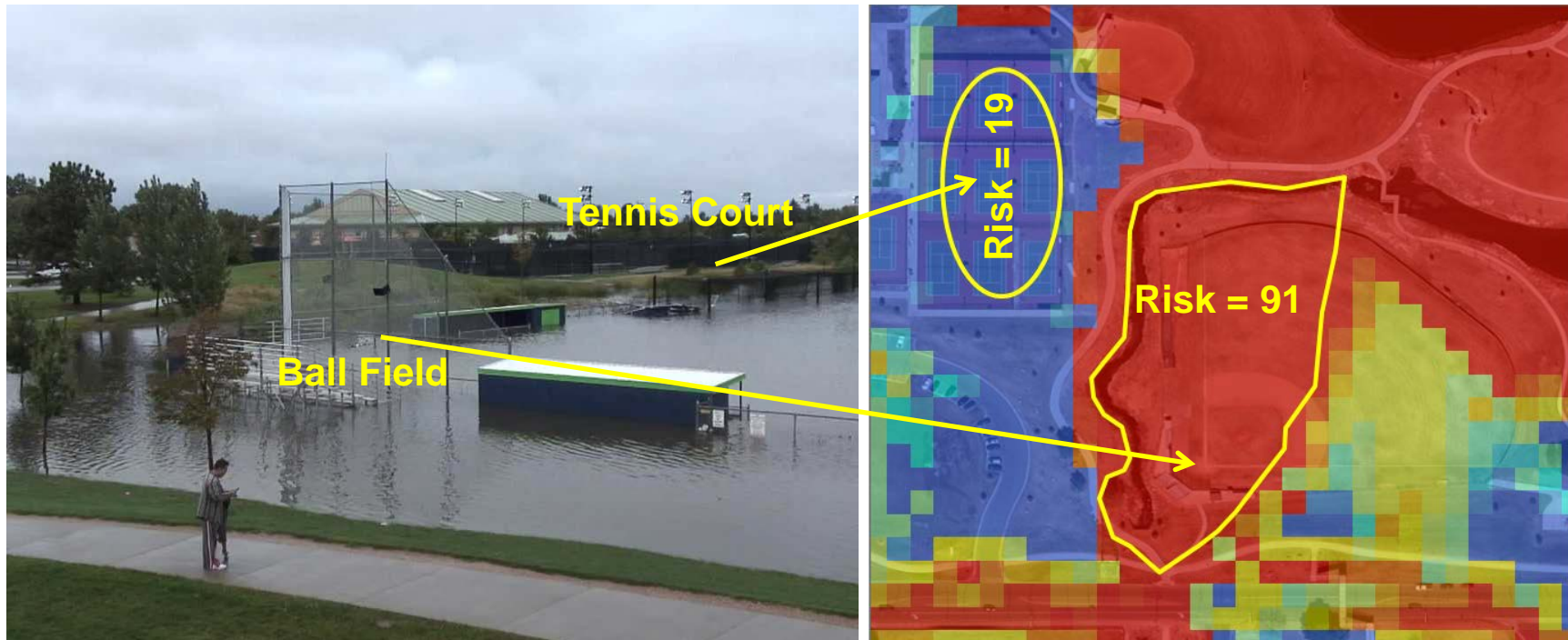
# Components of Flash Flooding Risk Model



# 2013 Boulder Flood Study:

## Flash Flooding at Utah Park in Aurora, Co

- The FEMA flood map was developed based on river miles but not “dry” land. FEMA puts the site in a X zone and FRS rated this site as “Low” inundation flood risk
- FFRS rated the Utah Ball Park as “Extreme” flash flooding risk site (FFRS = 91)
- FFRS is a comprehensive tool. A tennis court nearby wasn’t inundated. FFRS rated the site as Low (FFRS = 19). FFRS accurately captured the flood risk in the area





