

Evaluation of the FARSITE Fire Model in Southern California Shrublands

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10/21/07 10:03 PM

Cuddleback

Goals

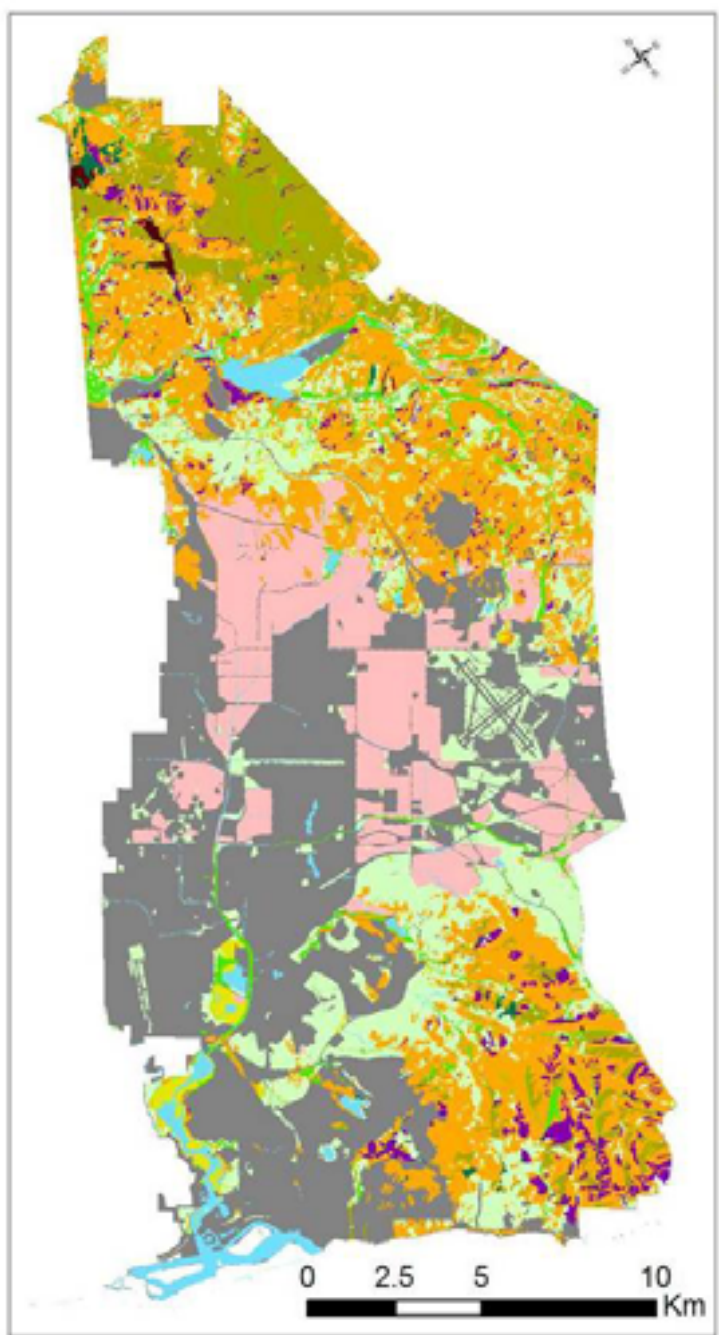
- Simulate Santiago Fire
- Create fire probability map
- Inform land managers regarding fuel modification and fire prevention strategies

FARSITE Input Data Files

- Landscape file: Fuel model, Slope, Aspect, Elevation, Canopy Cover
- Weather & Wind
 - Fremont Canyon weather station (RAWS)
- Adjustment (rate of spread adjustment factors)
 - One
- Initial fuel Moisture
- Optional Files
 - Fire Acceleration, Coarse woody profiles...etc.

