Hazard Risk Scores: From Underwriting to Pricing

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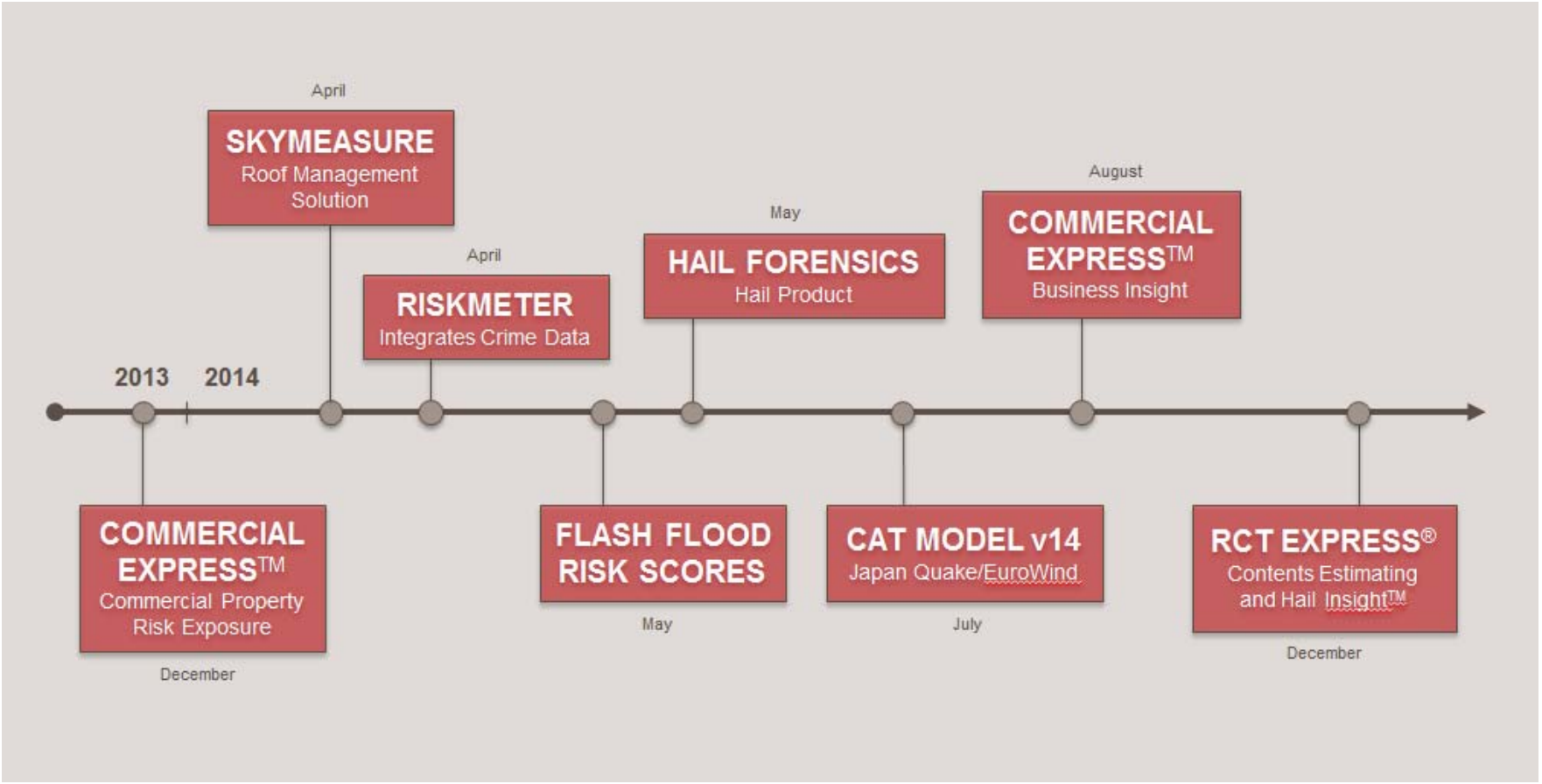
Agenda

- CoreLogic Introduction
- Importance of Location Accuracy
- Natural Peril Hazards: Science -> Insurance application
  - Severe Convective Storms (Hail/Tornado)
    - Weather Forensics: Claims uses
  - Flood
  - Wildfire
  - Others
- Questions?

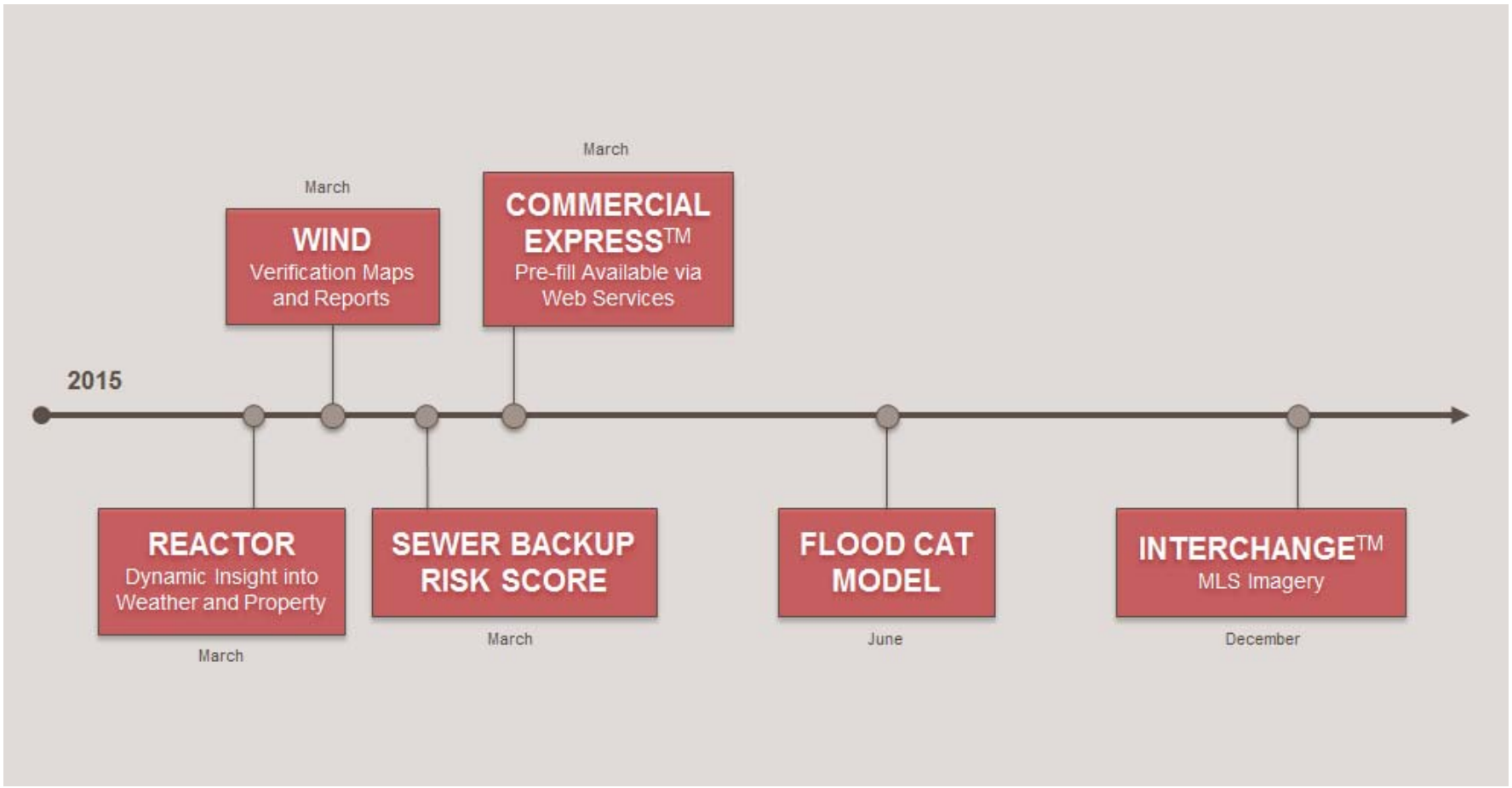
CoreLogic – Who are we?

- Flood unit serves 16 of the 20 top firms in the U.S.
- Integrated provider of credit reports to over 50 auto dealership systems
- Integrated to most mortgage loan origination systems
- Tax Services partners with 17 of 20 largest mortgage servicers
- Approximately 70% of U.S. real estate agents access CoreLogic data
- Government Sponsored Enterprises and Federal Financial Regulators
- 80 years of ITV data

INVESTING IN OUR CONTENT



BUILDING CONNECTEDNESS



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Complete View of Property Risk

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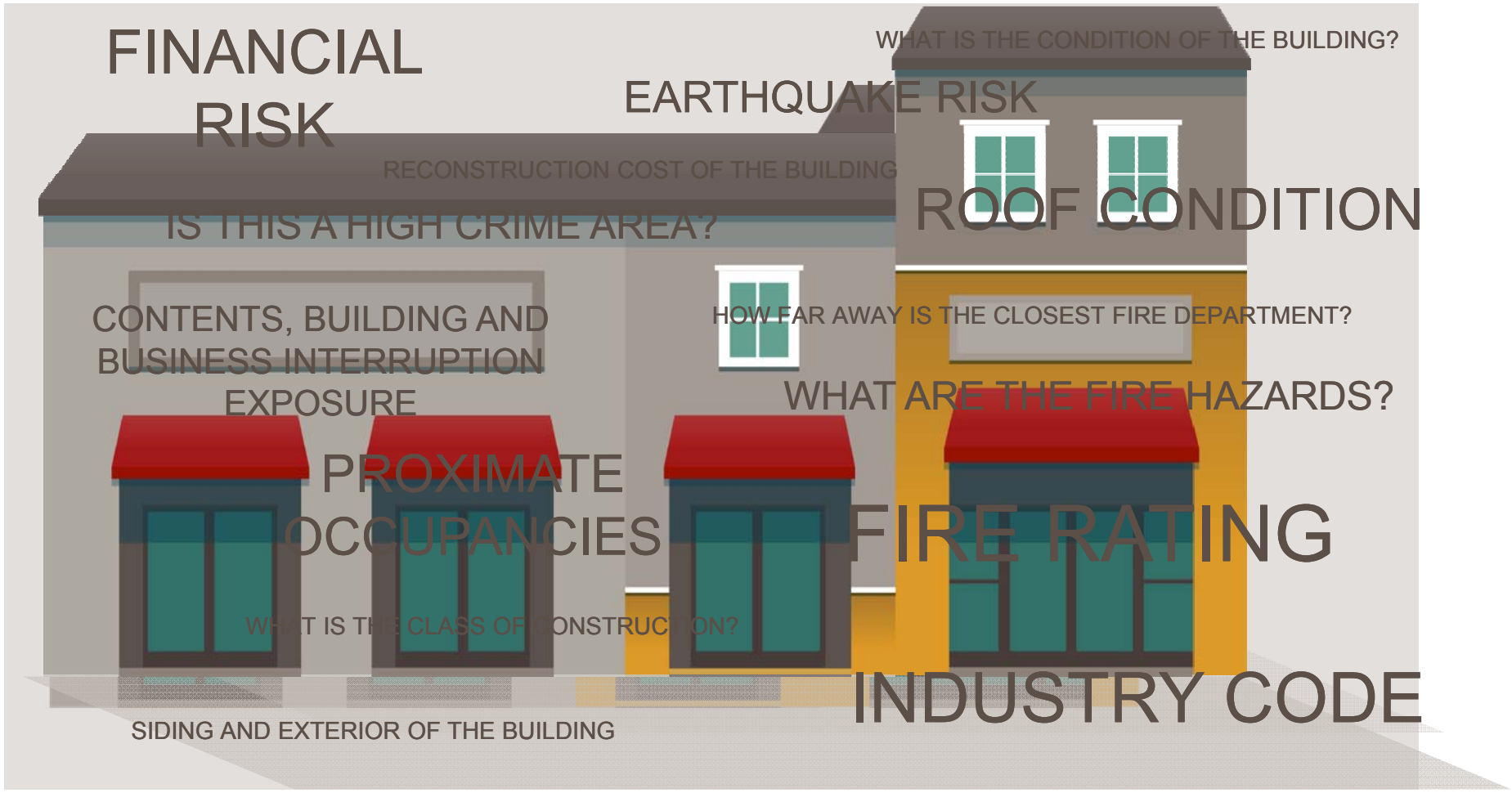
COMPLETE VIEW OF PROPERTY