# Flash Flood

Risk Rating

- LOW
- HIGH
- EXTREME
- MODERATE
- VERY HIGH

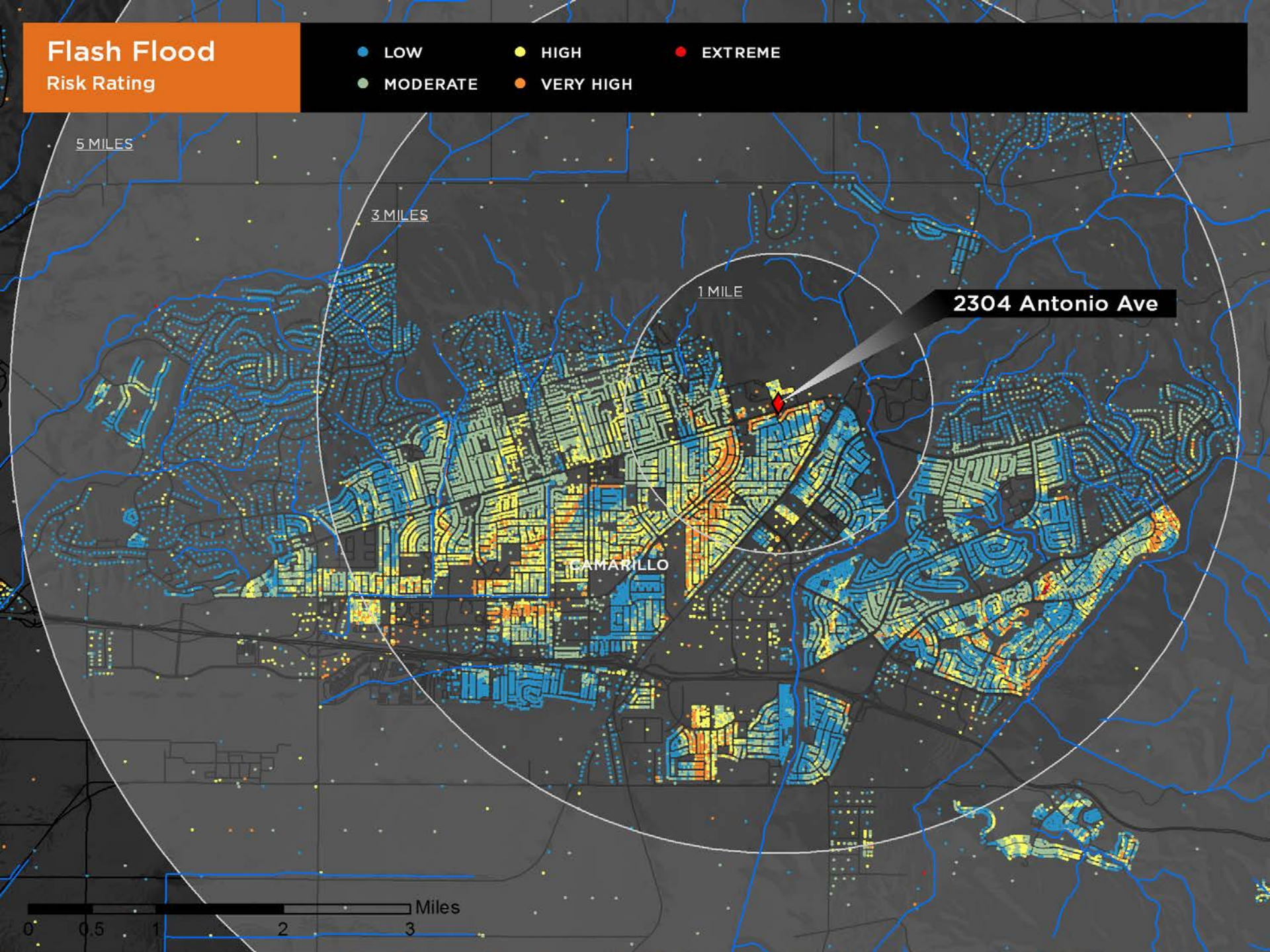
5 MILES

3 MILES

1 MILE

2304 Antonio Ave