Fuel Model

- Jones & Stokes 1992 Vegetation layer
- Update vegetation map with recent grassland surveys
- Convert vegetation map to fuel map
 - NFFL fuel models
 - USFS custom fuel models



Fuel Model

- NFFL1 Short grass
- NFFL3 Tall grass
- NFFL4 Chaparral
- NFFL9 Hardwood litter
- USFS15 Old Chamise
- USFS16 Ceanothus
- USFS18 Sagebrush and Buckwheat
- UCSB20 Wildland Urban interface
- UCSB21 Coastal Sage
- NB8 Open water
- NB9 Rock/Bare ground

NFFL Fuel Models

Fuel mode code	NFFL1	NFFL3	NFFL4	NFFL9
Vegetation	Short grass	Tall grass	Chaparral	Hardwood litter
Dead fuel Load (Mg/ha)				
1-hr	1.66	6.75	11.23	6.55
10-hr	0	0	8.99	0.92
100-hr	0	0	4.51/ 4.48	0.34
Live Fuel Load (Mg/ha)				
Herbaceous	0	0	0	0
Woody	0	0	11.21 / 11.23	0
Fuel model type	static	static	Static	static
Dead 1-hr SAV (1/cm)	105.98 / 114	45.42 / 49	60.56 / 65	75.7 / 82
SAV Live Herbaceous (1/cm)	0 / 59	0 / 59	0 / 59	0 / 59
SAV Live Woody (1/cm)	0 / 49	0 / 49	45.42 / 49	0 / 49
Fuel Bed Depth (cm)	30.48	76.2	182.88	6.1
Moisture of Ext. (%)	12 / 11	25	20	25
Dead Heat content (kJ/kg)	18,608 / 18,594	18,608 / 18,594	18,608 / 18,594	18,608 / 18,594
Live Heat content (kJ/kg)	18,608 / 18,594	18,608 / 18,594	18,608 / 18,594	18,608 / 18,594

Source: Anderson, 1982

Custom Fuel Models

Fuel mode code	USFS15	USFS16	USFS18	UCSB20	UCSB21	CM22
Vegetation	Old chamise	Ceanothus	Sagebrush and Buckwheat	Wildand Urban interface	Coastal Sage	Mustard
Dead fuel Load (Mg/ha)						
1-hr	4.48	5.04	12.33	1.66	5.5	14.21
10-hr	6.73	10.76	1.79	4.19	0.7	0
100-hr	2.24	4.04	0.22	3.36	0	0
Live Fuel Load (Mg/ha)						
Herbaceous	1.12	6.73	1.68	0	1.6	0
Woody	4.48	6.28	5.6	0.83	3	0
Fuel model type	static	static	static	static	static	static
Dead 1-hr SAV (1/cm)	19.37	15.14	19.37	105.98	19.37	28.11
SAV Live Herbaceous (1/cm)	66.61	45.42	45.42	0	45.42	0
SAV Live Woody (1/cm)	19.37	15.14	19.37	46.93	19.37	0
Fuel Bed Depth (cm)	91.44	182.88	91.44	53.34	91.44	128.02
Moisture of Ext. (%)	13	15	25	40	25	15
Dead Heat content (kJ/kg)	23,260	18,608	21,399	18,608	21,399	25,311
Live Heat content (kJ/kg)	23,260	18,608	21,399	18,608	21,399	25,311

Source: Weise and Regelbrugge, 1997

Initial Fuel Moisture

Date	Chamise	Sage	Sumac	Critical	Temp	RH
11/21/06	24.8	48.30	74.60	60	75	48
12/30/06	70.20	122.00	101.20	60	65	29
01/13/07	69.30	124.70	90.40	60	57	6
01/27/07	65.70	123.20	91.80	60		
03/03/07	59.40	182.00	92.90	60		
03/10/07	68.20	131.20	95.20	60	75	54
03/24/07	70.50	97.90	91.30	60	73	43
04/07/07	73.80	96.30	119.20	60	60	73
05/05/07	76.00	94.50	90.90	60	82	32
05/20/07	62.80	116.50	132.10	60	82	26
06/02/07	85.70	106.30	98.70	60		
06/11/07	84.40	94.00	156.10	60	80	38
06/16/07	72.20	74.00	120.30	60	83	31
06/30/07	67.00	78.40	145.00	60	88	35
09/08/07	57.50	18.80	86.50	60	85	33
09/23/07	27.70	45.60	57.50	60	71	49
10/06/07	50.50	96.80	94.80	60	76	23