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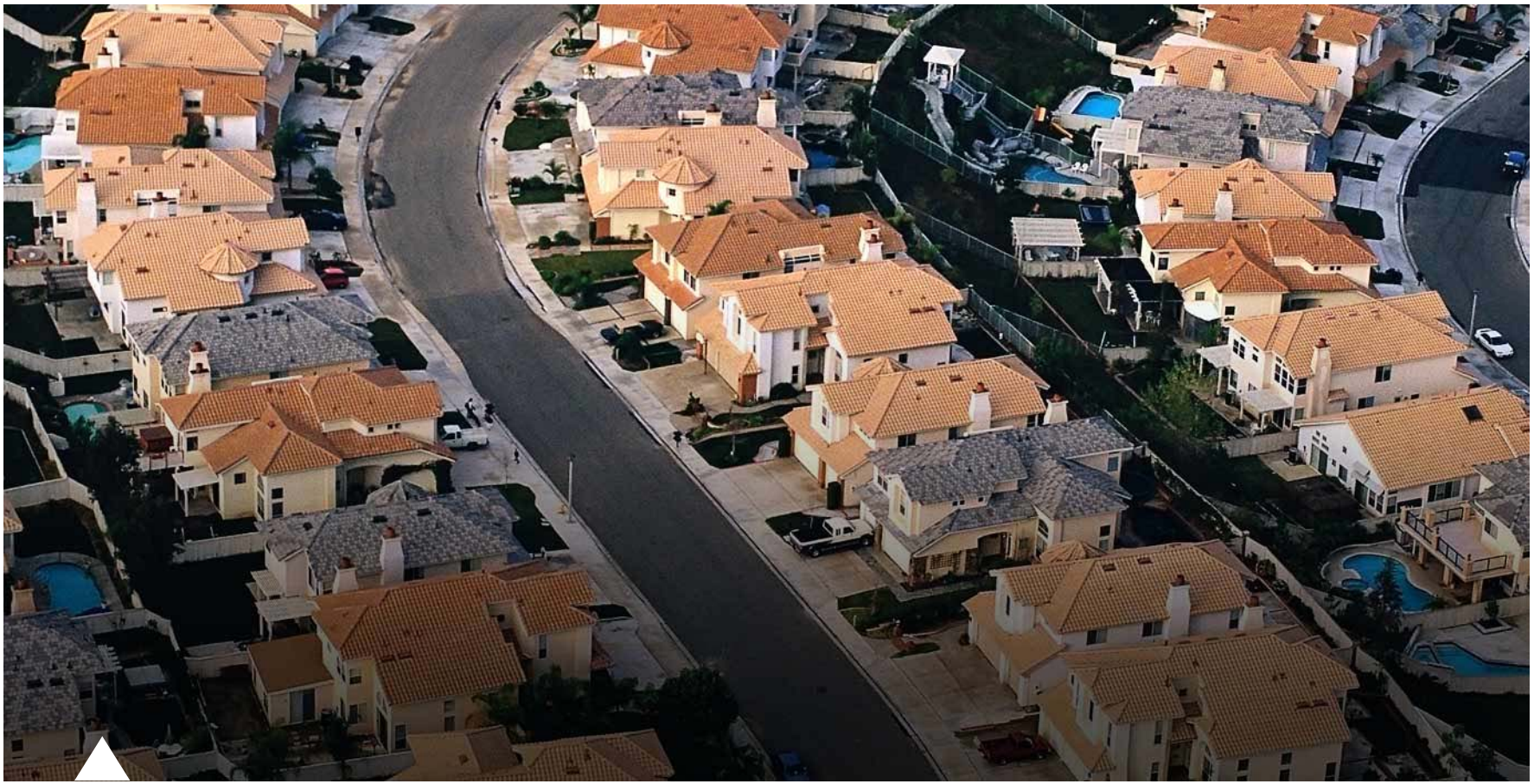
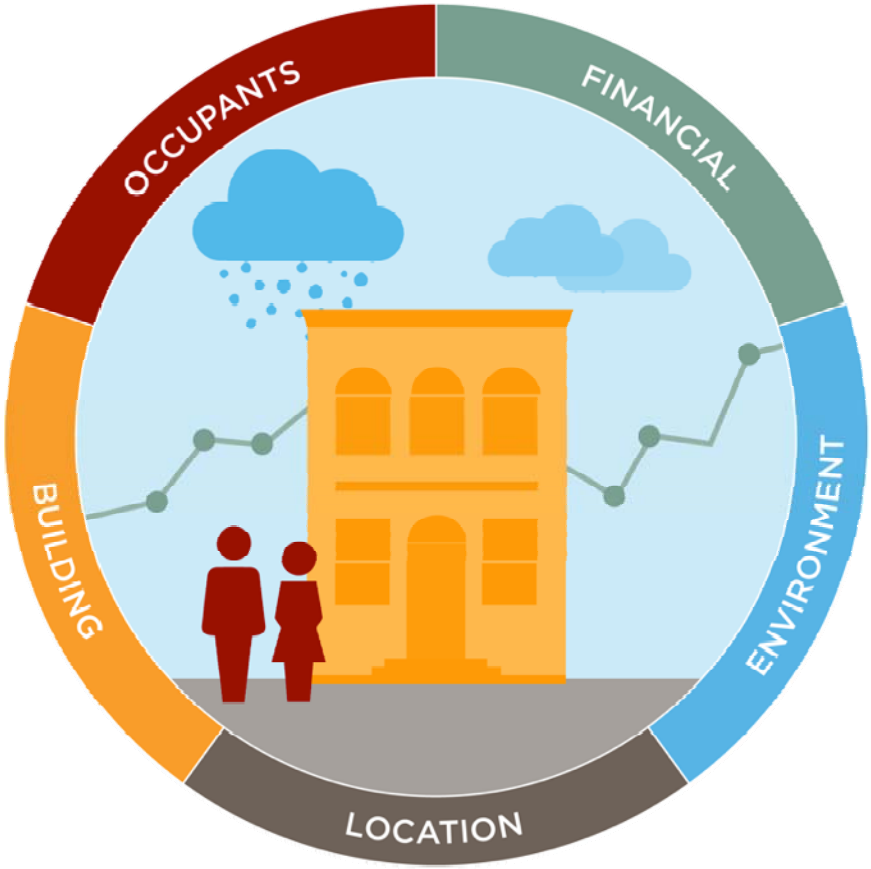


Importance of Location Level Data

Complete. Current. Connected.™



- ***Catastrophe Models***
- ***Weather Forensics***
- Construction Cost Trends
- Environmental Hazard Data

- Economic Housing Market Data
- Mortgage Financing and HELOCs
- Liens and Encumbrances
- Auto Loans
- Valuation and Due Diligence

- Occupant and Contents Risks
- Property Maintenance
- Home Business Activities

- Building Characteristics
- Reconstruction Costs
- Imagery and 3-D Wireframe
- Structural Risks
- Condition Information

- Structure & Parcel Geometry
- ***Locational Accuracy***
- Location Intelligence
- Fire Protection

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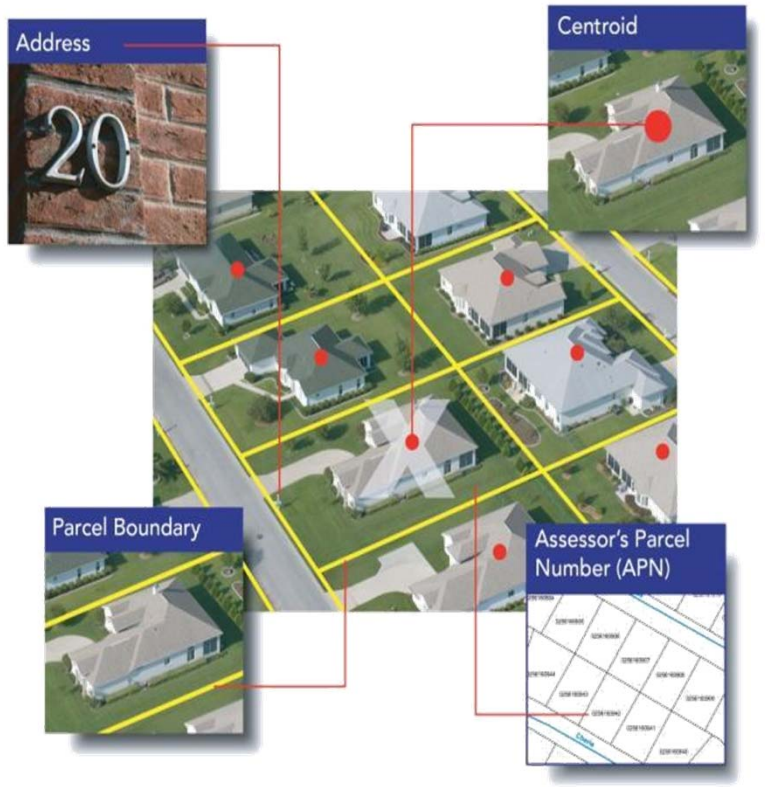
It Starts with Accuracy Locational Assignment

The most extensive and current parcel boundary map in the US

- An estimated 145M privately owned parcels in the U.S.
- CoreLogic has converted and normalized approx. 140M parcels
- Combined with innovative and proprietary geo-coding engine
- These tools go beyond county, zip or estimated accuracy to enable property level:
  - Geocoding accuracy
  - Risk assessment
  - Risk concentration
  - Granular and accurate results



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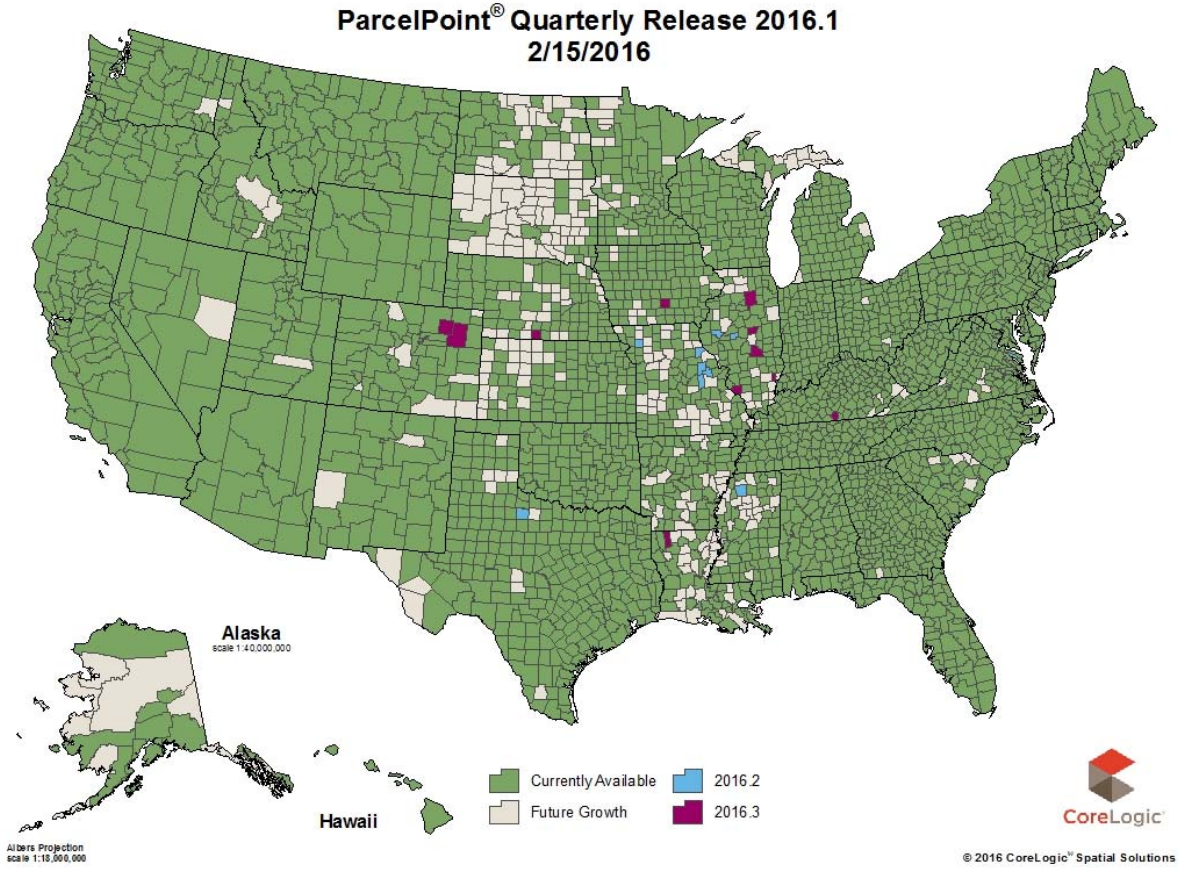
It Starts with Accuracy Locational Assignment



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Geocode Comparison

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Parcels as the Relational Link

Geocode	
Latitude	25.898951
Longitude	-80.126806
Address Line	276 BAL BAY DR
City/State Zip	MIAMI BEACH FL 33154
PxPoint Data Set	PARCEL
Elevation, Slope, and Aspect	
Elevation (Feet)	1.31
Slope (Degrees)	0
Aspect	Flat
Mainland Determination & Distance	
Distance to Seaward Water Feature	101 feet
Seaward Water Feature Name	Biscayne Bay
Mainland: Yes or No	No
Coastal Storm Surge	
Risk Value	5
Risk Level	Extreme
Hurricane Landfall Probability	
% 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
Flood Risk	
Flood Hazard Zone	AE
Undeveloped Coastal Barrier Area	COBRA_OUT
Special Flood Hazard Area (SFHA)	IN
Damaging Winds	
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
Sinkhole	
Risk	Low
Distance to Very High Sinkhole Risk	Greater than 10 miles
Wildfire Risk	
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.

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

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

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Hazard Risk Data Solutions

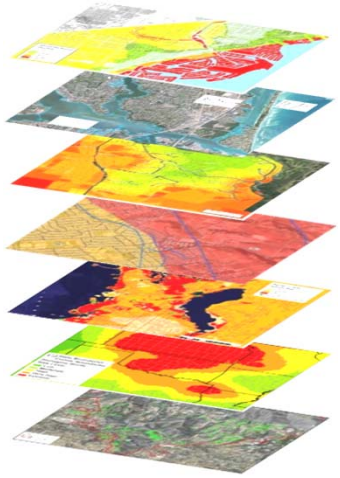
Coastal Risk
- Storm Surge
- Hurricane CAT Model (AAL/PML)
- Distance to Coastal Water Features
- Mainland Determination Files
- Elevation
- Tsunami Risk

Wildfire Hazard Risk

Earthquake Risk
- Earthquake CAT Model (AAL/PML
- MMI
- Liquefaction

Flood Data
- FEMA Flood Zones
- Flood Risk Score
- Flash Flood Risk
- Basement Flooding/Sewer Backup
- Flood CAT Model (AAL/PML)

Severe Convective Storm Risk
- Damaging Winds
- Hail
- Lightning



Weather Forensic Data
- Hail Event Footprints
- Wind Event Footprints
- Lightning Strikes

Florida Sinkhole Risk
- Sinkhole Risk Score
- Distance to Sinkhole

Fire Protection Classification
- Fire Station Locations
- Fire Districts
- Fire Protection Score (FPC)

Regulatory Databases
- Premium Tax
- Windpool
- Special Tax Districts
- Sales and Use Tax

Geospatial Databases
- ***Property Structure footprint***
- Property Parcels
- Municipal Boundaries
- School Districts
- Elevation/Slope/Aspect

Risk scores and supporting data variables, and/or Probabilistic models on all major Hazard Risks

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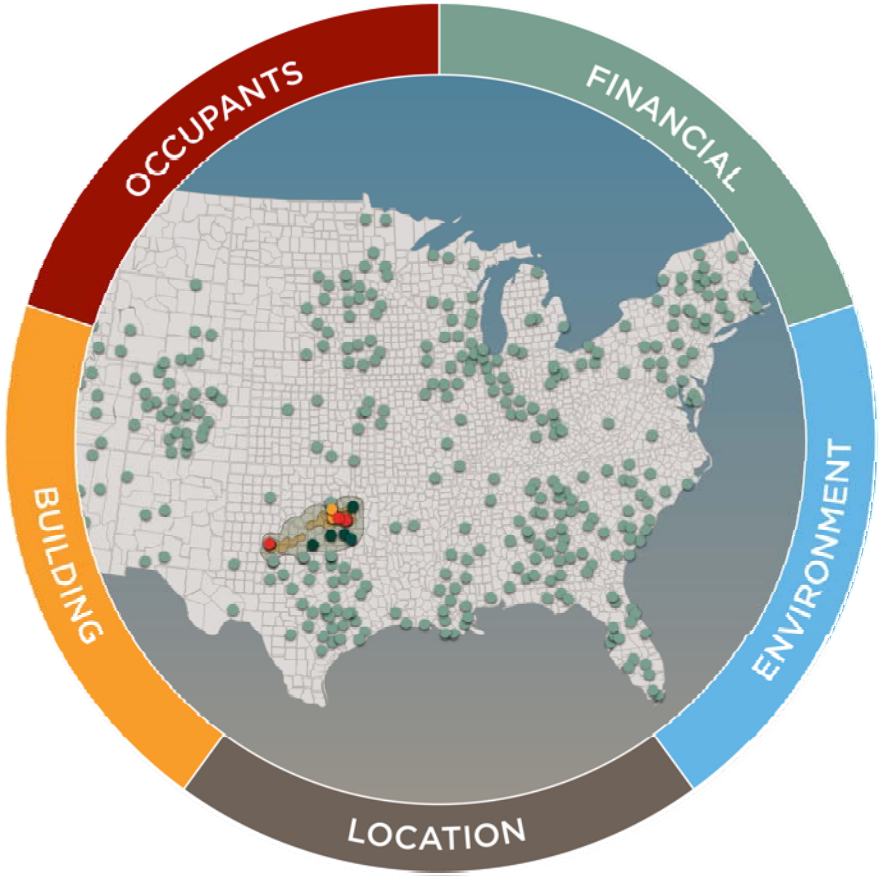
Point to Portfolio