CAMARILLO





# Wildfire Risk





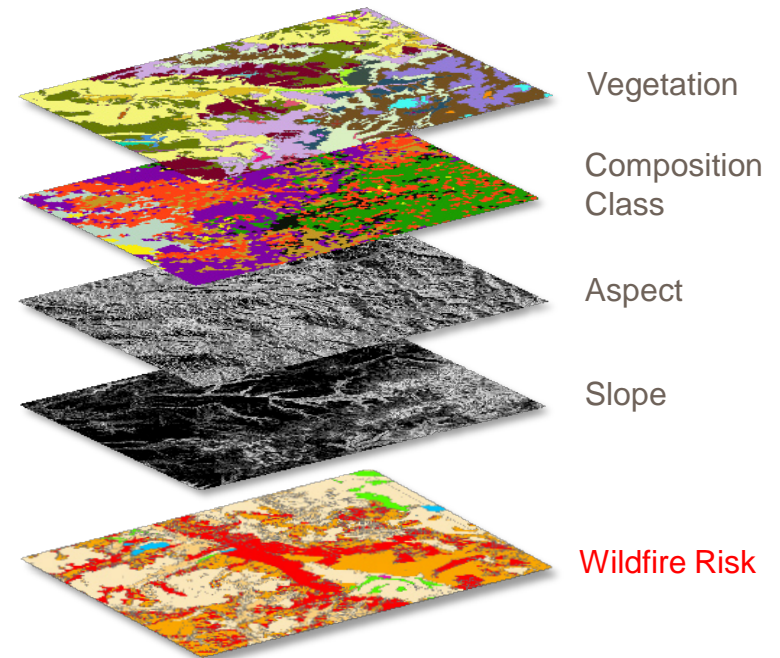
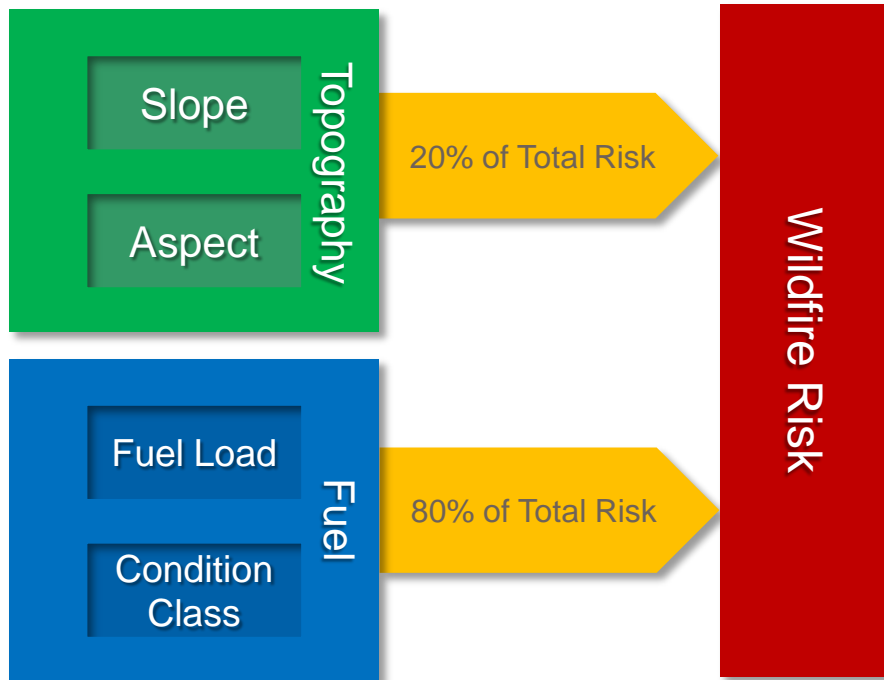
# Wildfire Risk Determination

