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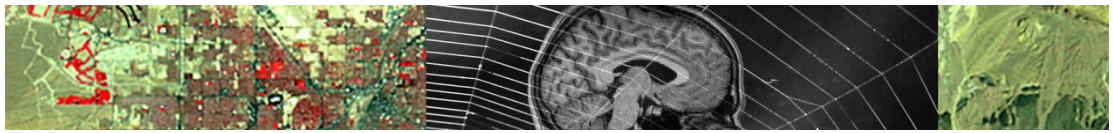

Spatial Literacy, Geographical Information Technologies, and Solutions to Societal Problems

Donald Janelle, Program Director, spatial@ucsb

Val Noronha, Digital Geographic Research Corporation

Richard Church, Professor, Geography, UCSB

Jake Sopher, Undergraduate Geography Student

4 October 2008
A Presentation to the
Board of Directors

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
ALUMNI ASSOCIATION

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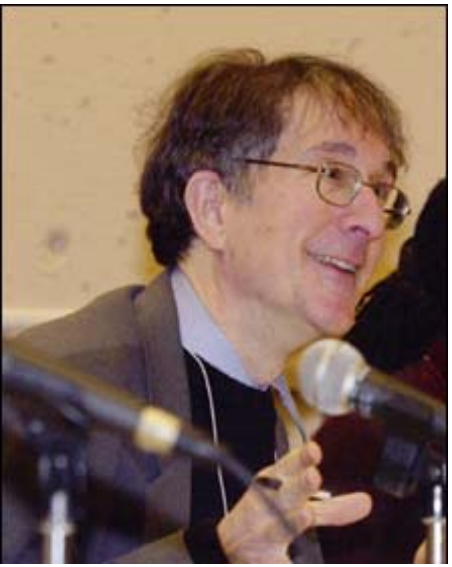
Spatial@ucsb

Founded in 2007 as a center for spatial studies under the direction of Michael Goodchild

Mission: to facilitate spatial thinking and use of spatial tools for learning, discovery, and problem solving in the natural, social, and behavioral sciences

Multiple Intelligences



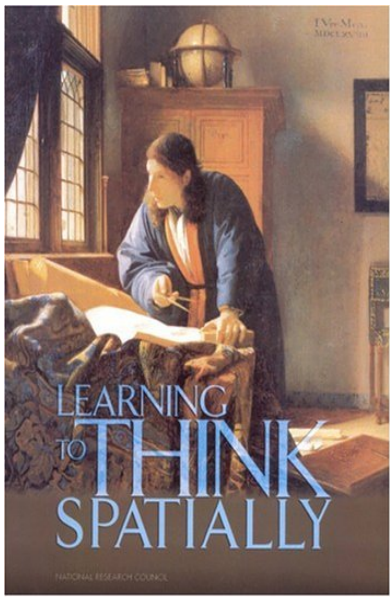
Howard Gardner, MIT

seven types of intelligence

Spatial Intelligence

- "These children think in images and pictures. They may be fascinated with mazes or jigsaw puzzles, or spend free time drawing, building with Lego or **daydreaming.**"

National Research Council report
***Learning to Think Spatially**, 2006*



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Established 2007 to integrate a campus-wide community of spatial thinkers

National Center for Geographic Information & Analysis
NCGIA Buffalo Santa Barbara Maine

The SAGE Center
For the Study of the Mind

CSISS
Center for Spatially Integrated Social Science
Spatial Resources for the Social Sciences

Cognitive Science Program
UCSB

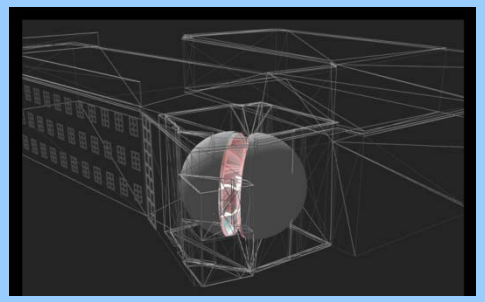
Hegarty Spatial Thinking Lab

CENTER FOR THE ANALYSIS OF SACRED SPACE

Alexandria Digital Library

SPOT at UCSB

The ALLOSPHERE



UCSB Four Eyes Lab
Imaging, Interaction, and Innovative Interfaces

UNIVERSITY OF CALIFORNIA, SANTA BARBARA
CNS–UCSB
Center for Nanotechnology in Society

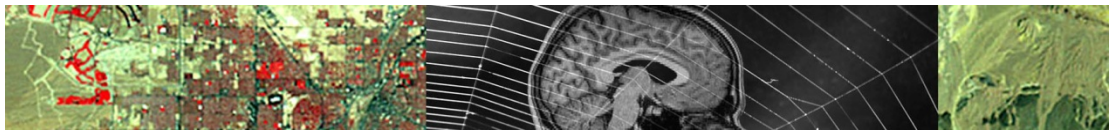
Mike Goodchild, director of spatial@ucsb

"spatial@ucsb aims to change what people think of spatial thinking – from something that only experts need to know about, to something that everyone should use."

National Center for Ecological Analysis and Synthesis

$$\frac{\partial}{\partial t}(\nabla^2\phi) = \frac{\partial\psi}{\partial z}\frac{\partial}{\partial x}(\nabla^2\psi) - \frac{\partial\psi}{\partial x}\frac{\partial}{\partial z}(\nabla^2\psi) + \nu\nabla^2(\nabla^2\psi) + g\alpha\frac{dT}{dx}$$

UCSB is Spatial



Applying Spatial Concepts and Geo-spatial Technologies

- Maps
- Geographic information systems (GIS)
- Global positioning systems (GPS)
- Satellite remote sensing
- Environmental sensors that know where they are