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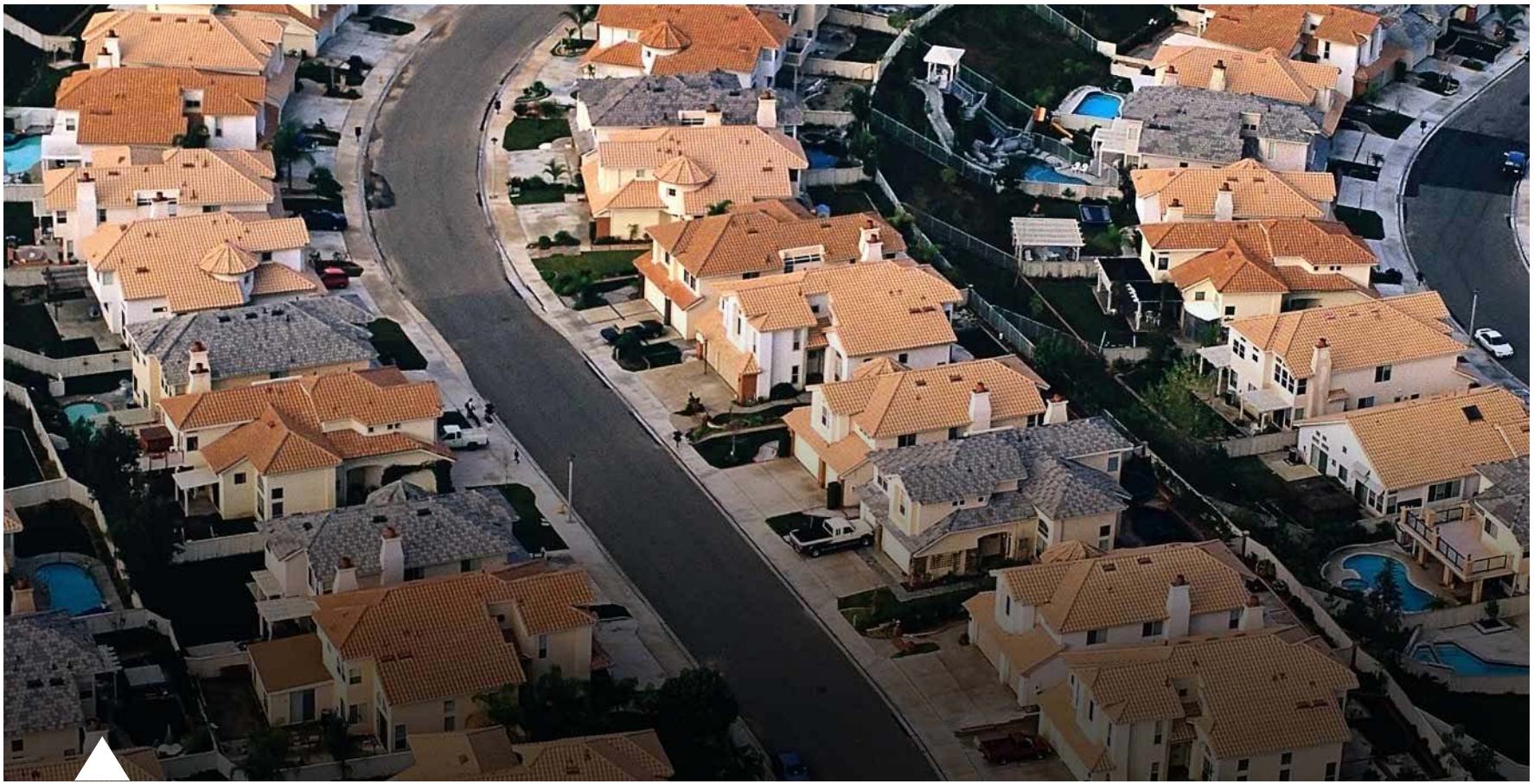

Natural Hazard Perils

Severe Convective Storms

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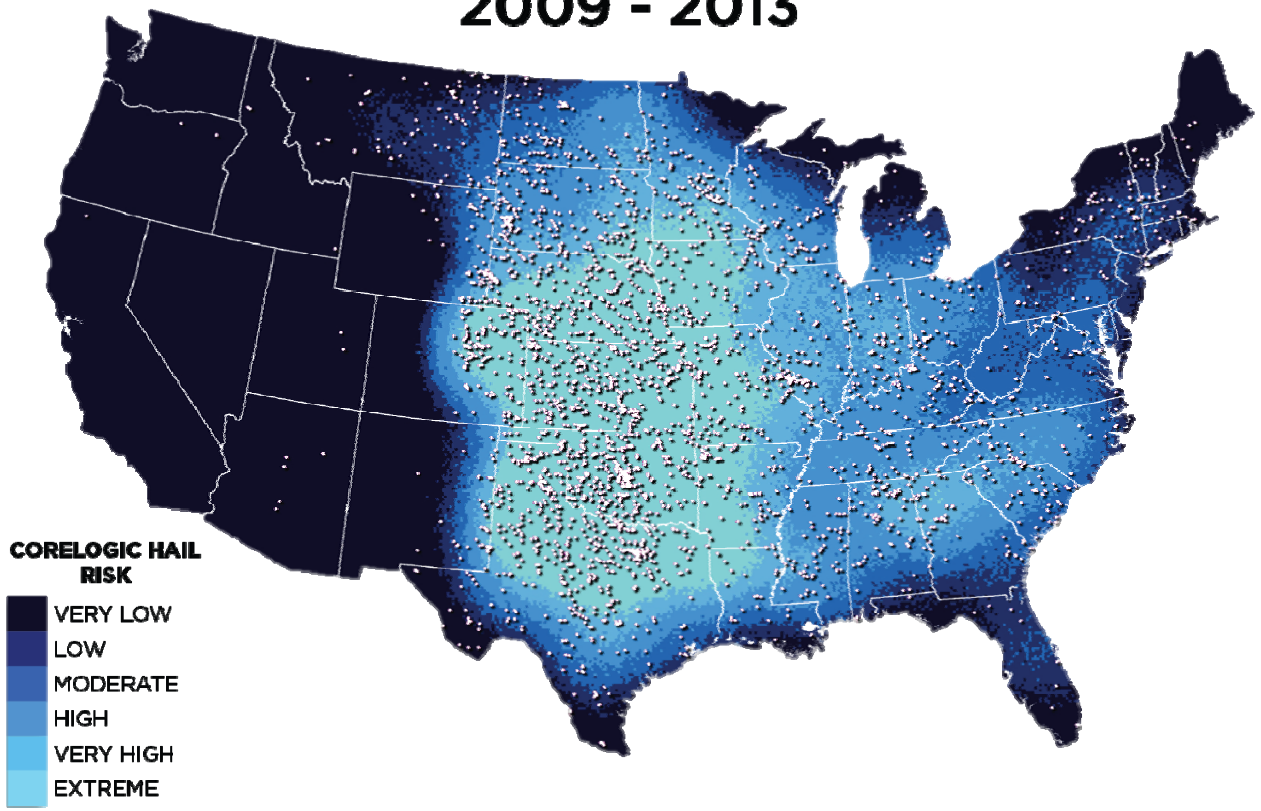
Severe Convective Storms (SCS)

- Severe Convective Storms (SCS)
  - Tornado, Hail and Straight Line Wind events
- Less attention given to SCS vs Hurricane and Earthquake
- Tornados and the storms that generate tornados account for more than half of the insured catastrophic losses (57%) that occur each year in the U.S.
  - Extend beyond “Tornado Alley”
- Frequency of observed events has increased
  - Growing population
  - Better observational tools (Doppler radar, etc.)
  - Rising global temperature / Climate change?

Severe Convective Storms: Hail

2"+ HAIL EVENTS
2009 - 2013



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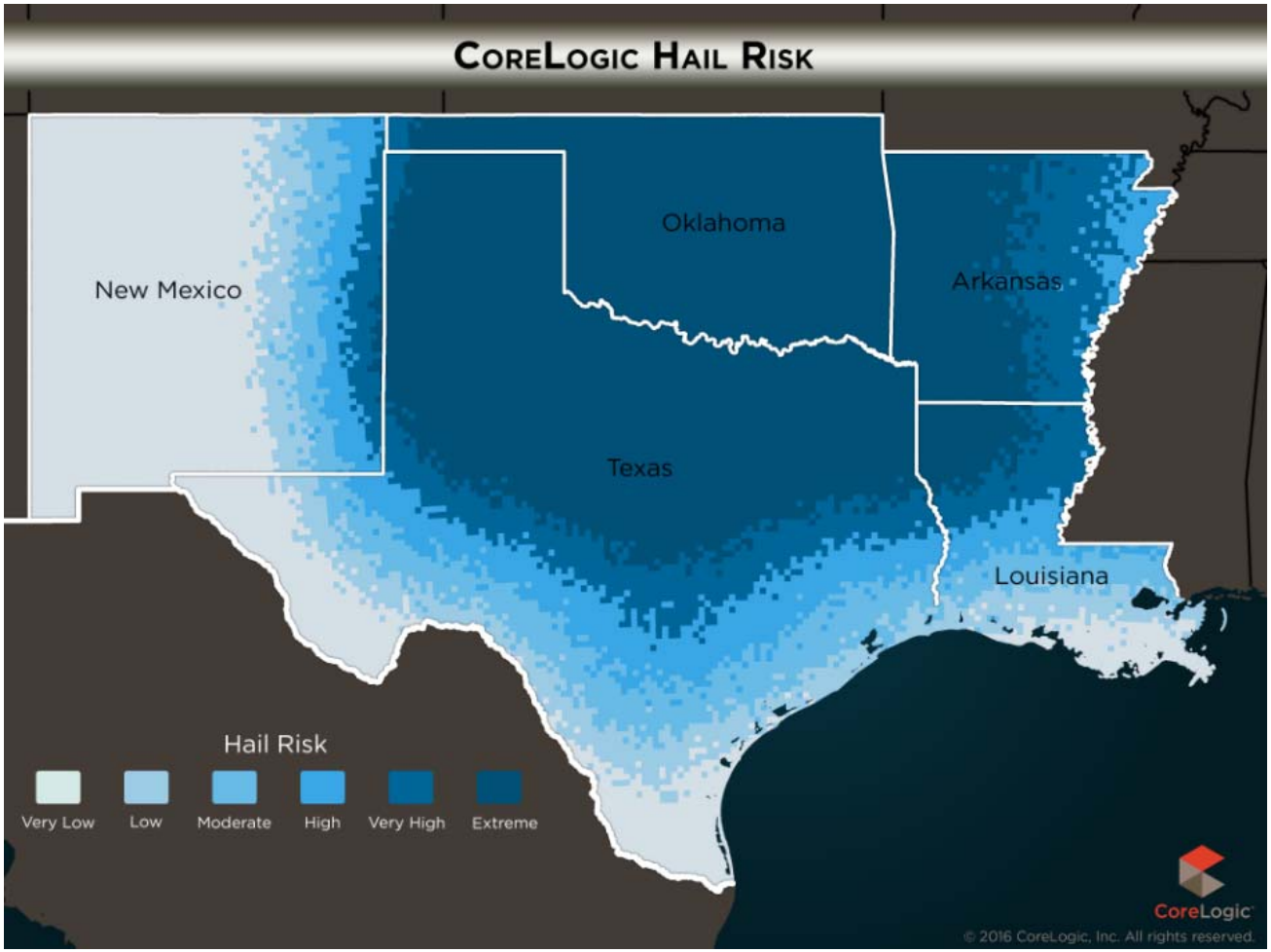
Severe Convective Storms: Hail



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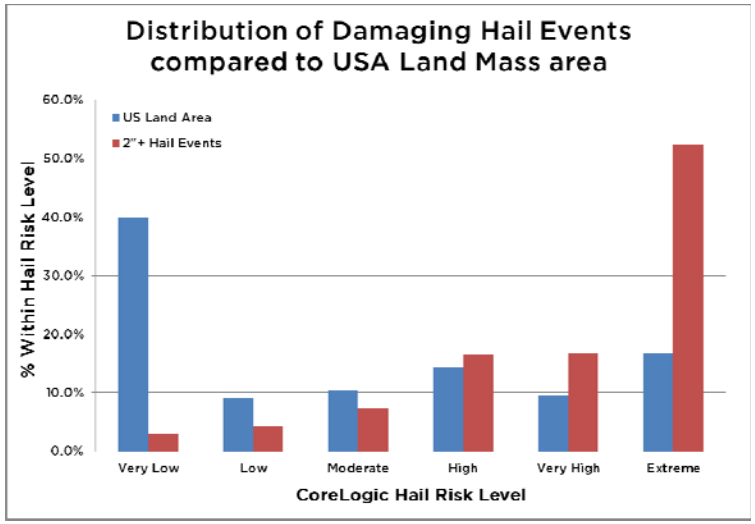
Distribution of 2”+ Hail Events

- 52.4% of Damaging Hail events occur in areas with Extreme Hail Risk levels
- 85.6% of Damaging Hail events occur in areas of High, Very High or Extreme Hail Risk
  - Areas are only 40.7% of the land area of the USA.