Chaparral Environmental Regimes Used In Fire Spread Predictions

Property Name	Moderate Conditions	Extreme Conditions
Dead 1 Hour Fuel Moisture	0.08	0.02
Dead 10 Hour Fuel Moisture	0.09	0.04
Dead 100 Hour Fuel Moisture	0.11	0.05
Live Herbaceous Fuel Moisture	1.50	0.90
Live Woody Fuel Moisture	1.10	0.70

Weather & Wind

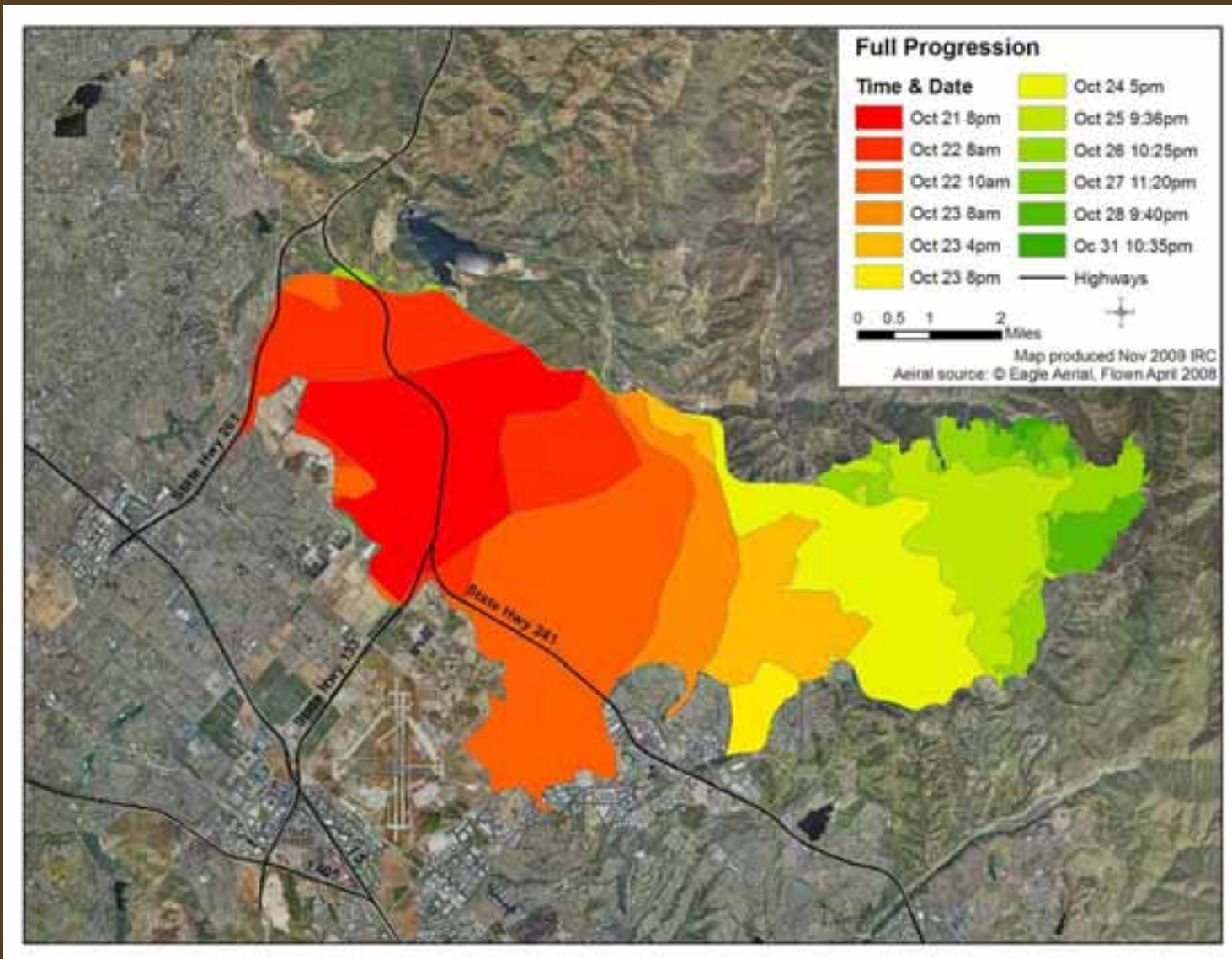
- Fremont Canyon weather station (RAWS)
- Elevation: 1781 ft / 543 m
- Bureau of Land Management and California Dept of Water Resources