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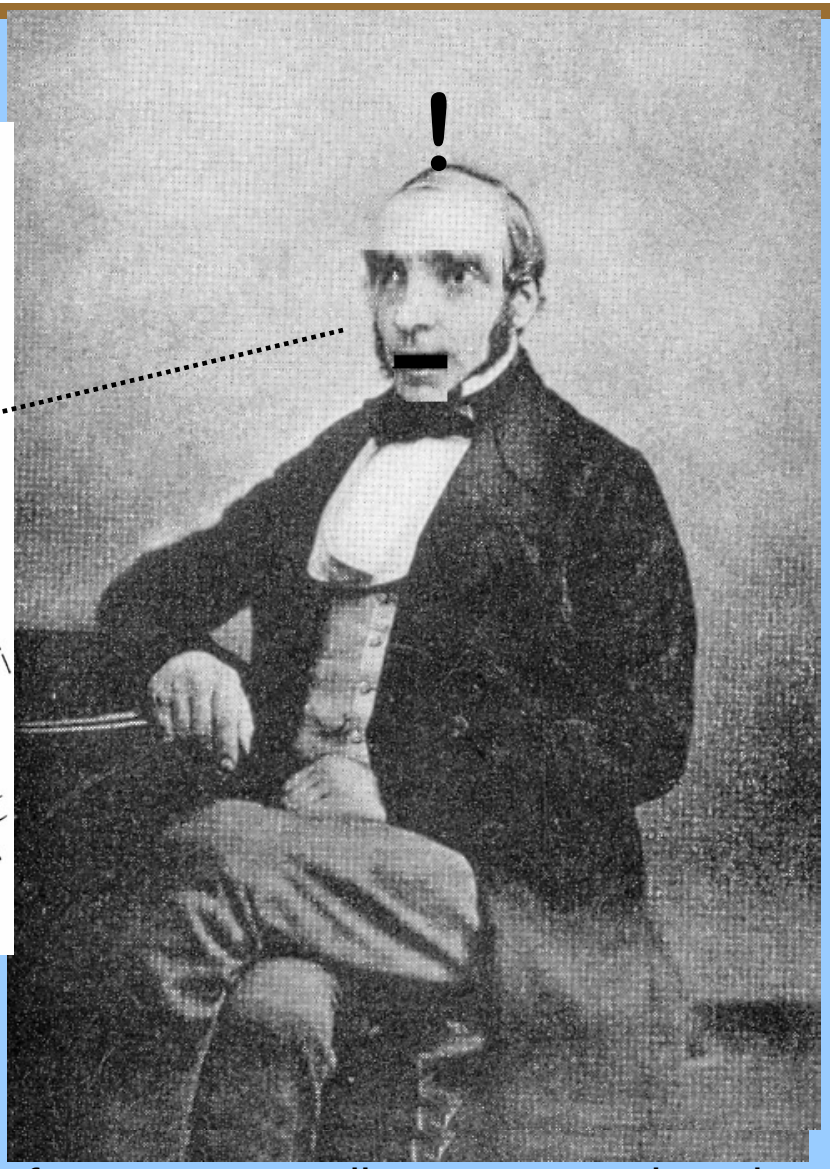
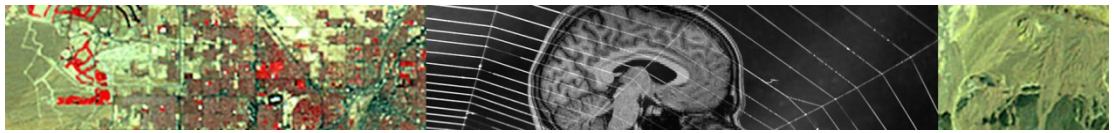
London Cholera Epidemic,1854

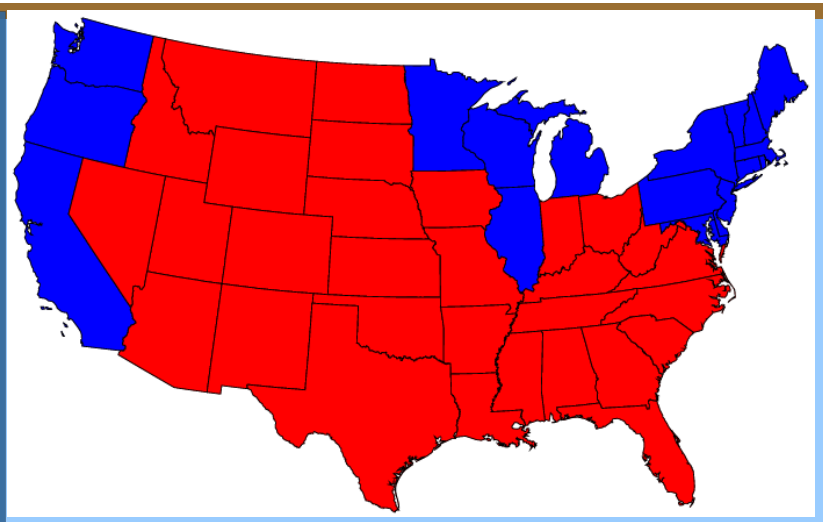


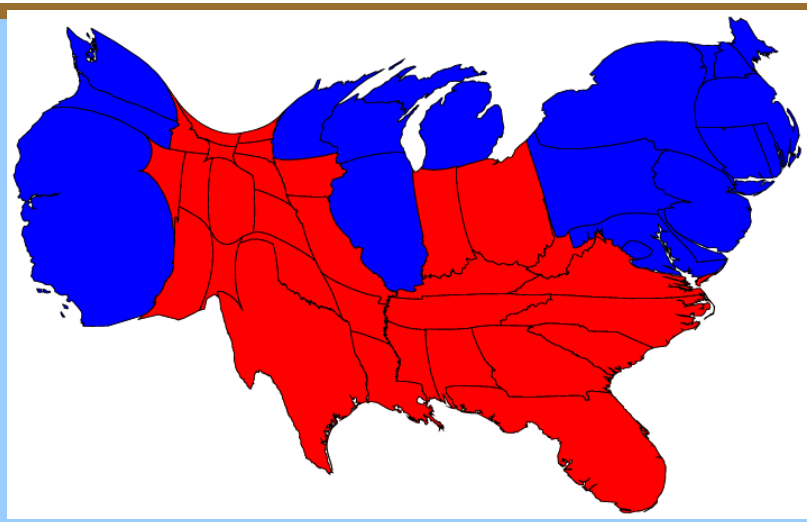
from Lance Waller, Emory University

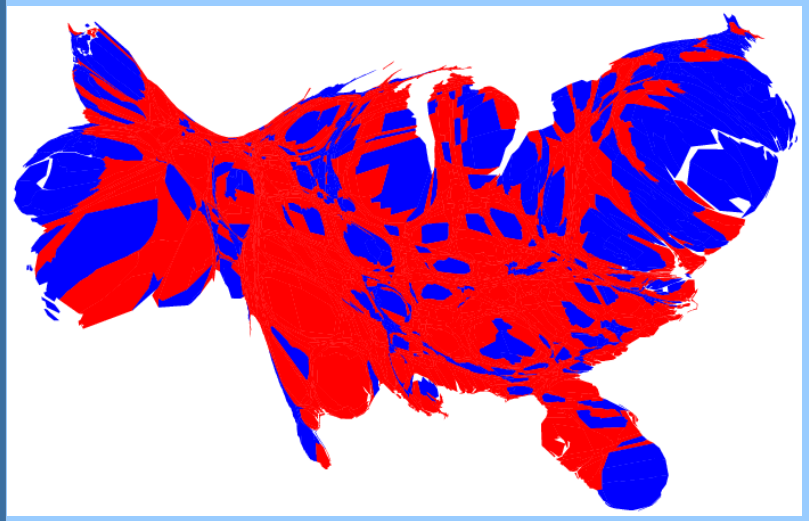
Johnson, S. (2006) *The Ghost Map.* Riverhead

Snow, J. (1949) *Snow on Cholera.* Oxford University Press.