Risk Level	USA Land Mass Area	2"+ Hail Events
Very Low	40.0%	2.9%
Low	9.0%	4.2%
Moderate	10.3%	7.3%
High	14.5%	16.4%
Very High	9.5%	16.8%
Extreme	16.7%	52.4%



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Hail Verification

Hail Verification Reports

- History of hail dates 2006 – present (U.S. only)
- Hail sizes at location and within one, three & 10 miles
- When used to verify all hail claims, studies suggest ~$1,000+ value to client per claim
- Available through CoreLogic Weather Verification Services (Weather Fusion)

	Estimated maximum hail size...			
Date*	**At Location**	**Within 1 mi**	**Within 3 mi**	**Within 10 mi**
May 29, 2012	0.9"	1"	1.1"	2.2"
May 28, 2012	--	--	1"	1.4"
Apr 14, 2012	--	--	0.75"	0.75"
Apr 13, 2012	--	0.75"	0.9"	1.1"
Jun 14, 2011	1.3"	1.5"	1.6"	1.8"
May 24, 2011	--	0.9"	1.4"	2.2"
May 19, 2011	--	--	0.8"	0.8"
May 19, 2010	--	0.9"	1.3"	3.1"

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Hail Verification

Hail Verification Reports: Use Cases

- Insurance Adjuster
  - Wants to validate the date of loss reported by the policyholder
  - Uses Hail Verification Reports to identify potential loss dates and compare that with the claims history of the property to validate coverage
  - If coverage is validated, claim is processed quickly, improving customer satisfaction due to decreased cycle time
  - If coverage is not validated or there are further questions, adjuster refers the claim to Special Investigative Unit (SIU) for an in-depth look at the claim, or may deny
  - Portfolio view of a large event – overlay a portfolio of locations and identify the estimated size of hail that fell at each location
    - Reserve estimates
    - Claims adjuster assignment (internal and external resources)

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Using Hail Scores for Underwriting
Countrywide Baseline Underwriting Guidelines

Hail Risk Level	Description and Underwriting Actions
11-12 (Extreme)	Locations with Extreme Hail scores comprise approximately 15% of the US Land mass area, but approximately 50% of all damaging hail events occur in these areas: - Given the extreme risk, the recommendation here is to require higher hail/roof deductibles, and/or require roof inspections for prior hail damage, and capture age of roof, before binding coverage. May also want to consider any hail risk mitigation options.
9-10 (Very High)	Locations with Very High Hail scores comprise approximately 10% of the US Land mass area, but approximately 17% of all damaging hail events occur in these areas: - Given the Very High risk, the recommendation here is to consider higher hail/roof deductibles, along with considering inspecting the property for prior hail damage and capturing age of roof.
7-8 (High)	Locations with High Hail scores comprise approximately 15% of the US Land mass area, but approximately 16% of all damaging hail events occur in these areas: - Given the High risk, the recommendation here is to consider higher hail/roof deductibles.
5-6 (Moderate)	Locations with Moderate Hail scores comprise approximately 10% of the US Land mass area, but approximately 7% of all damaging hail events occur in these areas: - Given the Moderate risk, the recommendation here is to consider higher hail/roof deductibles.
3-4 (Low)	Locations with Low Hail scores comprise approximately 10% of the US Land mass area, but only approximately 5% of all damaging hail events occur in these areas: - Given the Low risk, underwriting action may not need to be considered.
1-2 (Very Low)	Locations with Very Low Hail scores comprise approximately 40% of the US Land mass area, but only approximately 5% of all damaging hail events occur in these areas: - Given the Very Low risk, underwriting action is not needed.
0 (No risk, or not assigned)	Locations in these areas should be reviewed to determine whether the address was sufficient for geocoding, or if the property is in an area where we do not have hail data (AK, HI).

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Using Hail Scores in Pricing

- Bi-peril Rating plans
  - Develop a base rate for Hail by state/territory, and then develop a set of relativity factors that vary by Hail risk score
  - Would also vary depending on building characteristics such as roof type and type of exterior
- Secondary Rating factors
  - Factors that vary by Hail Risk score, applied to account for the difference between the score at the location being rated, verse the base/average score for the territory
- Territory Revisions
  - Revise Base territory definitions to account for Hail Risk levels
  - Develop separate territory definitions for Hail within a Bi-peril rating plan

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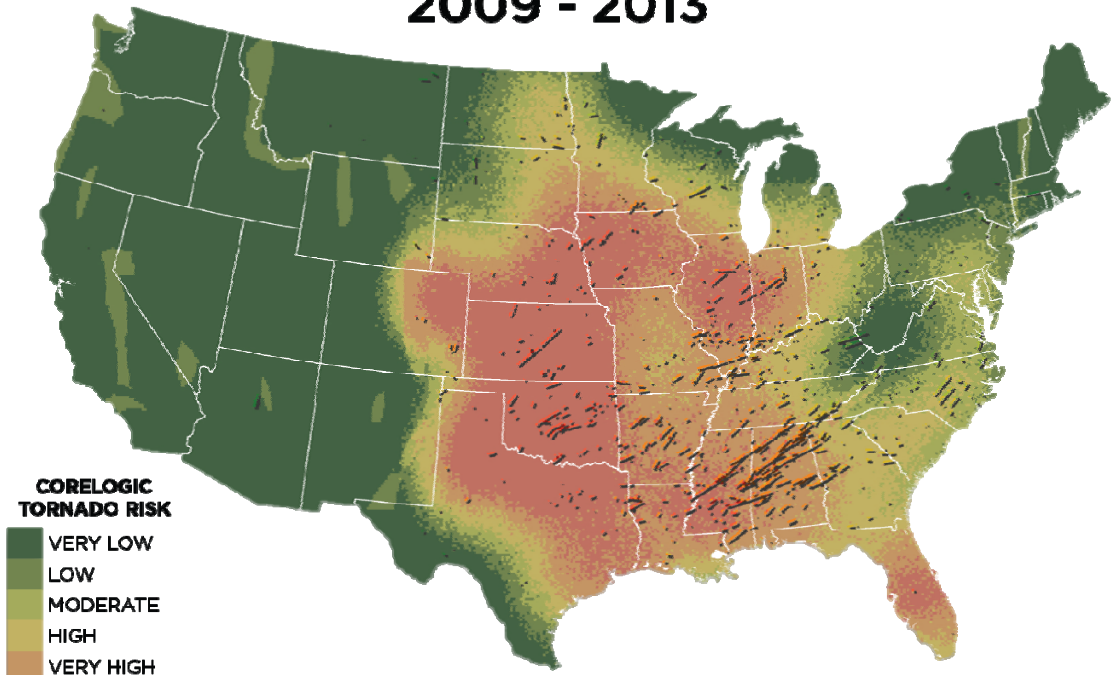
Severe Convective Storms: Tornado

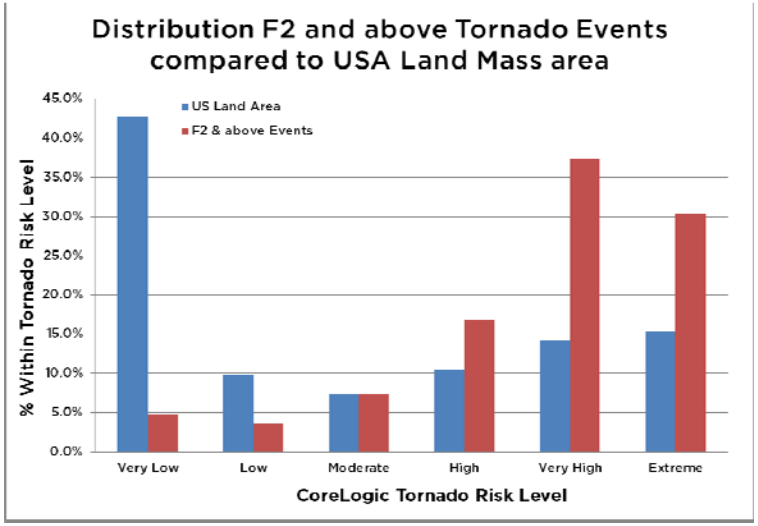
F2 AND GREATER TORNADO EVENTS
2009 - 2013



Distribution of F2 & Above Tornado Events

- 30.3% of F2 and higher events occur in areas with Extreme Tornado Risk levels
- 84.3% of F2 and above events occur in areas of High, Very High or Extreme Risk
  - Those areas are only 40.0% of the land area of the USA.

Risk Level	USA Land Mass Area	F2 & above Events
Very Low	42.8%	4.8%
Low	9.9%	3.6%
Moderate	7.3%	7.3%
High	10.4%	16.7%
Very High	14.3%	37.3%
Extreme	15.3%	30.3%



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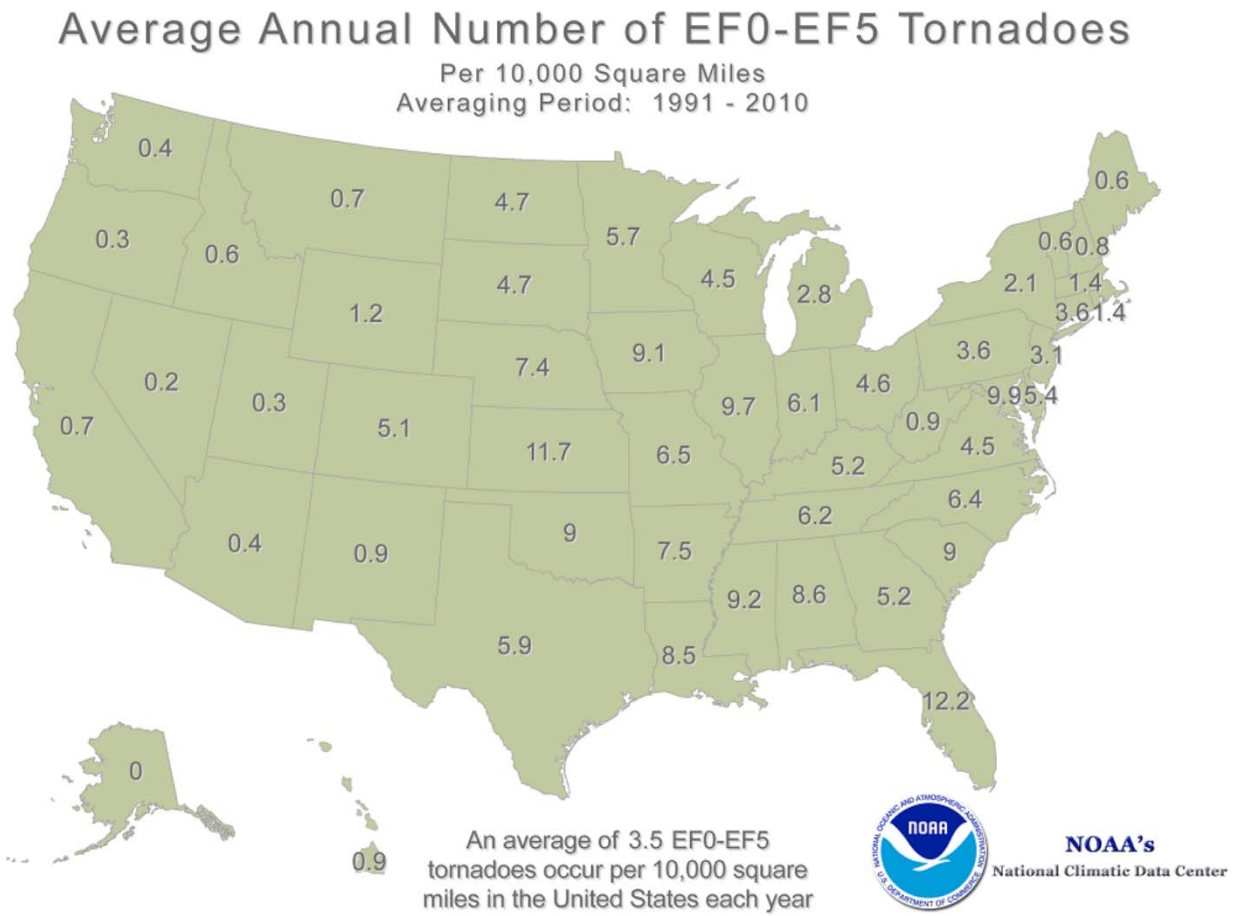
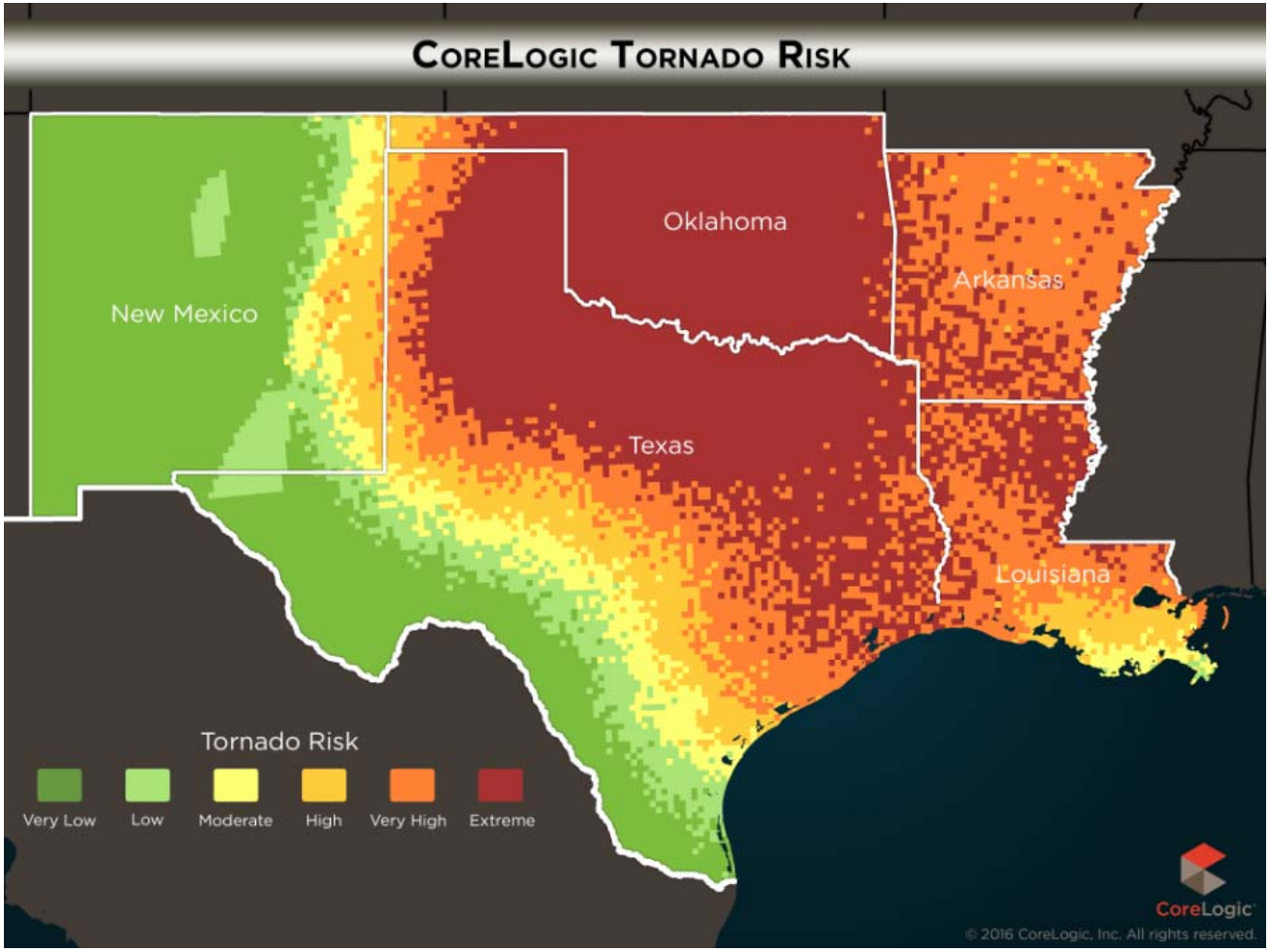
Annual EF0-EF5 Tornadoes



