

Earthquake Related Hazards Tsunami and Fire

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Tsunamis

- Series of traveling ocean waves of extremely long length generated by earthquakes, volcanoes, or landslides occurring below or near the ocean floor
- Great lengths between wave crests (60mi in deep ocean), and time between waves (10min>1hr)



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Tsunamis

- In shallow water, column of water is compressed
- Effects are amplified as tsunami enters bays, harbors, lagoons, shoals
- Second, subsequent waves are often most destructive
- Maximum heights of ?



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Tsunamis

- 3,400 Years ago, Minoan empire vanished overnight, Egyptian trading records indicate that Minoan ships simply stopped arriving
- About 1650 BC Santorini Volcano blew up and collapsed (about 4x bigger than Krakatoa). Wave heights of 50-100m
- Atlantis?



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Tsunamis

- Lituya Bay, AK: July 9, 1958
 - Waves rose to 1720 feet
 - Landslide associated with earthquake
- Sumatra, Indonesia: december 26, 2004
 - Magnitude 9.0, maximum wave run-up 30m in Western Sumatra
 - More than 283,000 fatalities



(A Third of Indianapolis Metro Area)
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Tsunamis

- **Before & After Jan 10, 2003 – Dec 29, 2004**
- Devastation extends 140 miles along coast & 2 miles inland



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Tsunamis

- Scour and Submergence



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What Do We Do About It?

- National Tsunami Hazard Mitigation Program
 - NOAA as lead, USGS, FEMA
- Originally 5 States: AK, CA, HI, OR, WA
- Warning Guidance, Hazard Assessment, Mitigation
- As a result of Sumatra, Congress has several bills in process



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Tsunami

- S50 has passed Senate, Bills in house
- Bottom Line: Increased funding for NOAA
 - Open Program to all threatened states
 - Upgrade and maintain warning system
 - “Tsunami Safe” communities
- Increased funding for USGS
 - Enhanced Equipment
 - NEIC Operations 24/7



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Fire Following

- Threat to lives and property following earthquakes, can cause more damage than seismic events themselves
- Drain on EMS
- Major and Minor Fires
- Undetected hazards months after initial event



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Fire Following

- 1906 SF: Fires Burned For Three Days
 - 28,000 buildings destroyed
 - 80% of damage was done by fire
 - Army tried to use TNT for extinguishing flames, which caused additional ignitions



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Fire Following

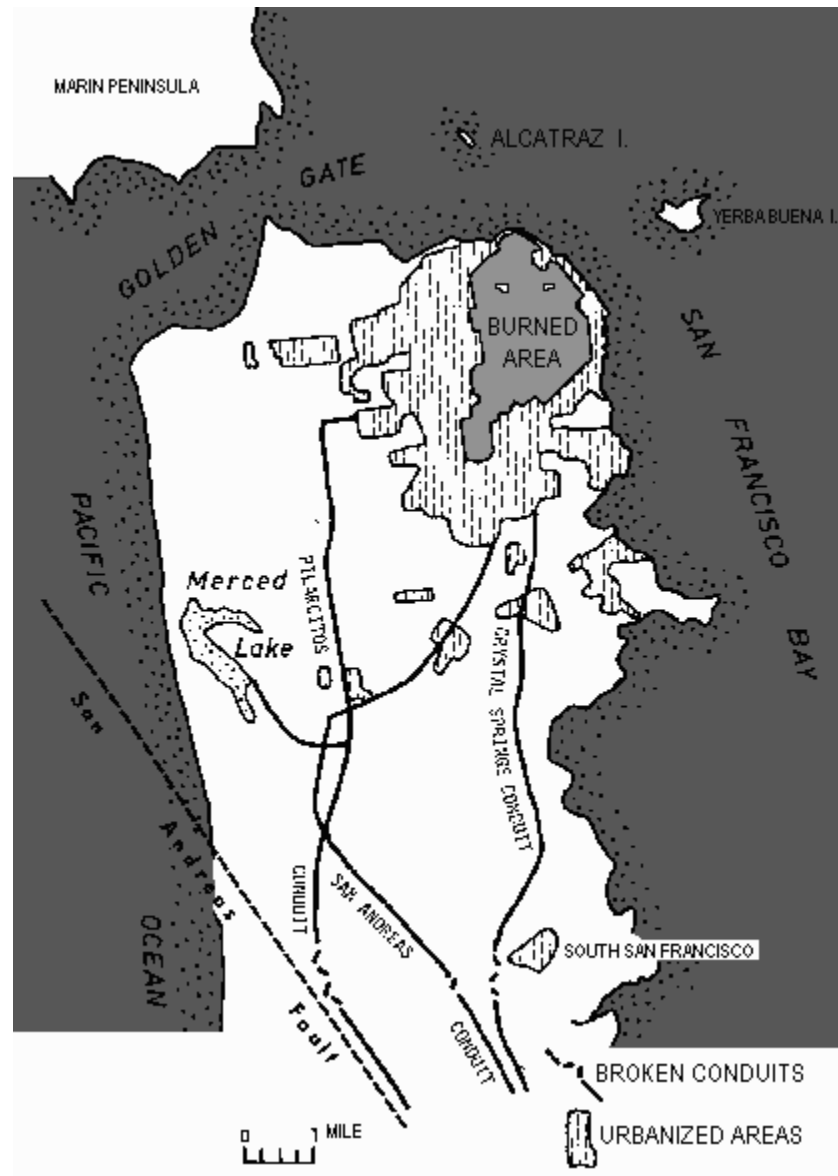


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Fire Following



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Fire Following

- 1989 Loma Prieta EQ
 - 26 Fires in San Francisco as a result of the earthquake
 - Marina District hydrants lacked pressure and volume due to broken mains
 - Water in the Bay was inaccessible to fire engines
 - Fire Boat pumped to reservoir, created pumper relay



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Fire Following



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Fire Following

- Northridge Earthquake: January 17, 1994
 - Mw6.7 0431
- More than 110 earthquake related fires
 - Most due to broken gas lines and secondary ignition
 - Arcing downed power lines
 - Chemical Reactions
 - Aftershocks created more fires as structures shifted further, weakened systems failed



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Fire Following



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Thank You



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