Precipitation	Hour 1	Hour 2	Temp 1	Temp2	Humid1	Humid 2	Elevation
0	12:30AM	3:00 PM	27	37	20	3	543

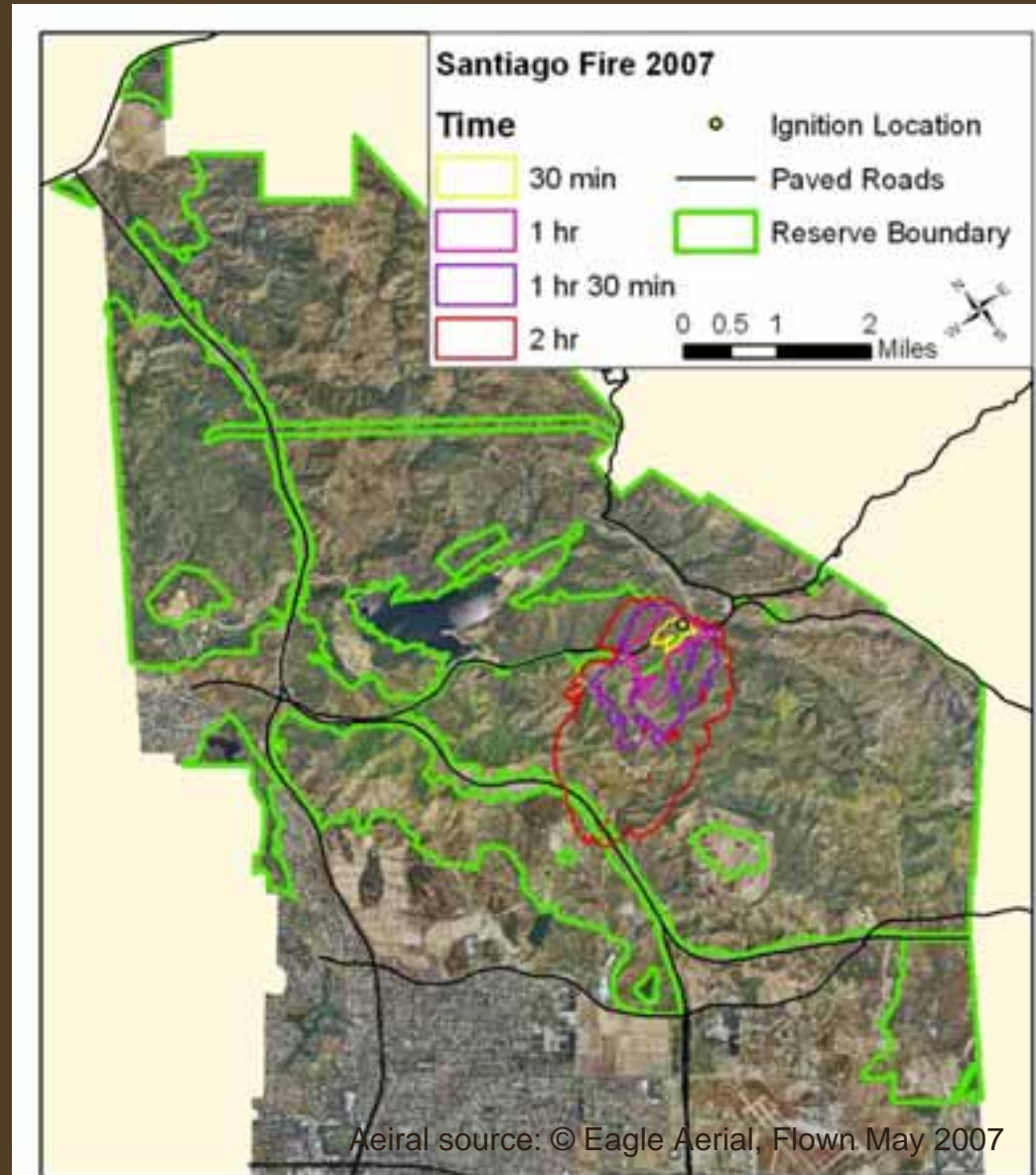
Hour	Speed (Km/hr)	Direction	CloudCover
1800	48	75	0
1900	48	69	0
2000	48	60	0