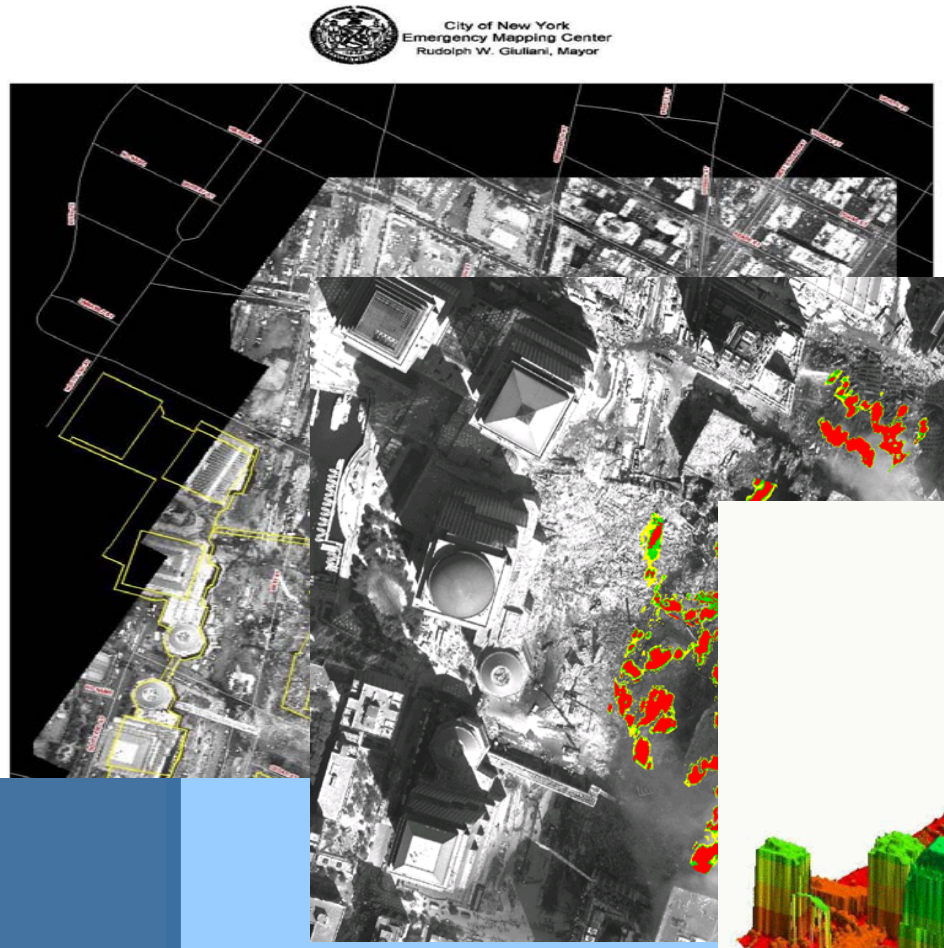


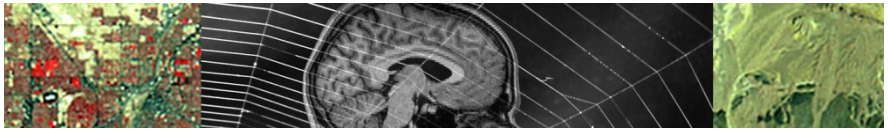


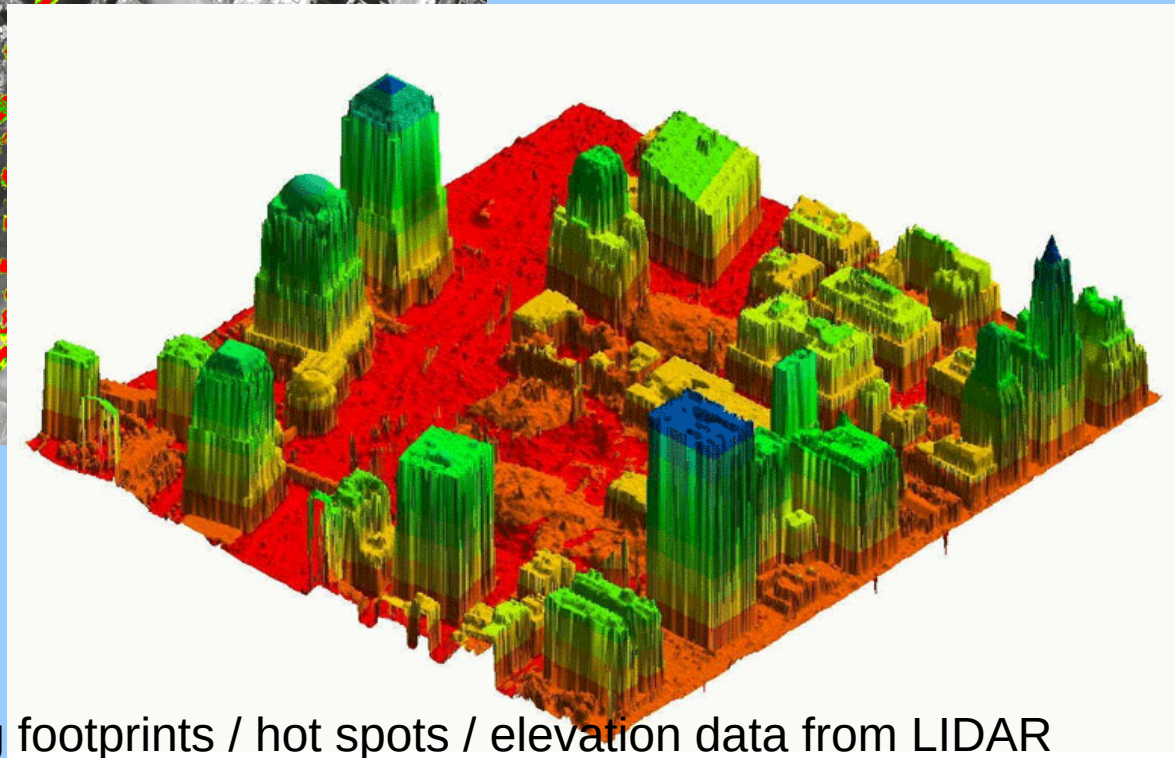


Michael Gastner, Cosma Shalizi, and Mark Newman
University of Michigan

http://www-personal.umich.edu/~mejn/election/







Aerial Imagery / building footprints / hot spots / elevation data from LIDAR

NYC Office of Emergency Management and NY Office of Cyber Security and Critical Infrastructure Coordination

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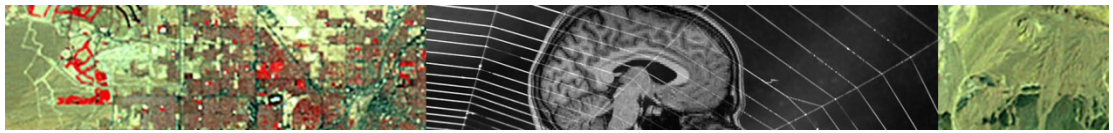
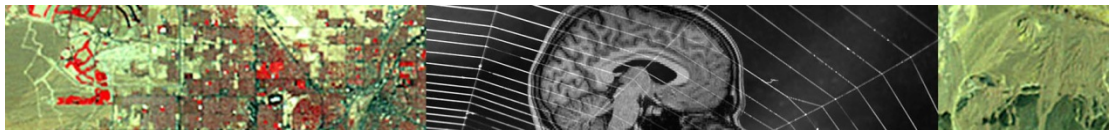


Applying Spatial Technology to Solve Societal Problems

- Congestion, Logistics, and Environmental Impacts of the Ports of LA / Long Beach (*Val Noronha*)
- Emergency Preparedness: An example from Mission Canyon, Santa Barbara *(Richard Church)*
- Gap Fire 2008 *(Jake Sopher)*
- Spatial Literacy for 6th graders



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NATIONAL CONSORTIUM ON REMOTE SENSING IN TRANSPORTATION
FREIGHT—PORTS

Congestion, Logistics, and Environmental Impacts of the Ports of LA / Long Beach (*Val Noronha*)

DGRC-UCSB Partnership in Transportation

- 1997: USDOT-Caltrans, SAE standards
- 2000: USDOT: 4 national consortia, remote sensing
- 2007: USDOT: 7 national consortia, remote sensing/GPS

Image: Google Earth

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FREIGHT—PORTS

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FREIGHT—PORTS

Facts

- Big and growing
  - World's largest port outside China-Singapore
  - 40% of U.S. import containers
  - 3x NY-NJ
  - 5x growth since 1990
  - 3x more growth by 2030
- Drayage trucking is critical link
  - Freeways were designed for 1970s freight volumes
  - Owner-operators, make $10/hr net
  - No fleet optimization
  - Port operations: 50% of LA emissions

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FREIGHT—PORTS

Important Questions

- Before investing in new infrastructure:
  - Freight freeways, maglev … need to know where the goods go. When? Congestion times? Terminal gate delays?
- Operational improvements:
  - Unproductive trips (empty containers, bobtails)
  - Terminals synchronize with truck arrivals?