## Data Elements

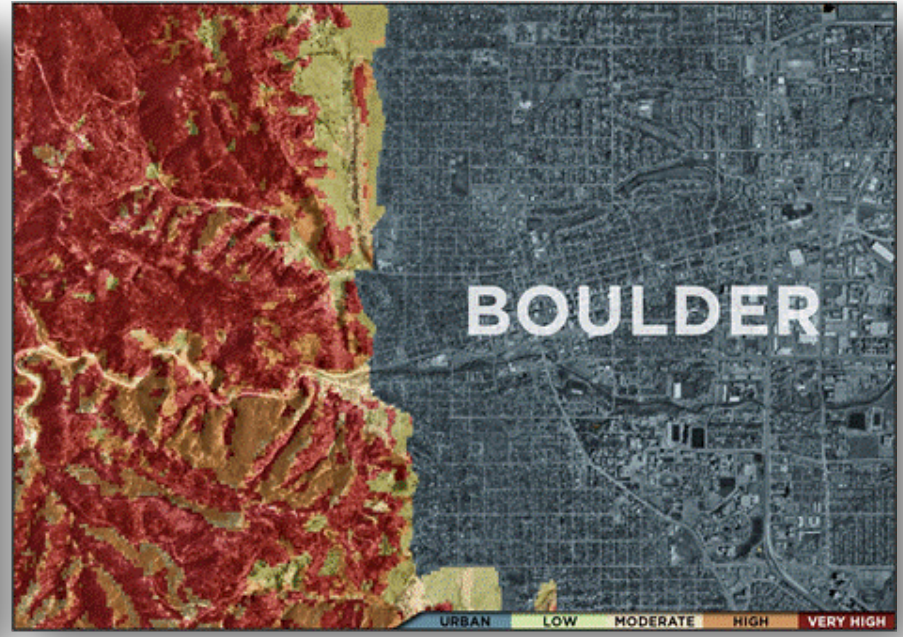
- Digital Elevation Model (DEM)
- Satellite Imagery
- Vegetation Condition Class data