Single Fire Simulation



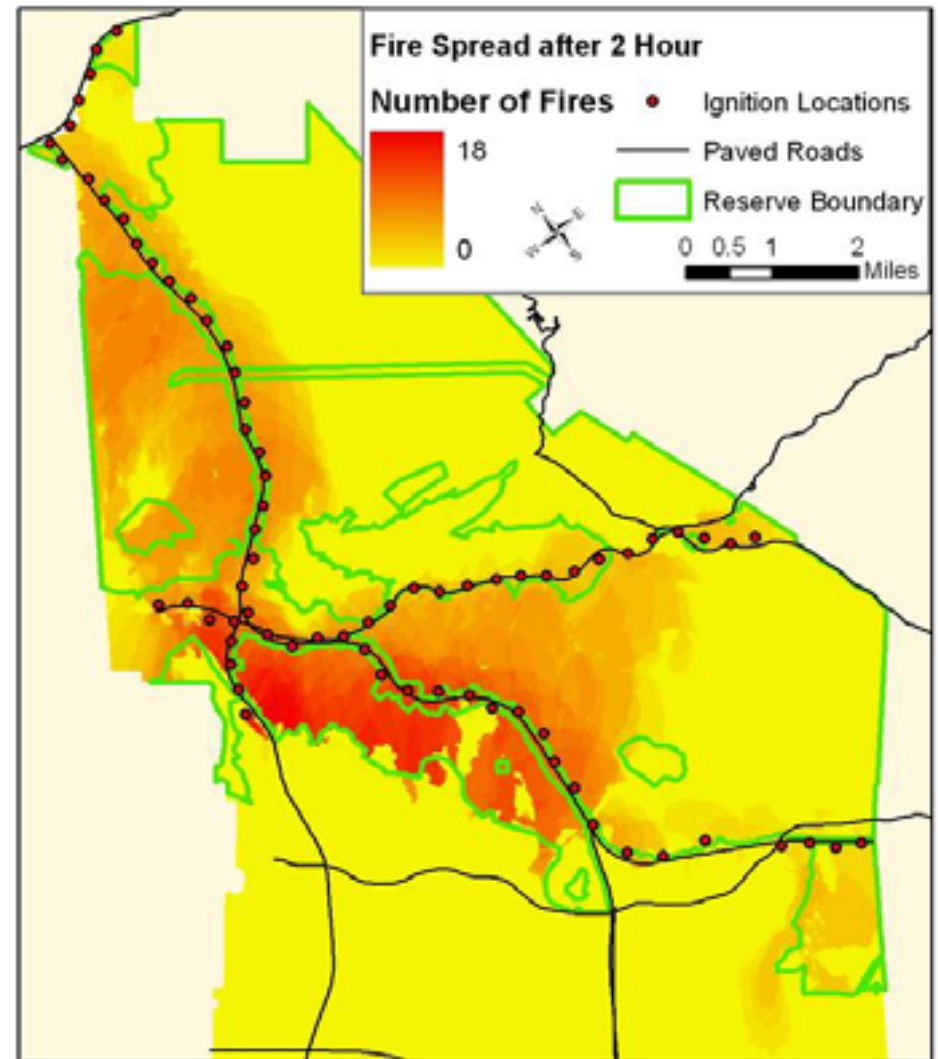