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FREIGHT—PORTS

Solutions

- Live data
  - Comprehensive urban dynamics
- Modeling
  - Infrastructure decisions
  - Operational efficiency
- Stakeholders
  - Caltrans, LA DOT, SCAG
  - Terminal operators: APL (partner)
  - Trucking companies: TE (partner)
  - Commercialization consultants
- Target: 10% reduction in port area freight traffic

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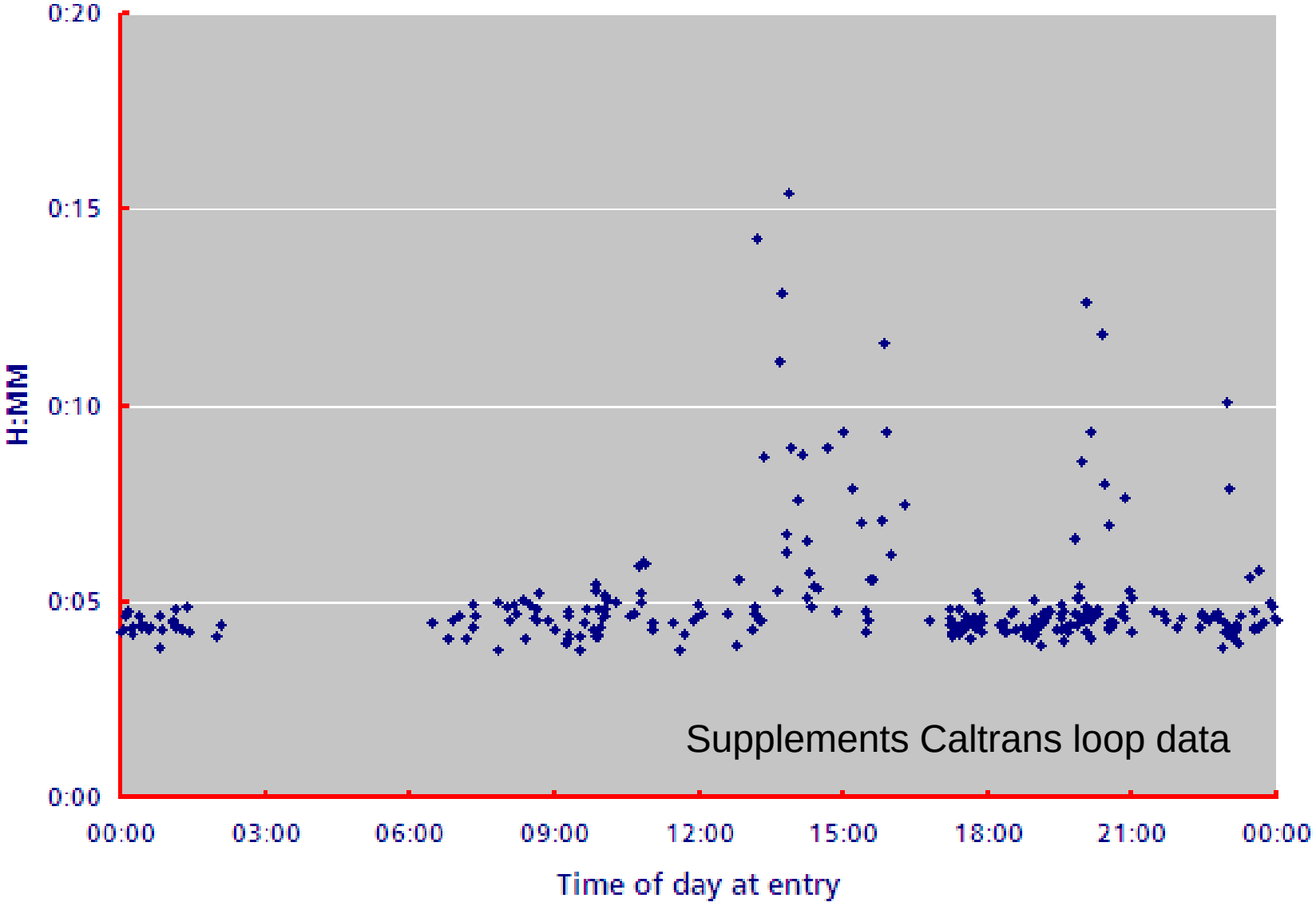
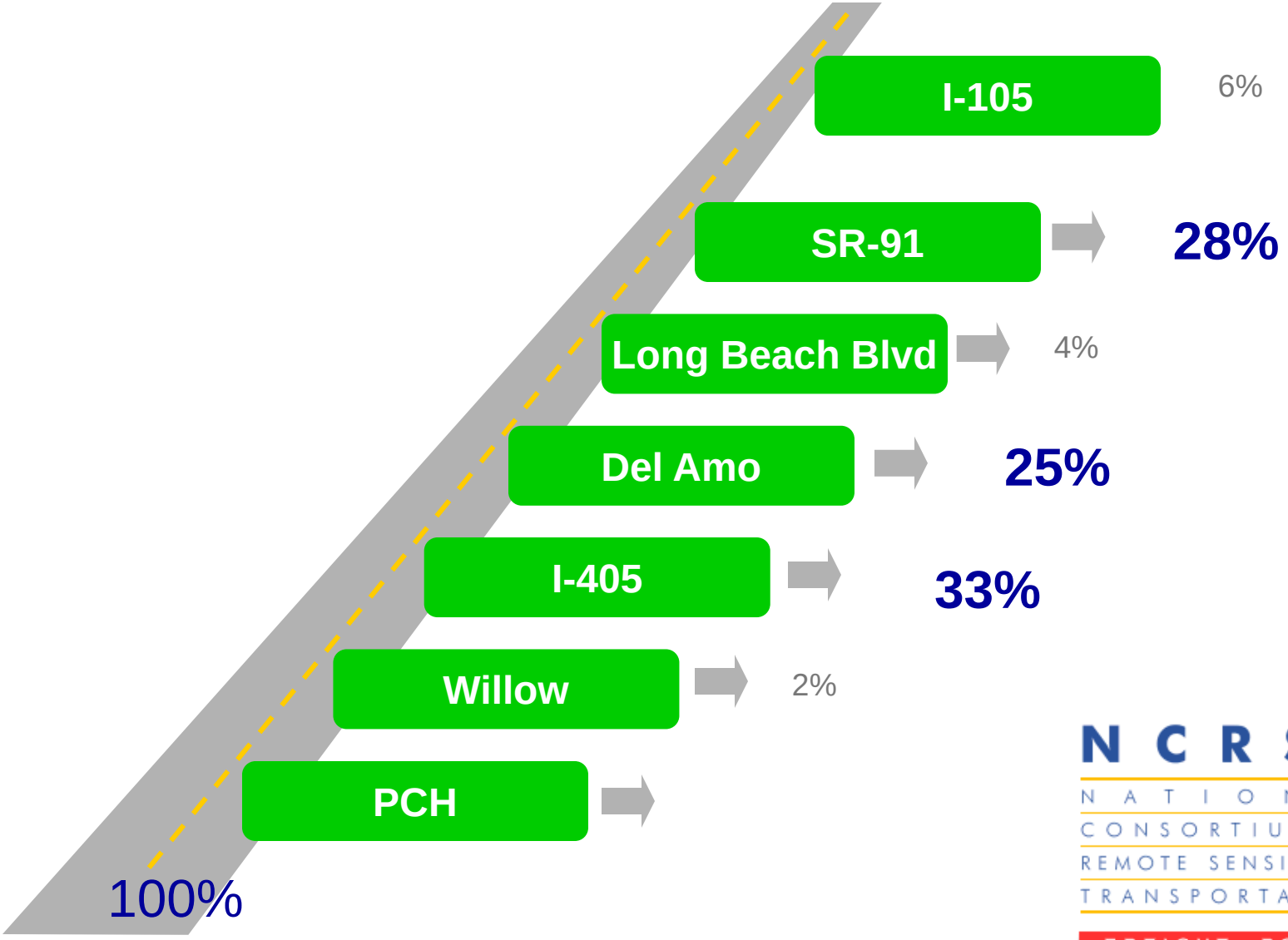
Travel Time: I-710 N to I-405