## Data Granularity

- Input cell size based on 30m grid
- All layers sampled at 30m

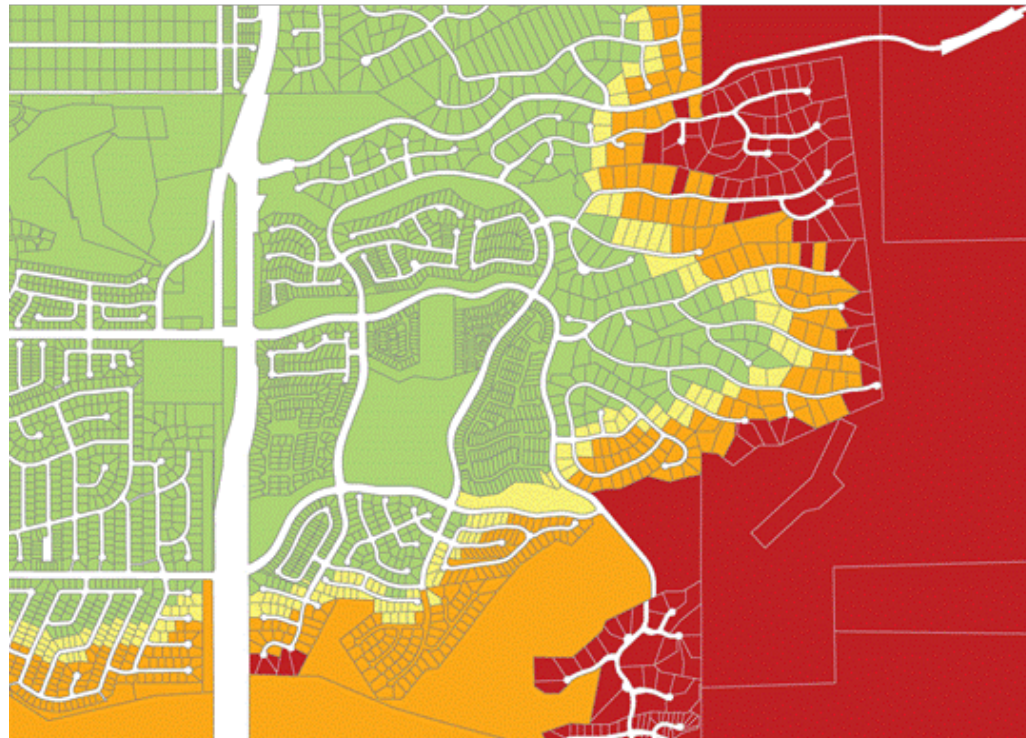


# Wildfire Risk: Los Angeles & Boulder



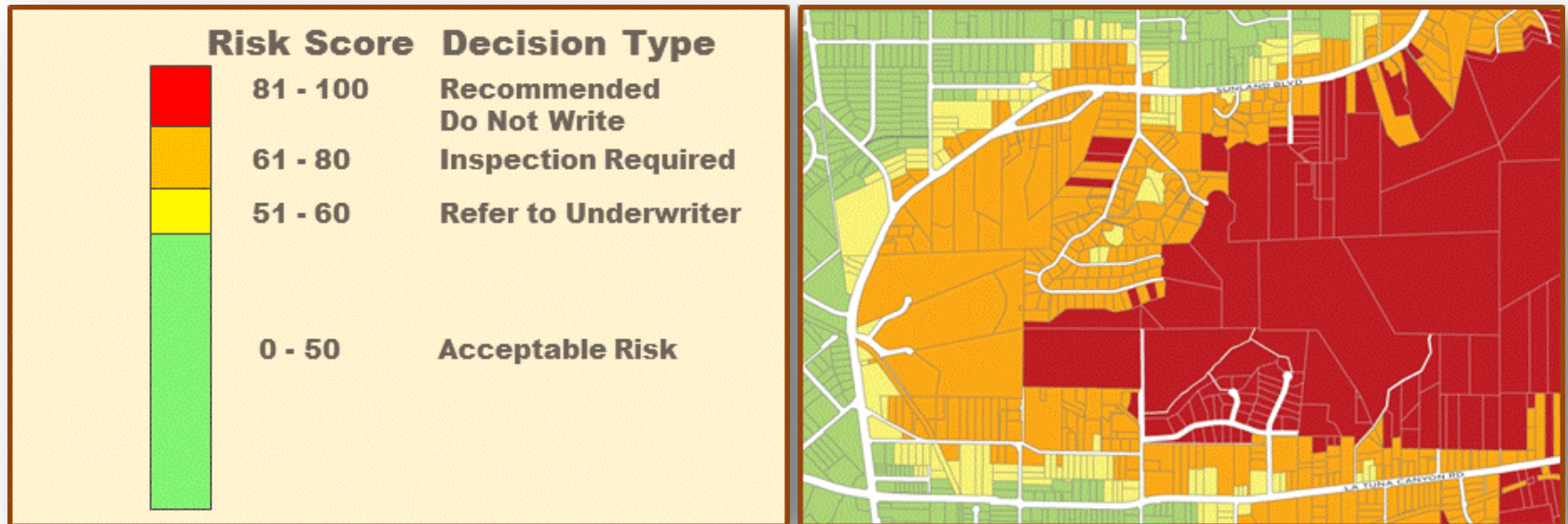


# Wildland/Urban Interface (WUI)



# Single Wildfire Score

- Wildfire risk on the property
- Distance to nearest High or Very High risk
- Distance to Wildland