Severe Convective Storms: Tornado



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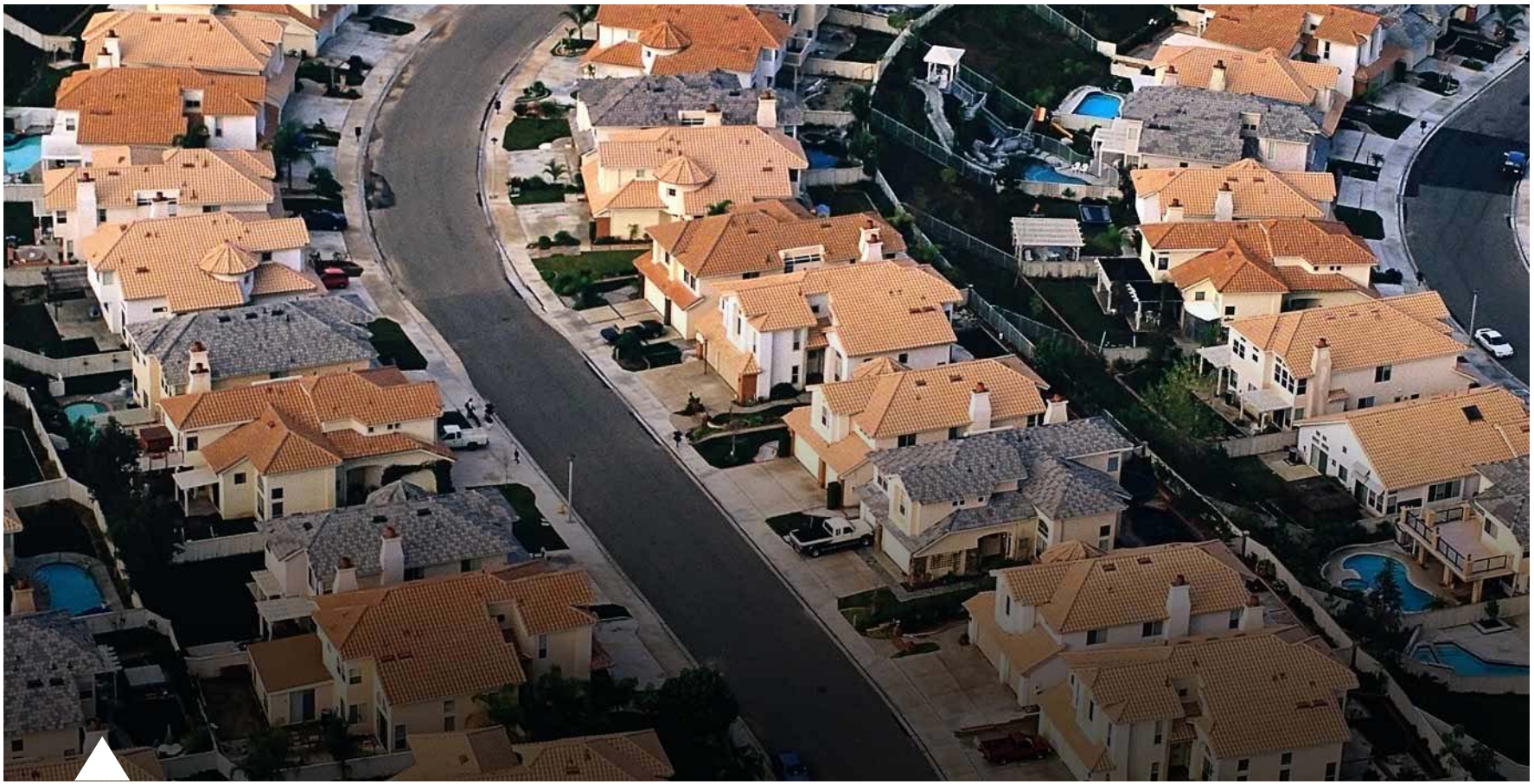


Natural Hazard Perils

Flood

Storm Surge Model

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

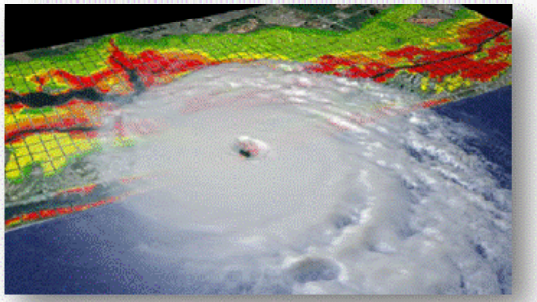
- Wind speed
- Hurricane speed
- Direction (track)
- Barometric pressure
- Tide
- Bathymetry (water depth)

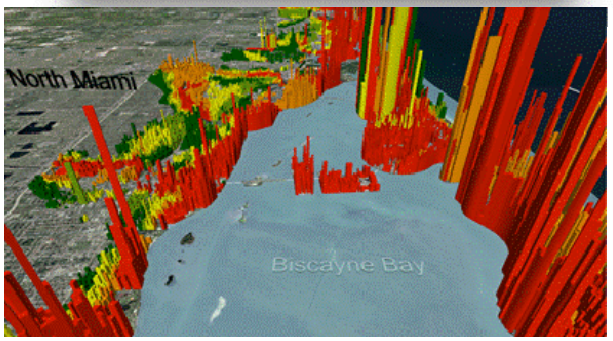
Results

- 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

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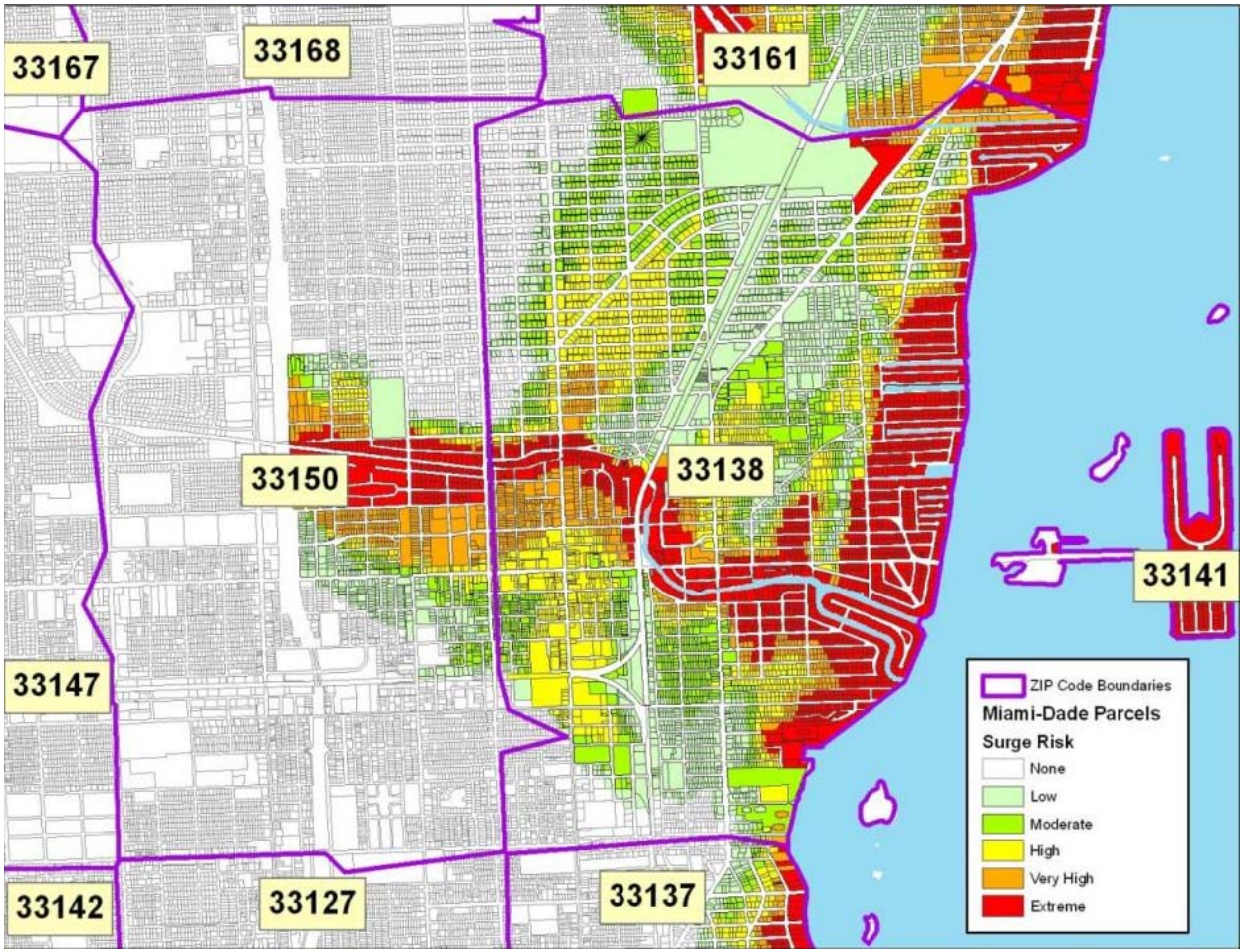
Storm Surge Risk at the Parcel Level



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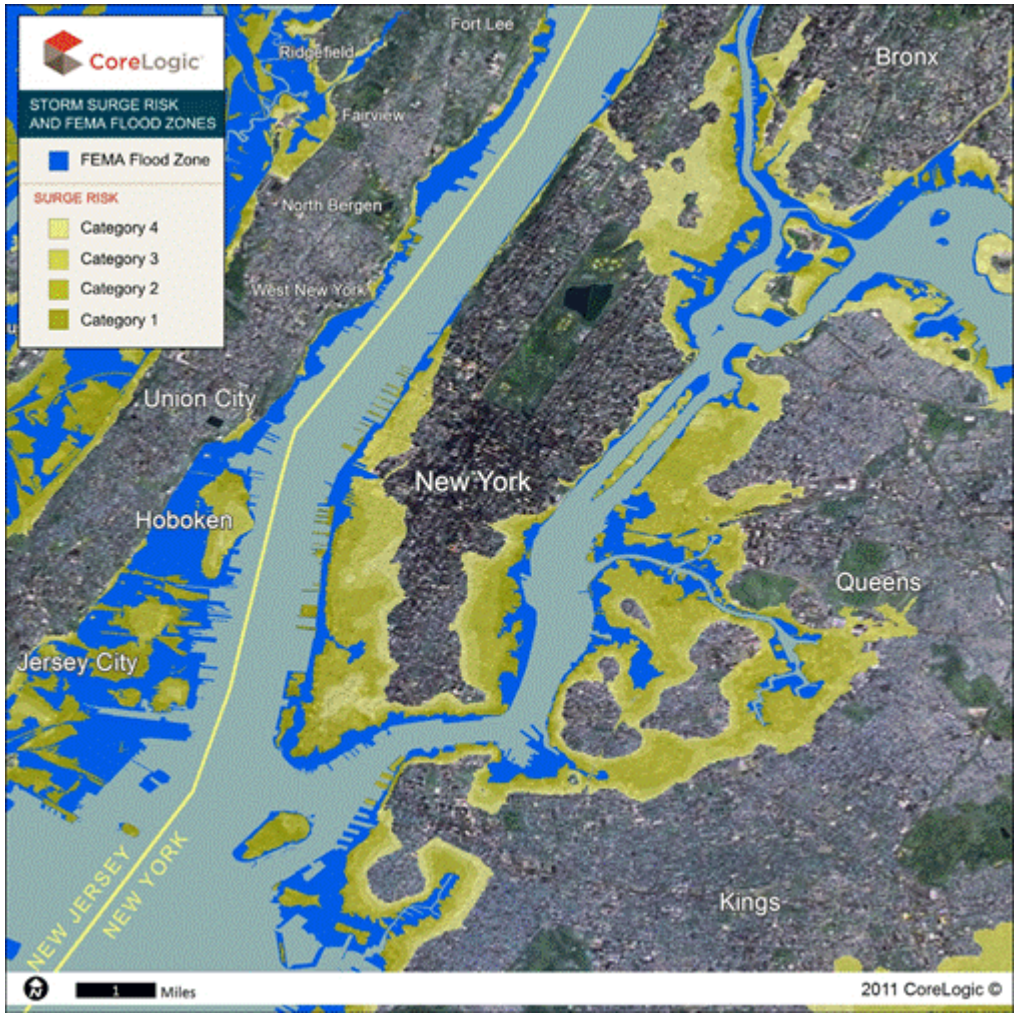
FEMA Flood Zones vs. Storm Surge Inundation



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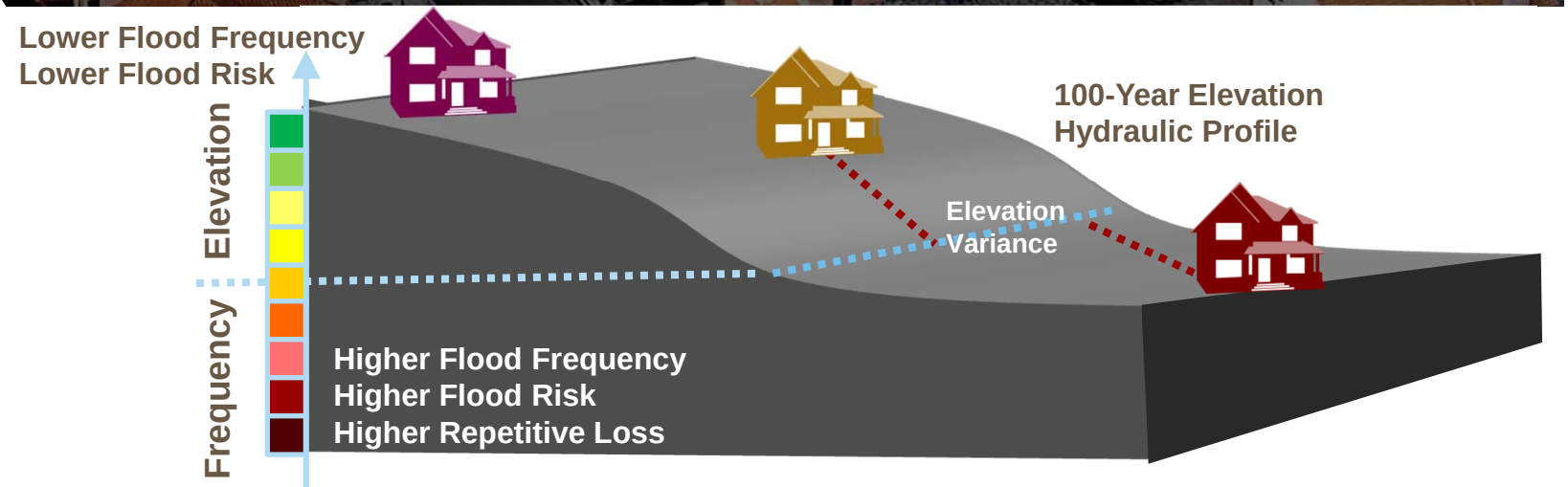
Flood Zone Determinations