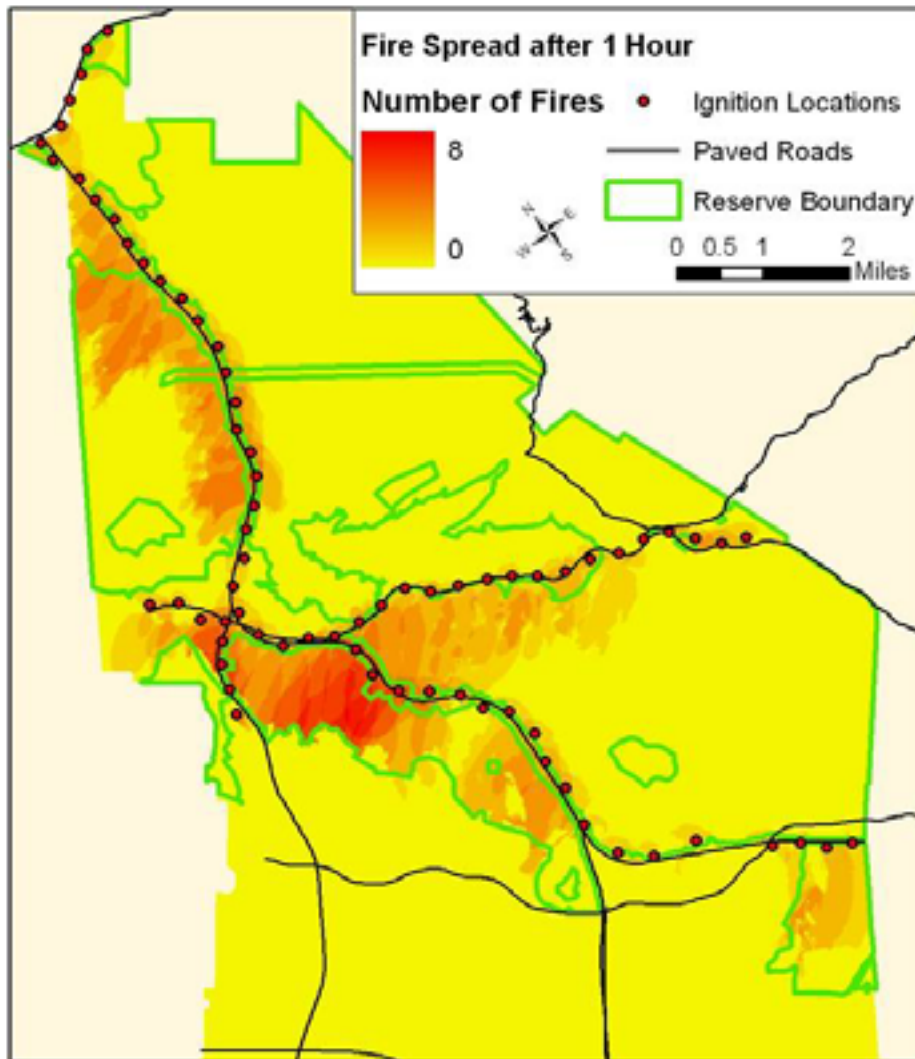
Single Fire Simulation