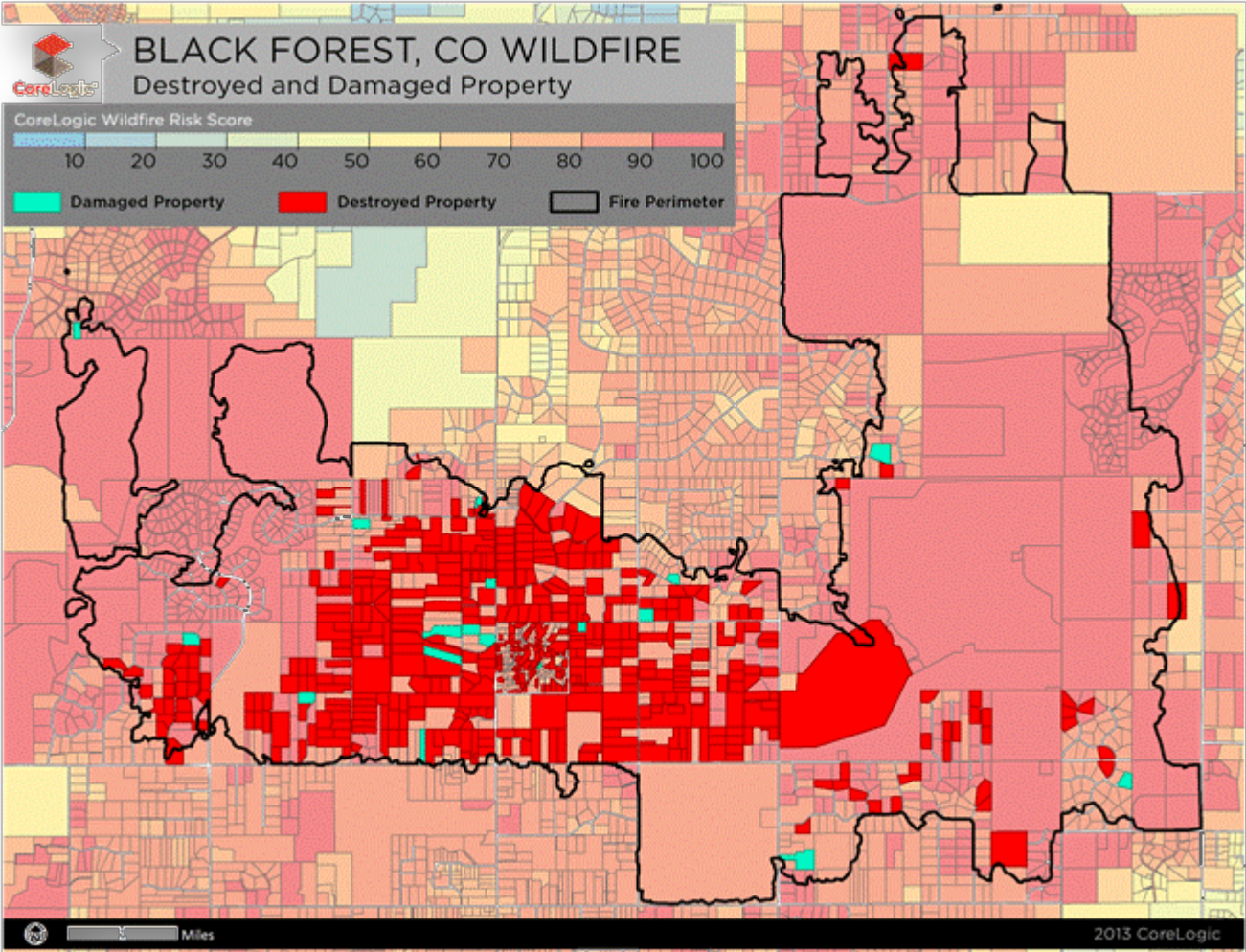
# Wildfire Risk: Western States

Residential properties potentially at risk of wildfire damage by risk score

Wildfire Risk Score (1-100)	Total Properties	Total Estimated Structure Value
81-100	905,397	\$161,371,288,370
61-80	1,083,968	\$216,027,903,174
51-60	466,590	\$87,029,431,767
1-50	25,431,565	\$3,606,671,218,032

State	1-50	51-60	61-80	81-100
AZ	2,075,488	19,154	38,552	48,823
CA	10,180,964	166,263	440,382	375,500
CO	1,516,315	58,440	141,602	200,443
ID	326,237	3,913	14,215	22,503
MT	229,891	11,286	23,387	26,468
NV	858,840	4,452	14,076	11,698
NM	423,945	10,302	23,224	35,024
OK	1,256,568	2,597	3,596	1,363
OR	1,155,722	27,087	56,957	107,388
TX	8,396,048	254,866	638,405	678,544
UT	696,981	17,397	33,144	22,859
WA	2,267,177	9,960	20,090	26,936
WY	117,596	1,023	1,443	3,323

# Black Forest Fire: Colorado





# Black Forest Fire: Colorado

Brushfire Risk	# Homes	Percent Properties By Risk Category	Home Value Total by Risk
Agriculture (Low)	1	0.19%	\$734,500
Urban (Low)	0	0.00%	\$0
Low	19	3.67%	\$4,849,100
Moderate	0	0.00%	\$0
High	51	9.85%	\$11,692,333
Very High	445	86.30%	\$115,476,700

Wildfire Single Score	# Homes	Percent Properties By Single Score	Average Distance to WUI	Home Values By 0-100 Category
0 to 50	0	0.00%	N/A	N/A
51 to 60	0	0.00%	N/A	N/A
61 to 80	15	2.90%	6,311.33	\$3,092,700.00
81 to 100	501	97.10%	4,070.78	\$129,659,933.00
Total Properties	516	100.00%		\$132,752,633.00

# Q&A Session & Thank You