- CoreLogic is the number one provider of flood zone determinations to the U.S. financial sector
- Serve many leading insurance brokers, primary carriers, and reinsurers worldwide
- Flood zone determinations are the least sophisticated (in or out), but most fundamental, of several CoreLogic Advanced Flood Risk Solutions products
- Our Flood Zone Determinations are a simple and effective way to identify Flood Risk
  - Accurate, timely and valuable
- Flood Risk Score
  - Premier tool in identifying the level of risk at a location – not just an “in/out” identifier

Flood Risk Score (FRS)

- Flood underwriters are moving beyond the flood zone determination to CoreLogic Flood Risk Score (FRS)
  - Advanced risk assessment tool that combines federal flood zones with hydrological science and critical risk data
- Elevation and comprehensive hydrology data, combined with an internal database of over 90,000 dams, levees and customized flood analysis
- Provides a precise and graduated risk assessment that distinguishes incremental levels of risk for properties located both “in” and “out” of floodplains
- When used with Sewer Backup Risk Score, can identify properties that that pose an highly elevated risk of Sewer Backup
- Scores range from 10-100, a score of 60 or above indicates that the location is within a FEMA 100-year flood zone

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 the100-year flood surface/profile to cover national rivers, lakes, coastal zones, and other water bodies

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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

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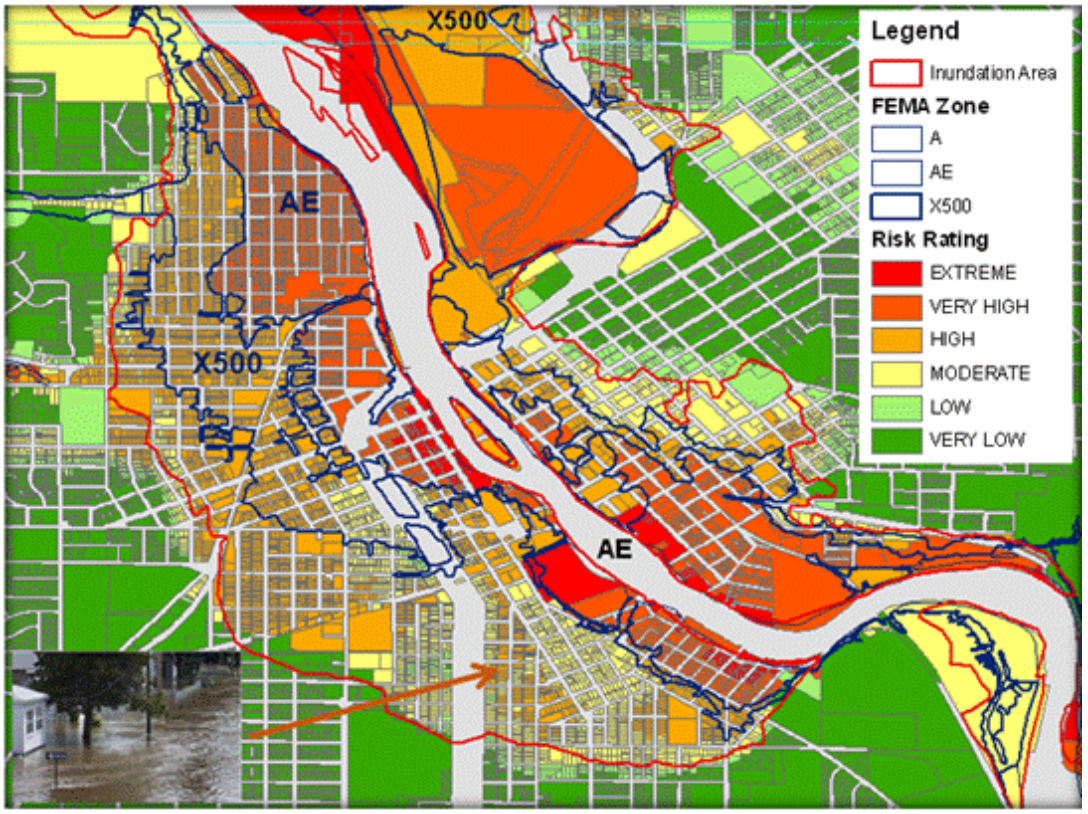
Flood Risk Score Analysis: The 2008 Midwest Flood in Cedar Rapids

- 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



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Flash Flooding Overview

- A relatively short-term event, occurring within 2-6 hours, as a result of high intensity rainfall, dam break, levee failure, rapid snowmelt and ice jams.
- Can move at incredible speeds destroying everything in its path
  - Flooding and/or destruction of building structures and automobiles
  - Road erosion and damage to bridge infrastructure
  - Debris flow can contain building structures, homes, automobiles, trees and boulders
  - Summation of the National Climatic Data Center (NCDC) reports from 2005-2014 showed that 40% of property damage caused by inland flooding (riverine and flash flooding combined) was the result of flash flooding totaling $11.4B

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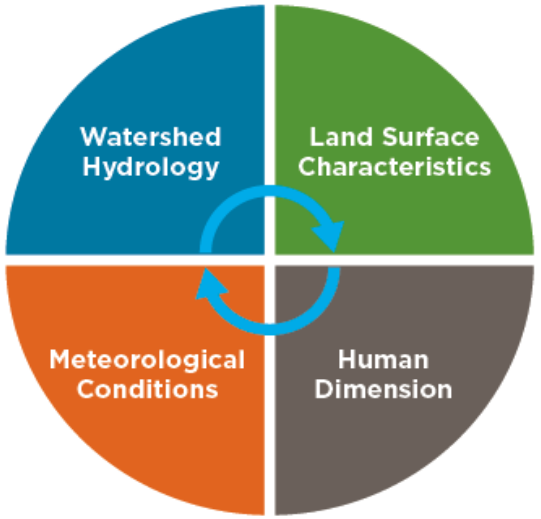
Flash Flood Risk Score Methodology

- **Watershed Hydrology:**
  - Identifies land slope, flow direction and flow accumulation in watersheds.
- **Land Surface Characteristics:**
  - Catchment slope, hydro properties/infiltration of soils, imperviousness of land use and Interceptions of forest coverage which determine surface runoff potential from rainfall.
- **Meteorological Conditions:**
  - Rain fall intensity and frequency*, hail probability and geographic distribution patterns and its probability in geographic areas to represent flash flooding in space and time.
- **Human Dimension:**
  - Building design, waste and debris, automobiles and poorly designed infrastructure.



*Rainfall intensity and frequency provided by Weather Service International (WSI)

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Components of FFRS Model

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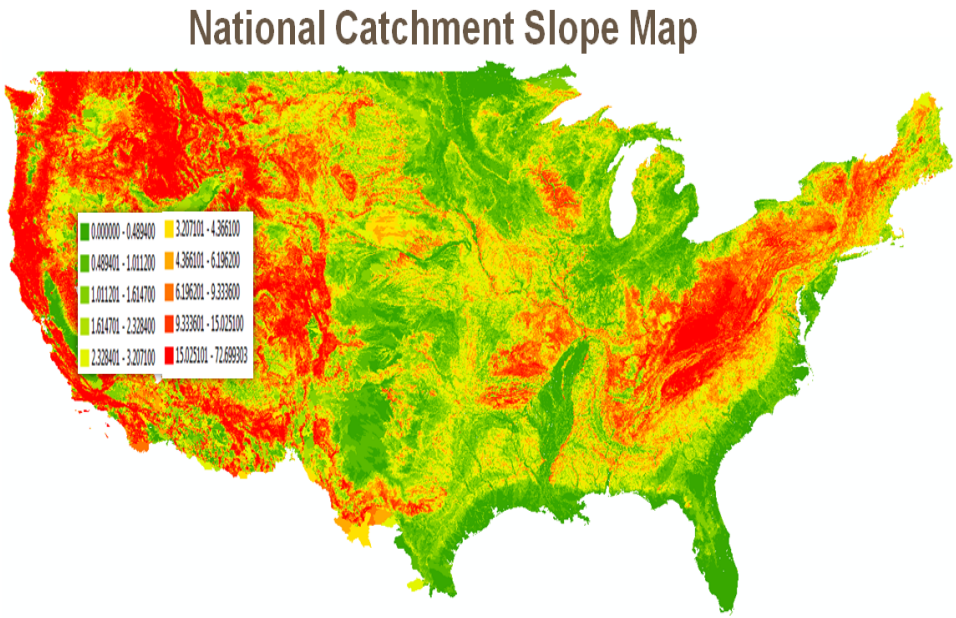
FFRS Methodology

Flow Accumulation

- National Catchment Slope Average Dataset
  - Created with 10m granularity to incorporate hydraulic sloping
  - Average catchment slope helps recognize where downhill movement of water within the catchment would be more pronounced
  - Uses over 3.1 million catchment areas
  - Independent of FEMA flood zone determinations



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FFRS Report

Flash Flood Risk Score Output:

- Flash Flood Risk Score is calculated by evaluating all the inputs and their flash flood potential
- Each element is weighted and calculated to provide the following outputs:
  - Flash Flood Risk Score based on a sliding scale of 1-100
  - Flash Flood Risk Rating from “Very Low” to “Extreme”
  - Subwatershed Code for location
  - State County FIPS Code for location

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Profitably Insuring the Risk of Flood

A probabilistic model supports key insurance activities

- Risk Differentiation / Underwriting
  - Ability to use a catastrophe model to differentiate the insured risk to a property, including credits and deficiencies as identified in underwriting cycle
- Pricing Adequacy
  - Ability to use a catastrophe model to measure the cost of risk, as an input into a rating/pricing formula
- Capital Management
  - Ability to evaluate concentration risk and manage capital adequacy for ratings and regulation

Flood Models Analysis in Brief

- **Data**
  - 100+ data layers, spanning DEMs, flood zonation, stream boundaries, coastal defenses, levees and other flood defenses
  - Uses same flood zone / digital elevation maps as FRS
- **Science**
  - CoreLogic hydrologists, meteorologists, GIS specialists & engineers supporting flood risk management in the US for more than a decade
- **Analytics**
  - Grid-scale computing delivers probabilistic stochastic modeling results into a production underwriting environment to support insurance

CoreLogic Flood offerings to Insurers

A suite of products to cover the insurers' needs

Insurance Activity

Screening → Pricing → Portfolio Risk

CoreLogic Products & Value Proposition

Flood Risk Scores

Single dimensional evaluation of risk
Easily implemented into u/w Process

Probabilistic Flood Model

Comprehensively include mitigation credits,
u/w info and policy terms into enterprise risk

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Flood Example: North Dallas

Flood Example: Using Risk Scores & Relativities

Flood Risk Score (FRS)	Flood Annual Probability	Est Loss Severity $1000 TIV
	0.0%	$ 150.00
0	0.0%	$ 150.00
10	0.0%	$ 200.00
20	0.0%	$ 200.00
30	0.1%	$ 200.00
40	0.3%	$ 220.00
50	0.6%	$ 250.00
60	1.3%	$ 300.00
70	2.5%	$ 350.00
80	6.0%	$ 400.00
90	15.0%	$ 500.00

Address	FRS	Annual Prob	Avg Loss Severity per $1000 TIV	$ 250,000 Insured Value	Annual Flood Loss Cost
7125 Winding Creek Rd	60	1.30%	$ 375.00	$ 250,000	$ 1,218.75
7115 Winding Creek Rd	50	0.60%	$ 312.50	$ 250,000	$ 468.75
7118 Winding Creek Rd	40	0.25%	$ 275.00	$ 250,000	$ 171.88
7111 Schafer St	30	0.13%	$ 250.00	$ 250,000	$ 81.25
7103 Schafer St	20	0.03%	$ 250.00	$ 250,000	$ 18.75

items in RED come directly from the model

Flood Example: Using Simulation Model Results

Address	Model return period (years)	Annual Prob	Est Loss Cost per $1000 TIV	$ 250,000 Insured Value	Annual Flood Loss Cost
7125 Winding Creek Rd	166	0.60%	$ 4.437	$ 250,000	$ 1,109.30
7115 Winding Creek Rd	76	1.31%	$ 9.725	$ 250,000	$ 2,431.18
7118 Winding Creek Rd	934	0.11%	$ 0.723	$ 250,000	$ 180.71
7111 Schafer St	2,896	0.03%	$ 0.187	$ 250,000	$ 46.67
7103 Schafer St	5,578	0.02%	$ 0.072	$ 250,000	$ 17.90

items in RED come directly from the model

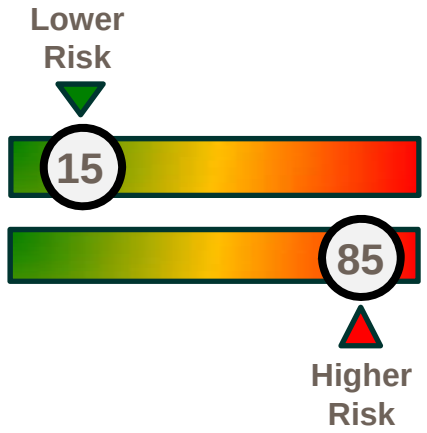
Sewer Backup Risk Score Solution

Sewer Backup/Basement Flood

Contributions

Intense Rainfall
River Flooding Risk
Flash Flooding Risk
Coastal Flooding Risk
Combined Sewer Area
Land Use
Watershed Hydrology
Watershed Slope
Soil Infiltration
Forest Coverage
Street Network Pattern
Structure Information
Ground Depressions