Multiple Fire Simulation

- Purpose:
 - Create fire probability map to inform management decision
- FARSITE
 - Ignition points Half Km apart along target ignition paved roads

FARSITE

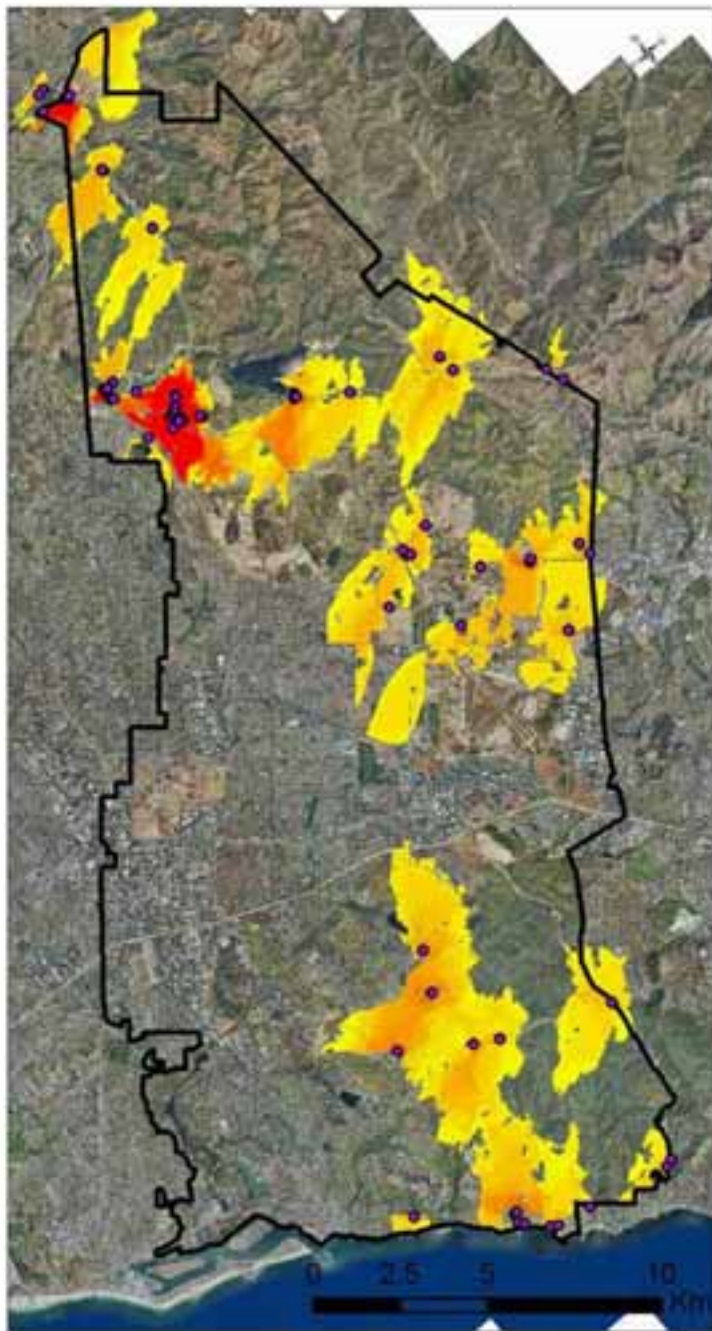


Multiple Fire Simulation

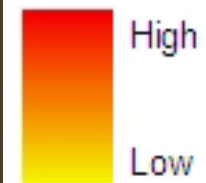
- Challenge
 - FARSITE
 - Time consuming
 - No variation in weather data
- New approach
 - David Weise, John Benoit
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Multiple Fire Simulation

- Command-line version of FARSITE
 - Run multiple simulation automatically
 - Randomly select ignition points and weather data



Fire Probability



◆ Ignition points

□ Irvine Ranch Boundary

Next Steps

- Create ignition probability surface
- Use multiple weather station data to create a landscape weather layer
- Improve county-wide fire probability map

Question?

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