2008 July 1-31



Meso Dynamics (710 N)



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Micro Analysis

- Truck detours: incursions on non-designated streets
  - Insufficient turn radii
  - Break median dividers, light poles
  - Traffic signal timing
- Parking in residential neighborhoods

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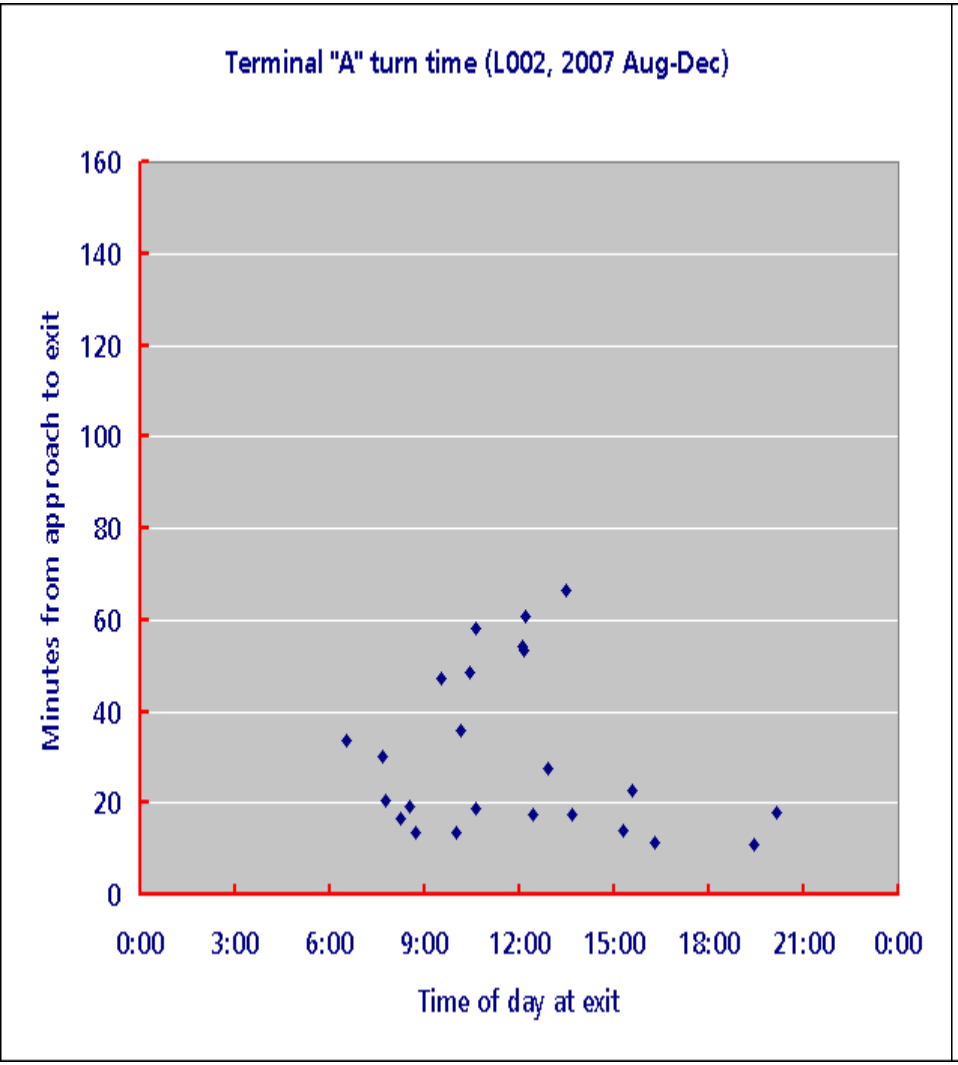