Measure Risk



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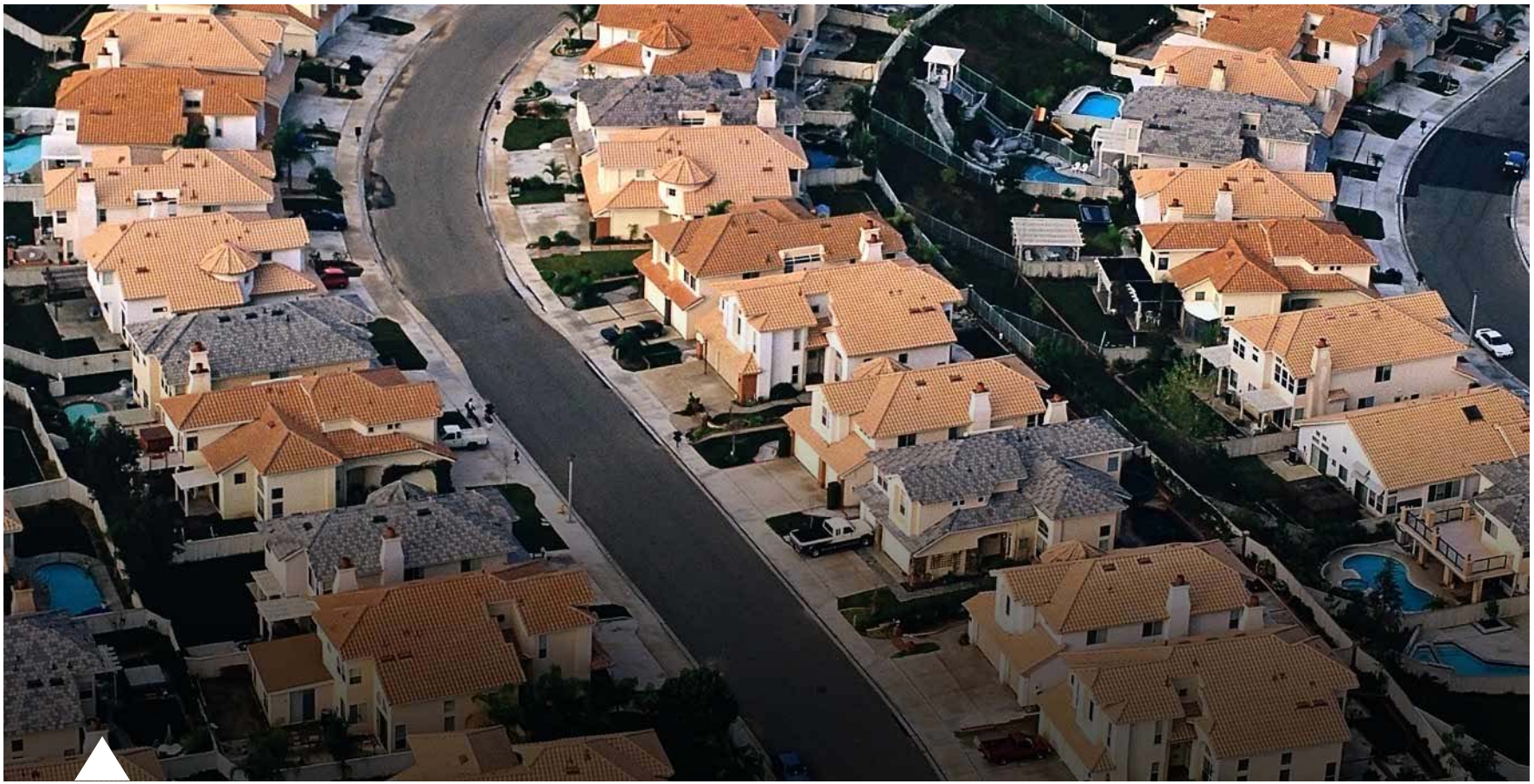


Natural Hazard Perils

Wildfire

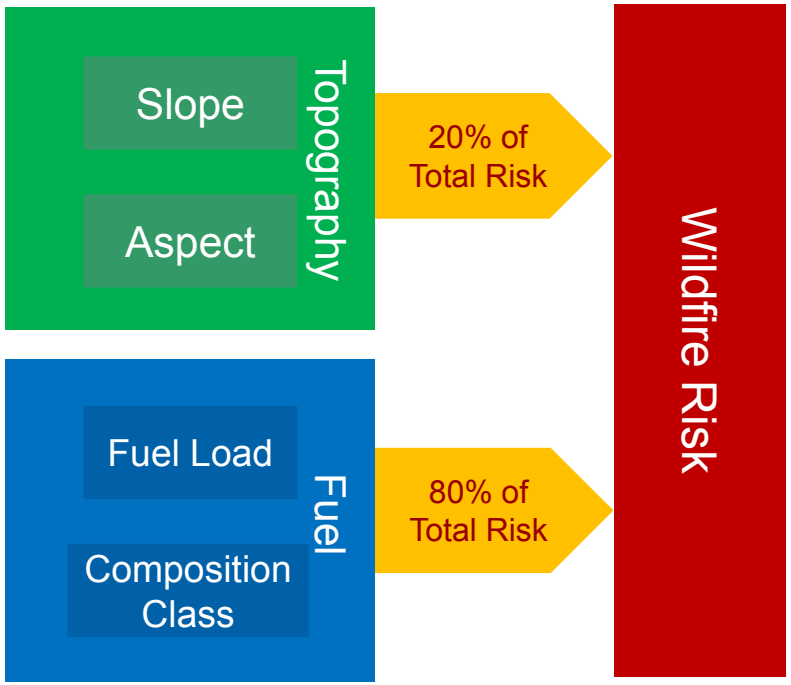
Identifying Wildfire Loss Potential

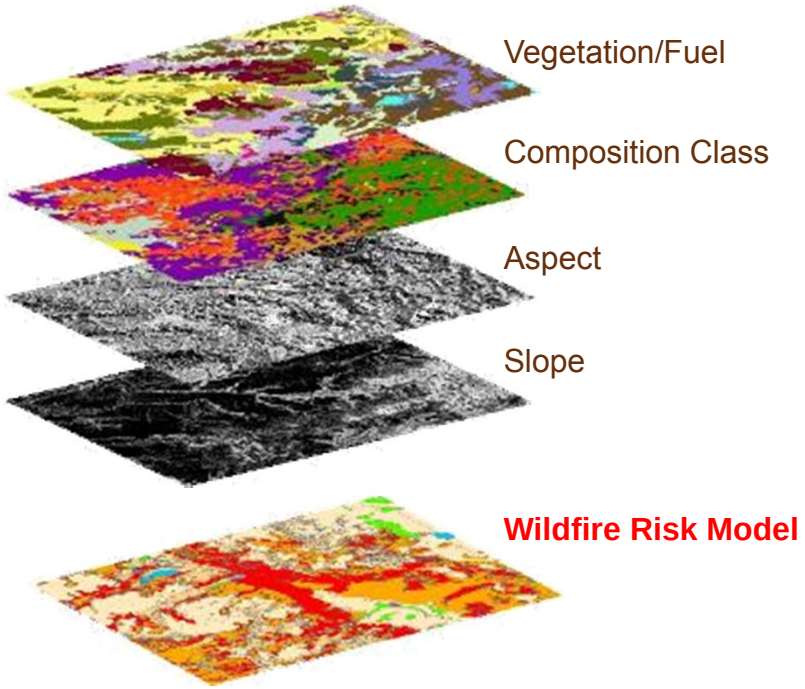
- Determining the potential for wildfire insured losses requires an understanding of:
  - The risk on the property (at the geocoded point location within the boundaries of the parcel)
  - The risk posed by nearby areas of higher risk (inside or outside the parcel, but beyond the geocoded point)
- To help insurance companies evaluate and understand the potential for loss, CoreLogic has developed two analysis tools:
  - 1) Wildfire Risk Database
  - 2) Wildfire Risk Score

Wildfire Risk Database

Data Elements:

- Digital Elevation Model (DEM)
- Satellite Imagery (vegetation/fuel)
- Vegetation Composition Class Data (fire history)





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Wildfire Risk Score

- Wildfire Score measures the distance from the geocoded point to:
  - The nearest High or Very High risk area
  - The nearest area designated as Wildland
- Combines:
  - The risk on the property
  - The distance to the nearest High or Very High
  - The distance to the nearest Wildland
- Results in a score based on a 0 to 100 scale

Bastrop TX 2011 Wildfire

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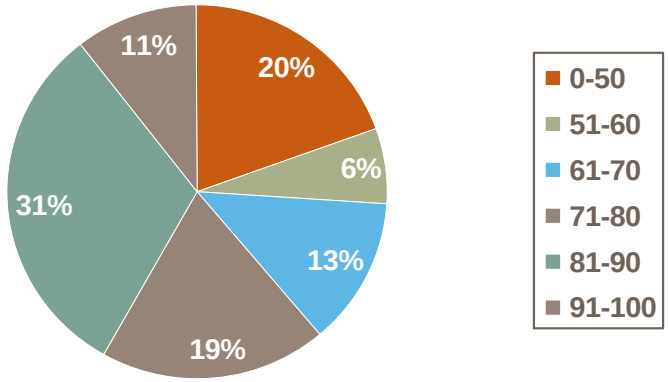
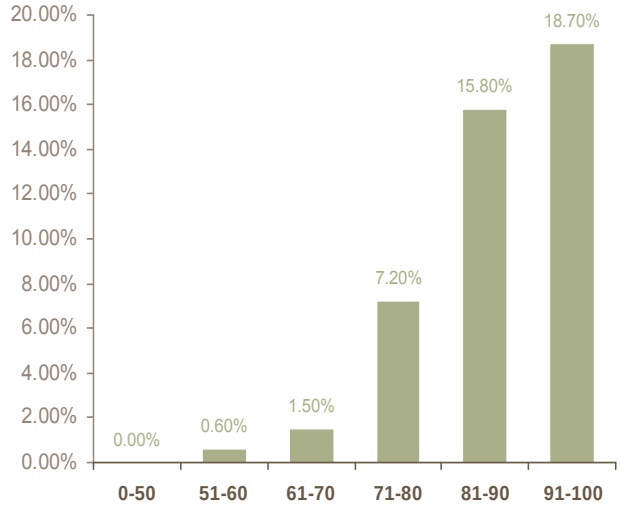
Bastrop TX findings

- CoreLogic Wildfire scores highly correlated with actual damage
  - % of properties damaged increases as the Wildfire Risk Score increases

Distribution of Properties by Wildfire Score



% of properties damaged or destroyed, by WF score



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Additional statistics from Bastrop TX

- % of properties damaged increases with Wildfire Risk Score
- Damage % varies across Very High risk scores, but increasing

Wildfire Score summary

WF Score	Total properties	% in group w/ damage
Scores 0-50	3,328	0.0%
scores 51-60	1,089	0.6%
scores 61-70	2,151	1.5%
scores 71-80	3,180	7.2%
scores 81-90	5,302	15.8%
scores 91-100	1,781	18.7%
Total	16,831	8.5%

Very High risk score summary

WF Score	Tot # props	% with damage
81	51	0.0%
82	992	13.7%
83	869	13.8%
84	690	7.4%
85	513	17.0%
86	13	0.0%
87	591	27.1%
88	642	21.3%
89	540	15.6%
90	401	15.5%
91	4	0.0%
92	246	39.8%
93	298	19.5%
94	327	16.2%
95	529	6.8%
96	0	0.0%
97	34	47.1%
98	58	22.4%
99	47	8.5%
100	238	23.1%
Grand Total	7083	16.5%

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Additional statistics from Bastrop TX

- Low and Medium Density Residential had highest damage rate
- High and Very High Brush Risk categories had highest damage rate

Break Risk Information

	# of homes		
Break risk	not damaged	damaged	% w/ damage
Agriculture	786	20	2.5%
High Density Residential	2,316	19	0.8%
Medium Density Residential	5,881	720	10.9%
Low Density Residential	2,976	488	14.1%
Scattered Residential	1,477	105	6.6%
Urban	353	-	0.0%
Urban Non-Residential	5	-	0.0%
Water	10	-	0.0%
Wildland	1,588	87	5.2%
Grand Total	15,392	1,439	8.5%

Brush Risk Information

	# of homes		
Brush risk	not damaged	damaged	% w/ damage
Urban	3,094	2	0.1%
Low	723	1	0.1%
Agriculture	3,738	186	4.7%
Moderate	4,160	198	4.5%
High	2,600	490	15.9%
Very High	1,077	562	34.3%
Grand Total	15,392	1,439	8.5%

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Bastrop TX Wildfire summary

CoreLogic Wildfire Risk Scores highly correlated to actual damage

- % of properties damaged by Wildfire increase significantly as the WF Risk Score increases
  - Low to Moderate risks (scores 0-60) comprise 26% of total properties insured, but only 0.5% of damaged properties.
    - 0.2% of insured Low to Moderate Risk properties damaged.
  - High risks (scores 61-80) comprise 32% of total properties insured, and 18.2% of damaged properties.
    - 4.9% of insured High Risk properties damaged.
  - Very high risks (scores 81-100) comprise 42% of total properties insured, but over 81% of damaged properties.
    - 16.5% of insured Very High risk properties damaged.
- Low and Medium density housing had highest damage rate
- High and Very High Brush Risk categories had highest damage rate

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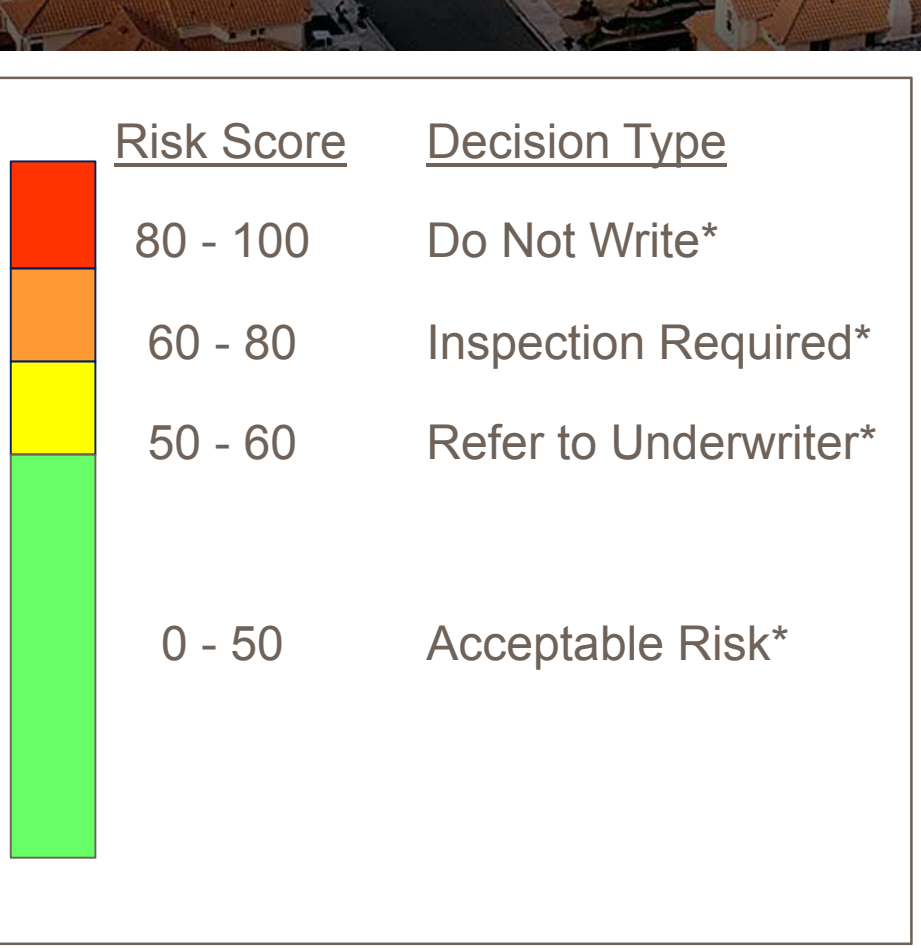
Wildfire Risk Score: Underwriting Guide



Risk Score	Decision Type
80 - 100	Do Not Write*
60 - 80	Inspection Required*
50 - 60	Refer to Underwriter*
0 - 50	Acceptable Risk*

*Sample risk classifications.
Can be customized for client needs based on additional business rules.

Depending on a company's risk appetite, scores can be used for automated decision making and exceptions processing.

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Wildfire Model Validation – Pricing use case

- Selected Fires – Sample populations

WFRS Range	# of Single Fam Res	SFR Dist %	# damaged	Damage Dist %	% damaged in range
1-10	45,560	29.1%	2	0.1%	0.00%
11-20	1,048	0.7%	-	0.0%	0.00%
21-30	19,937	12.7%	-	0.0%	0.00%
31-40	20,639	13.2%	-	0.0%	0.00%
41-50	18,822	12.0%	51	1.8%	0.27%
51-60	8,753	5.6%	127	4.4%	1.45%
61-70	11,866	7.6%	236	8.2%	1.99%
71-80	13,040	8.3%	461	16.0%	3.54%
81-90	12,126	7.7%	1,383	47.9%	11.41%
91-100	5,031	3.2%	625	21.7%	12.42%
	156,822	100.0%	2,885	100.0%	1.84%
Low (1-50)	106,006	67.6%	53	1.8%	0.05%
Moderate (51-60)	8,753	5.6%	127	4.4%	1.45%
High (61-80)	24,906	15.9%	697	24.2%	2.80%
Very High (81-100)	17,157	10.9%	2,008	69.6%	11.70%
	156,822	100.0%	2,885	100.0%	1.84%

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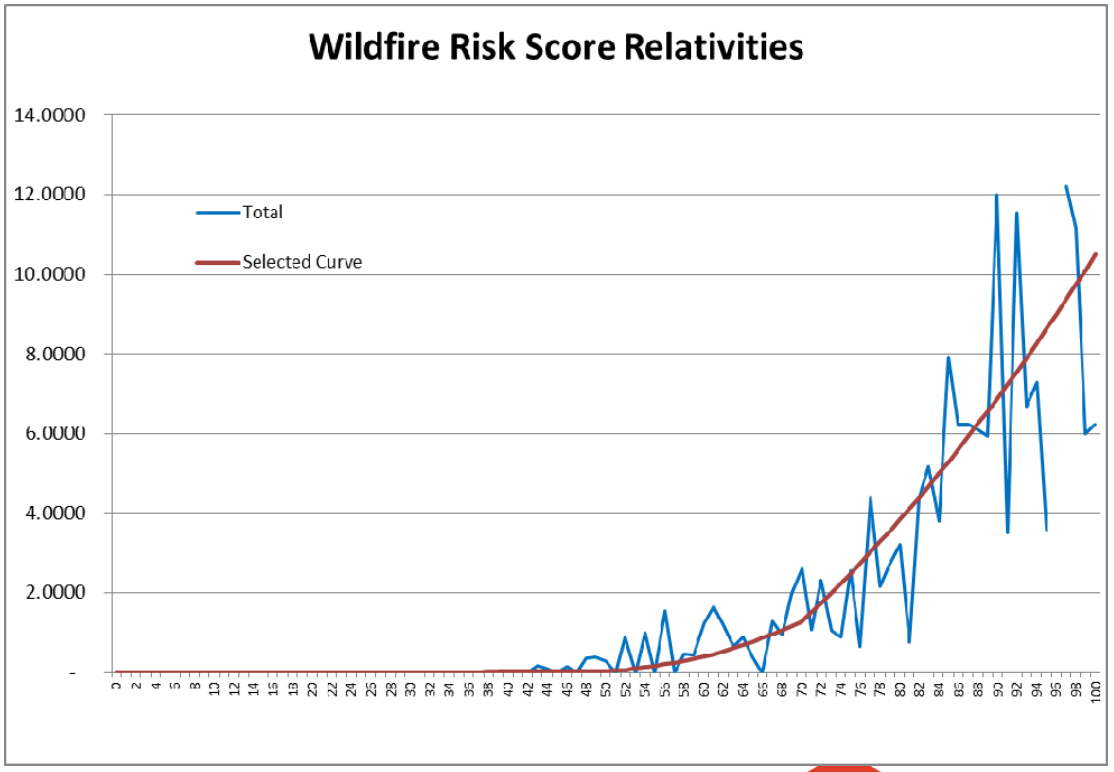
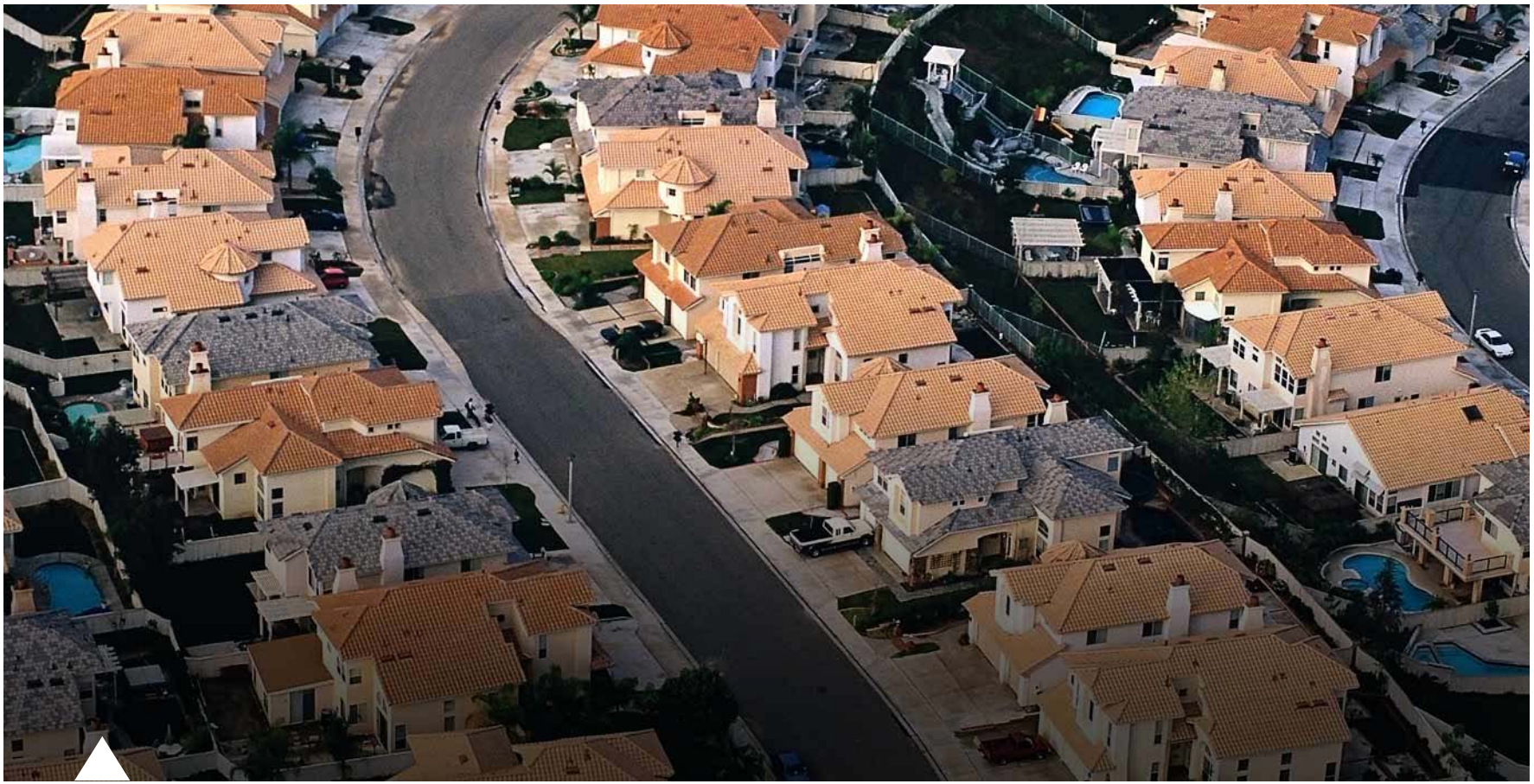
Wildfire Model Validation – Risk Relativities

- Selected Fires – Risk Relativities
  - Can be used for Rating, but also helps insurers determine their risk tolerances for Underwriting decisions

WFRS Range	% damaged in range	damage Relativity
1-10	0.00%	0.0024
11-20	0.00%	-
21-30	0.00%	-
31-40	0.00%	-
41-50	0.27%	0.1473
51-60	1.45%	0.7887
61-70	1.99%	1.0811
71-80	3.54%	1.9217
81-90	11.41%	6.1996
91-100	12.42%	6.7528
	1.84%	1.0000
Low (1-50)	0.05%	0.0272
Moderate (51-60)	1.45%	0.7887
High (61-80)	2.80%	1.5212
Very High (81-100)	11.70%	6.3619
	1.84%	1.0000





Natural Hazard Perils

Hazard Risk Score (HRS)

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Hazard Risk Score (HRS) Overview

- Combines nine natural hazard products into one score
- Derived with underlying data for each of the nine natural hazards for every location in the US
- Underlying data combined into an aggregated, consistent and normalized value that allows statistically valid combinations to be made
- Locations with higher risk levels (exposure to multiple hazard risks) receive higher scores than those with minimal risk levels
- Locations with lower risk scores have a lower exposure to loss from underlying risks
- Factors in an individual risk's contribution to total loss

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Hazard Risk Score Overview

One Score Spanning Nine Natural Hazards

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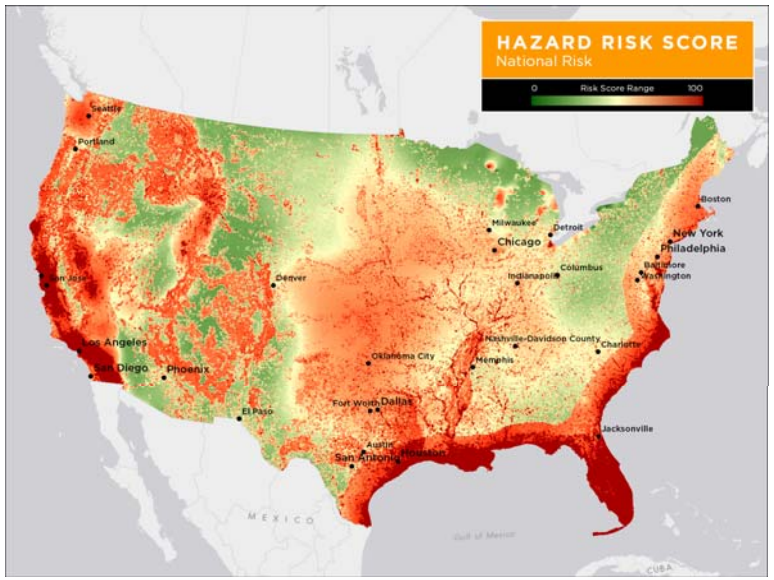
Hazard Risk Score Overview

- Single normalized score used to predict the risk of loss from multiple natural hazard events
- Associated probability of financial losses occurring.
- Probability of an event, or the frequency of those events, is a significant factor in determining the risk levels associated with the individual hazard layers
- A higher risk level indicates a higher probability that the risk event will occur).



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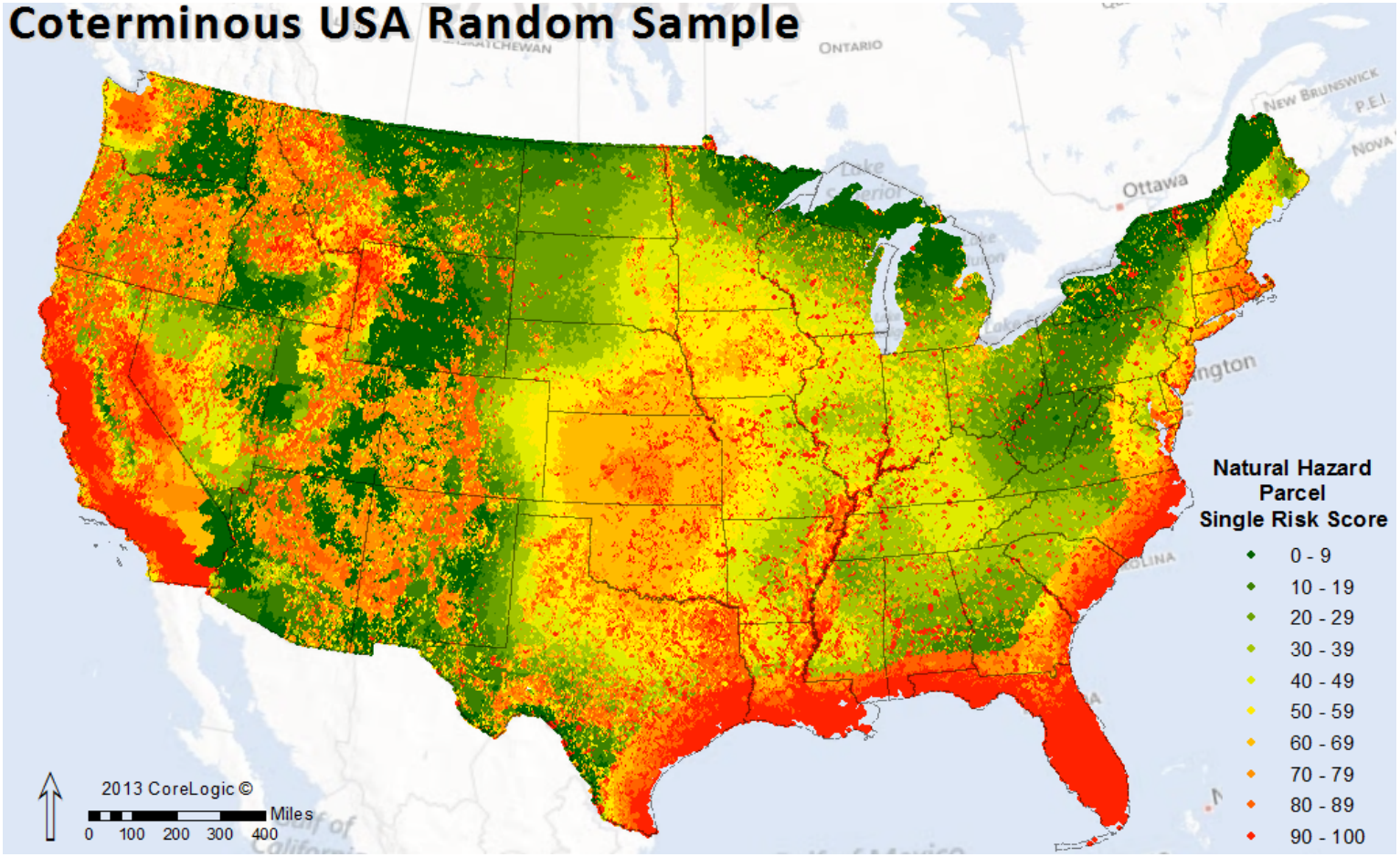
Single Risk Score Summary



Additional Hazard Databases

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Thank You
&
Questions