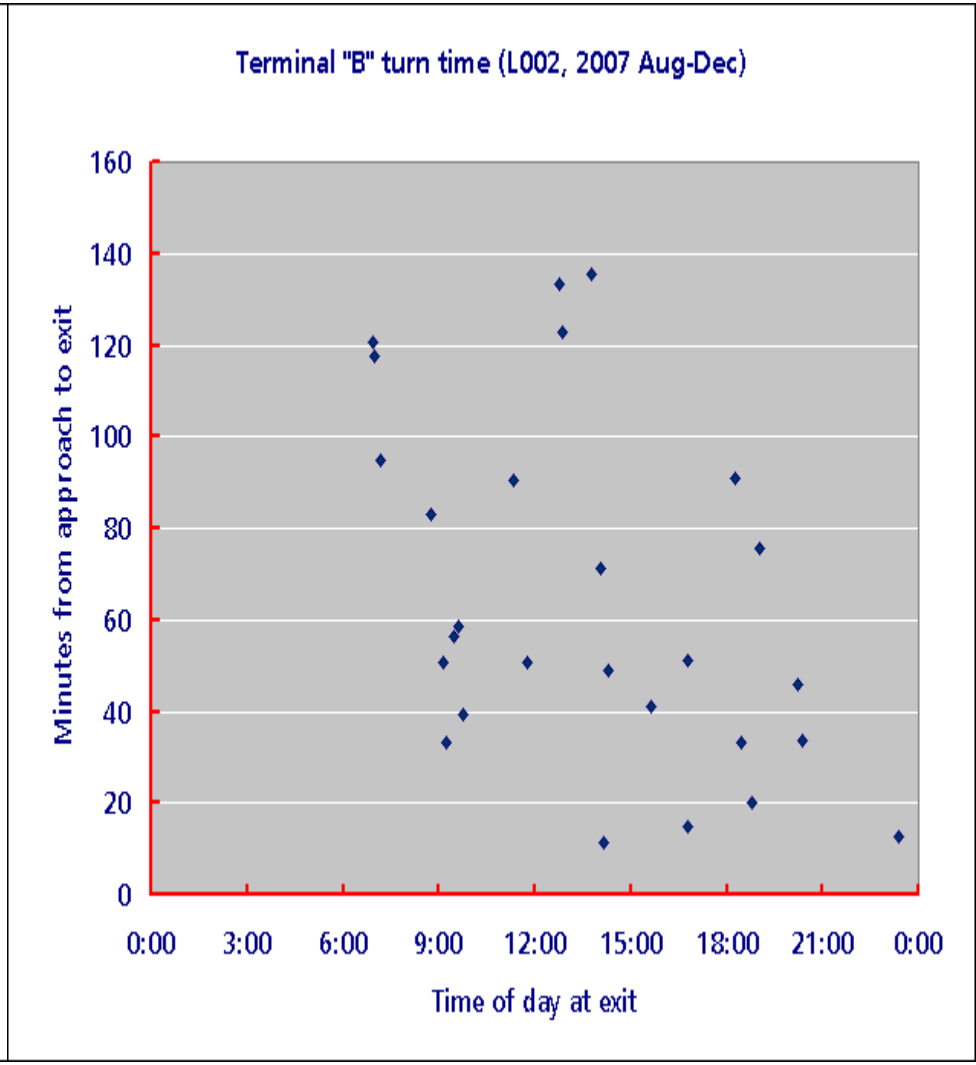

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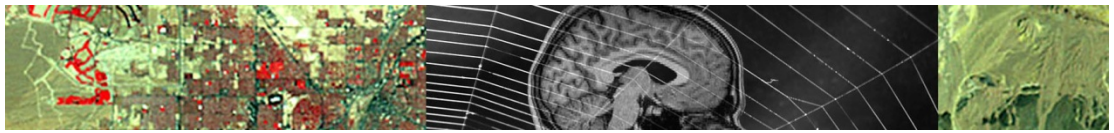
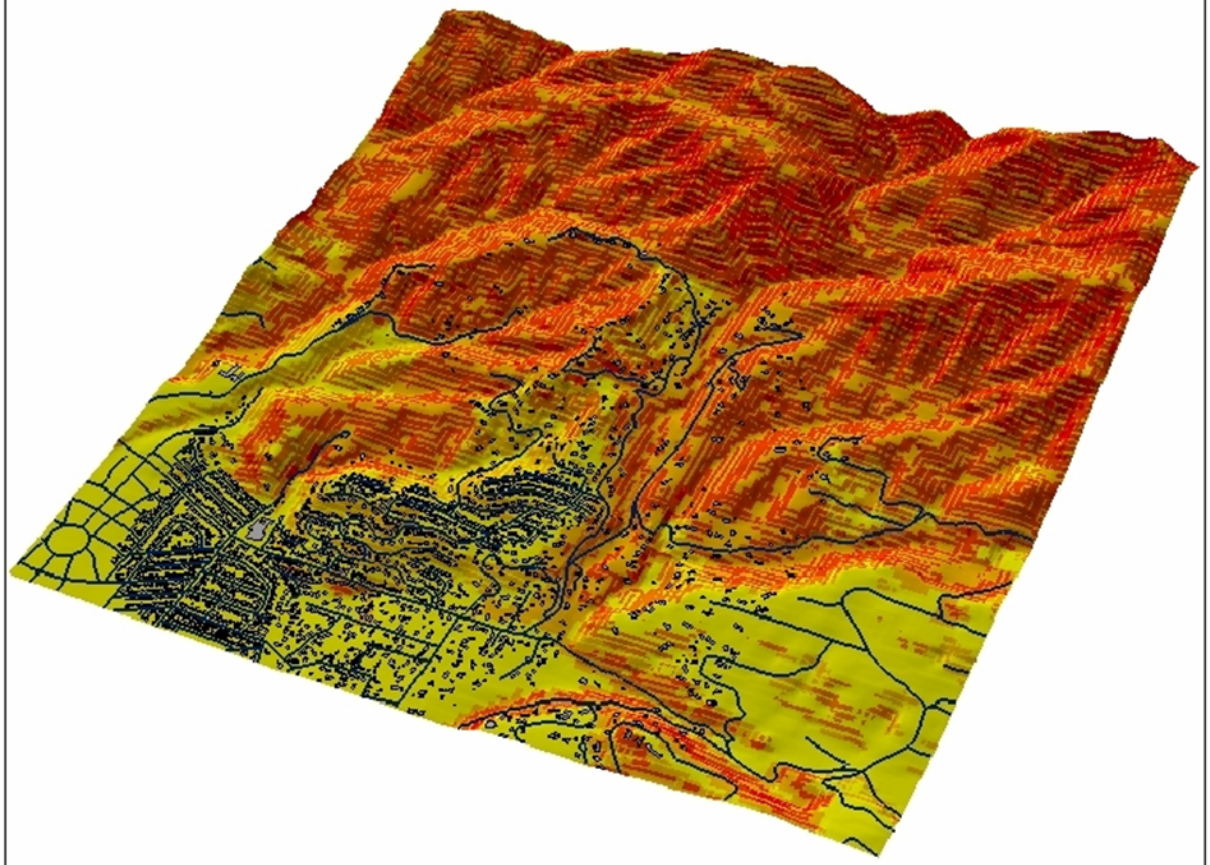
Fire Hazard & Evacuation

Mission Canyon Santa Barbara

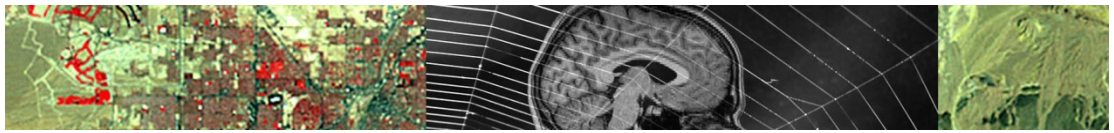
Based on research by Richard Church (UCSB)



Mission Canyon Wildfire Hazard
Santa Barbara County



Street Centerline
Building Footprints
Medium Risk
High Risk
Extreme Risk



Los Angeles T

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Thursday, July 31, 2008

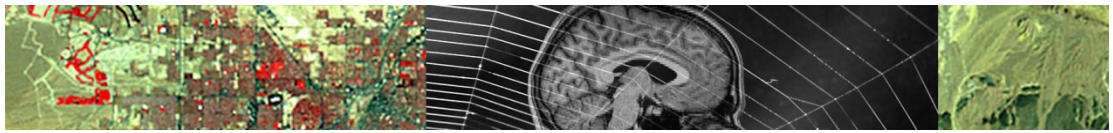
BIG BURN

Many Californians live in or near the combustible wild. Santa Barbara County's bucolic Mission Canyon is a prime example. Despite its ample allures, it's a firetrap.

IN HARM'S WAY

By Bettina Boxall : Times Staff Writer

Third of five parts



- Simulations
  - 1.8 vehicles per driveway
- Driver behavior influenced by:
  - lane width
  - slope
  - view distances
  - traffic control mechanisms
  - information feedback
  - driver aggressiveness
- 770 homes
  - clearing times > 30 minutes

2D clip

3D clip

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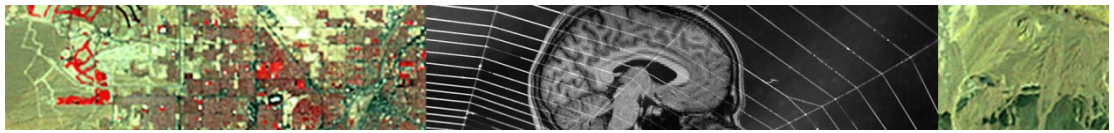
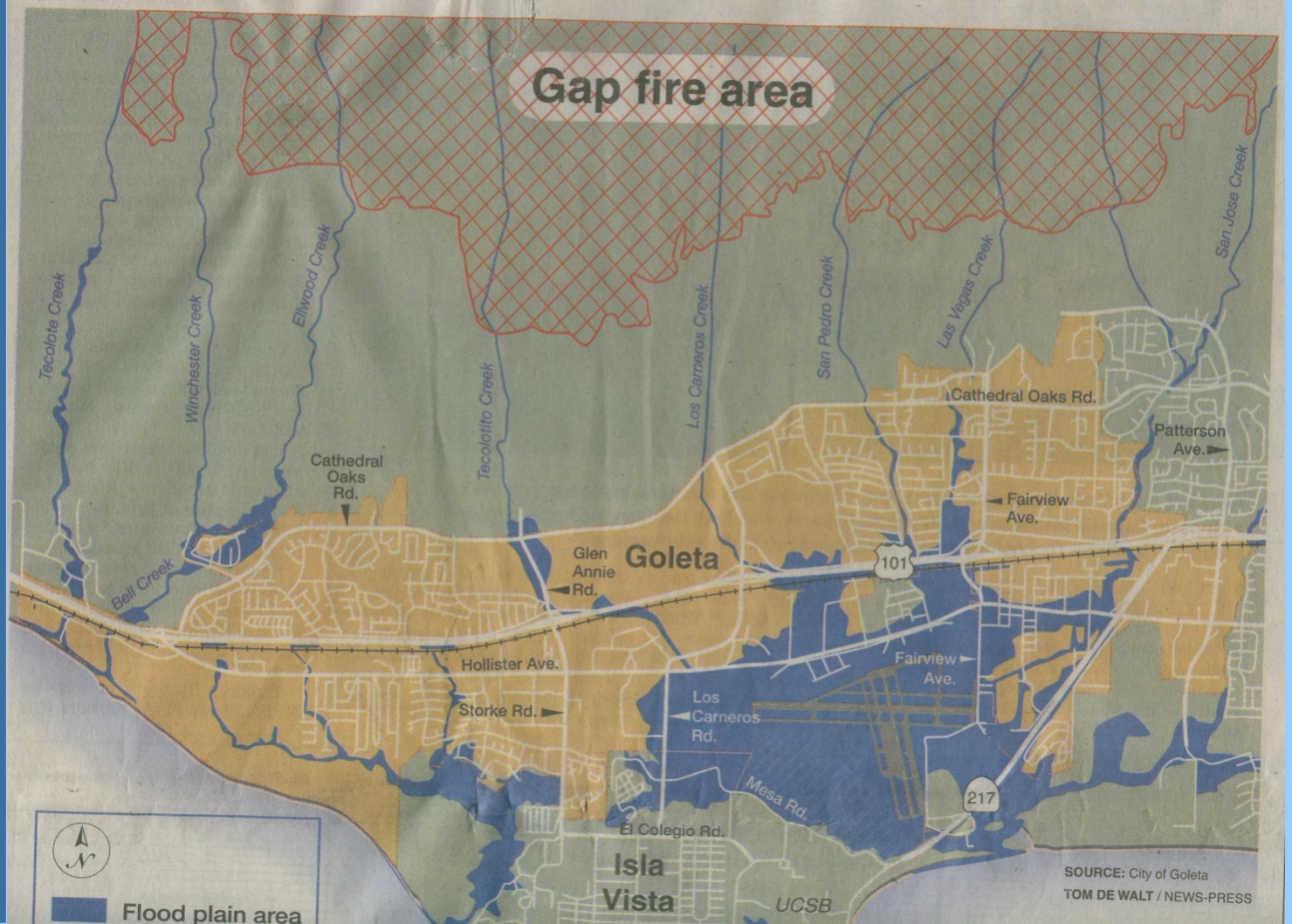


FRIDAY, SEPTEMBER 19, 2008

Goleta to hold meetings to address flood concerns



Gap Fire

- Started 1 July 08
- Contained 28 July
- Burned 9,443 a.
- Power outages >150,000 homes
- >2,500 fighters
- >3,200 homes threatened
- >5,000 people evacuated

Map from Santa Barbara News Press

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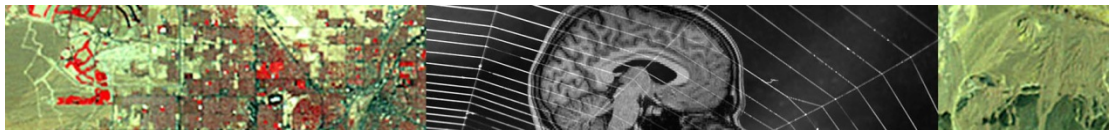

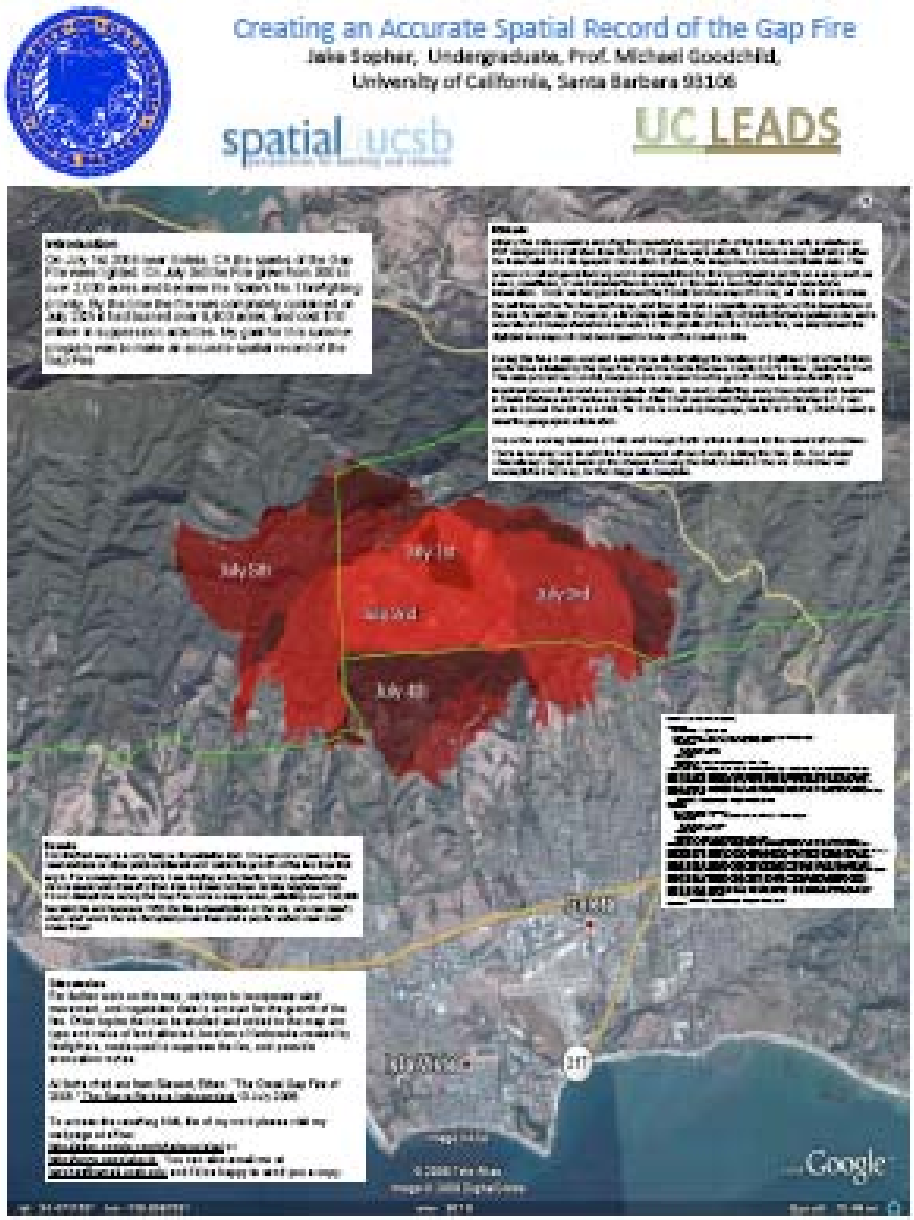

Map of the Recent Gap Fire

- Further analysis will be performed on map
- Map was created to have a record/archive of Gap Fire
- Focusing on fire behavior and emergency response
- Current map shows interaction of power lines and fire

http://www.geogjake.tk

Based on work of Jake Sopher
on behalf of spatial@ucsb, 2008

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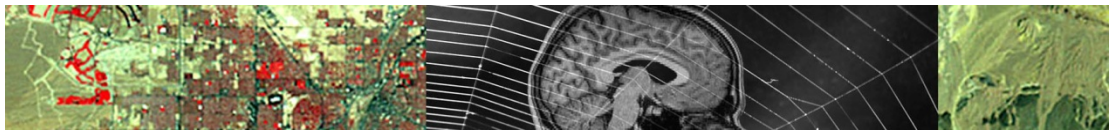
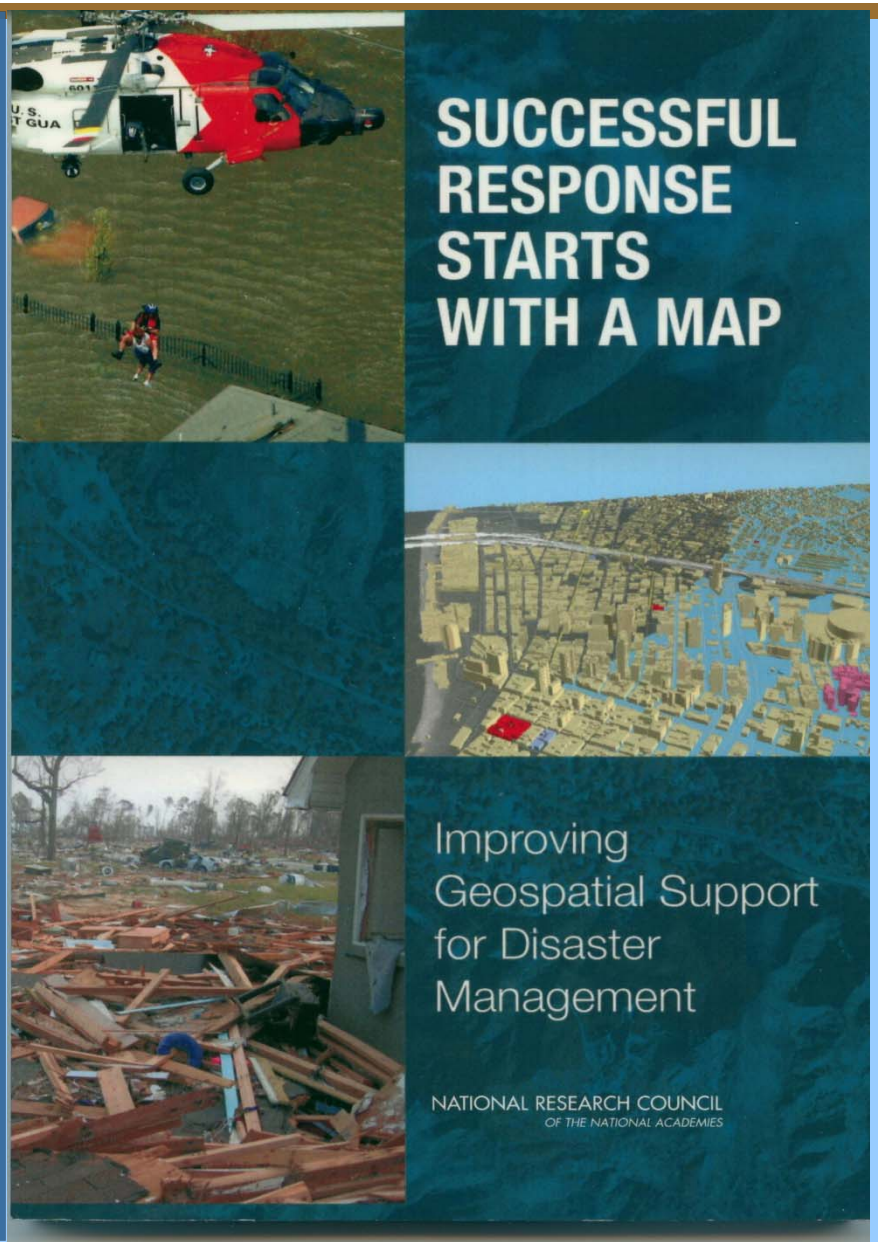


Emergency Preparedness for Santa Barbara

spatial@ucsb proposal to engage community and researchers to build prototype geo-information and communication system for emergencies

- Santa Barbara—good case for proof of concept
  - isolated by physical geography
  - limited transportation accessibility
  - Diverse range of potential hazards
  - UCSB—leader in geo-spatial technologies
- System to serve:
  - responders & strategic planners
  - citizens



- National Research Council Report, 2007
- Michael Goodchild, Chair of the NRC Committee on Planning for Catastrophe
- Available at www.nap.edu

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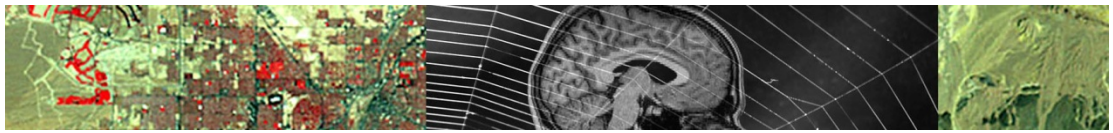

Promoting Spatial Literacy in Education

- Identify spatial concepts basic for human well-being and for every-day life decisions
- Introduce geographic tools to access data, analyze patterns and processes, and solve problems
- Develop curricula resources for school teachers and for undergraduate instructors/students
- Create Web resources for teachers and learners

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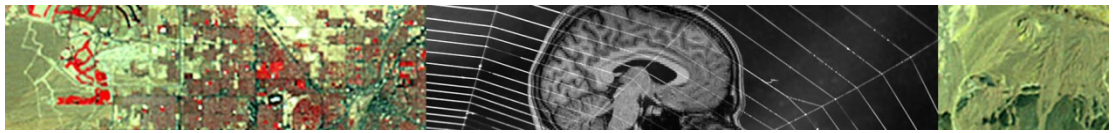

Nurturing the Next Generation of Spatial Thinkers


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Thank You

Questions?

For more information on applications of spatial thinking in science and society

www.spatial.ucsb.edu