L A Times Photo

Wildfire and debris flows: Our Greatest Hazards?

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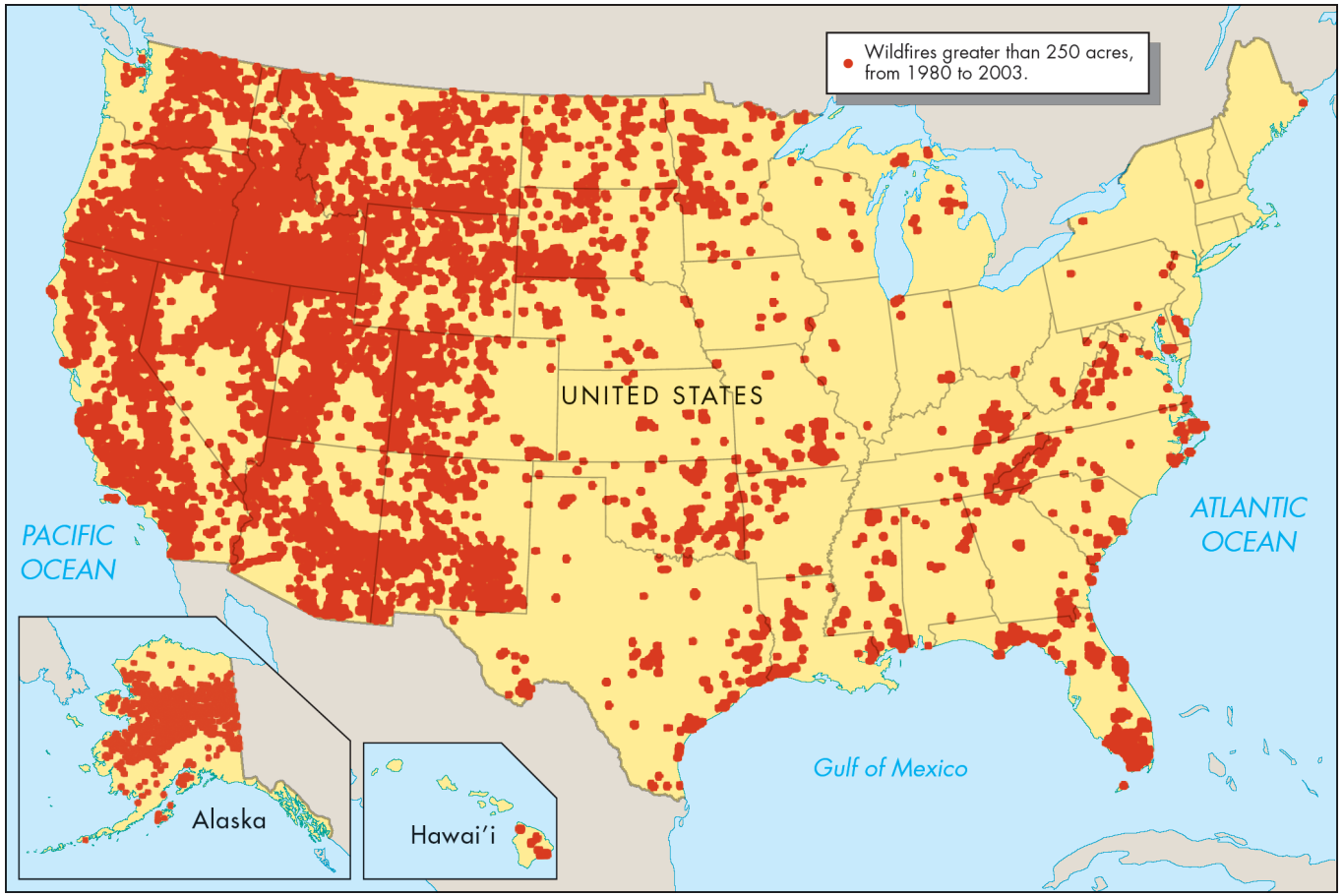
https://www.slideshare.net/secret/4o6fqsdk7NI84B



Wildfire is natural process that helps balance the carbon budget

As a result of climate change

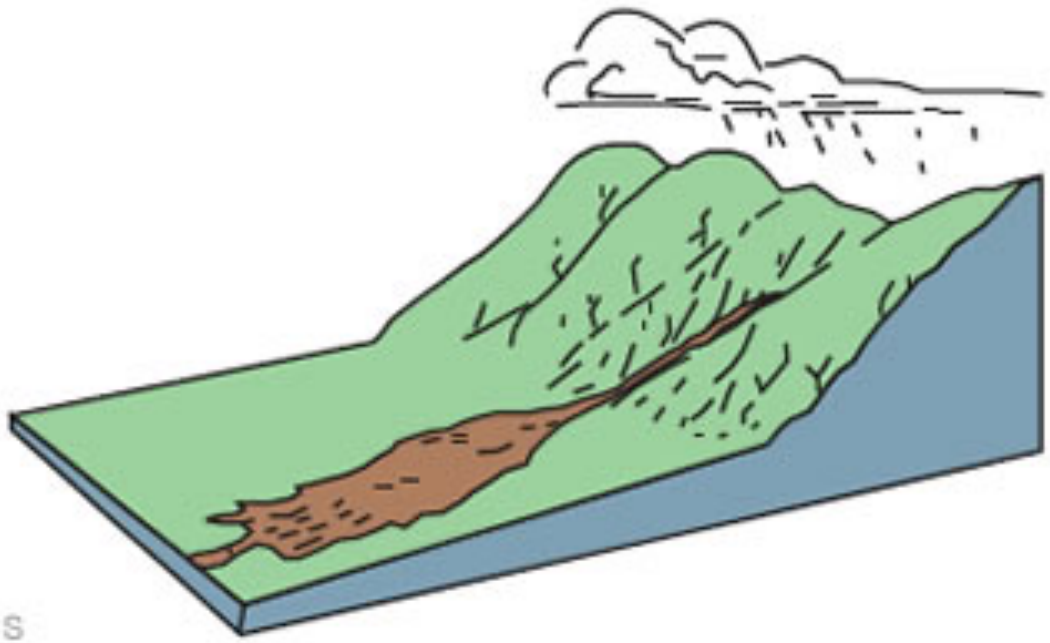
Wildfire intensity and size are increasing

Fire season is getting longer—now almost all year

The Event

The January 9, 2018 debris flow through the village of Montecito, just east of Santa Barbara followed the Thomas Fire by just days. The fire removed mountainside vegetation, baking the soil. An intense burst of rain in just 5 minutes was followed minutes later by debris flows that were initiated in several mountain canyons and roared down in or near coastal streams killing 21 people (two still missing), destroying or damaging several hundred homes and commercial property and closing US 101 for about 3 weeks.

There is a difference between **mud slide** (not a geologic term); **mud flow** with more than 60 % fine sand, silt and clay; **debris flow**, a fast moving flow of mud, rock, boulders, trees and other debris; and **landslide,** a comprehensive term for lots of types of slope failure such as deep seated rotational slides (example La Conchita in 2005) or shallow soil slips.



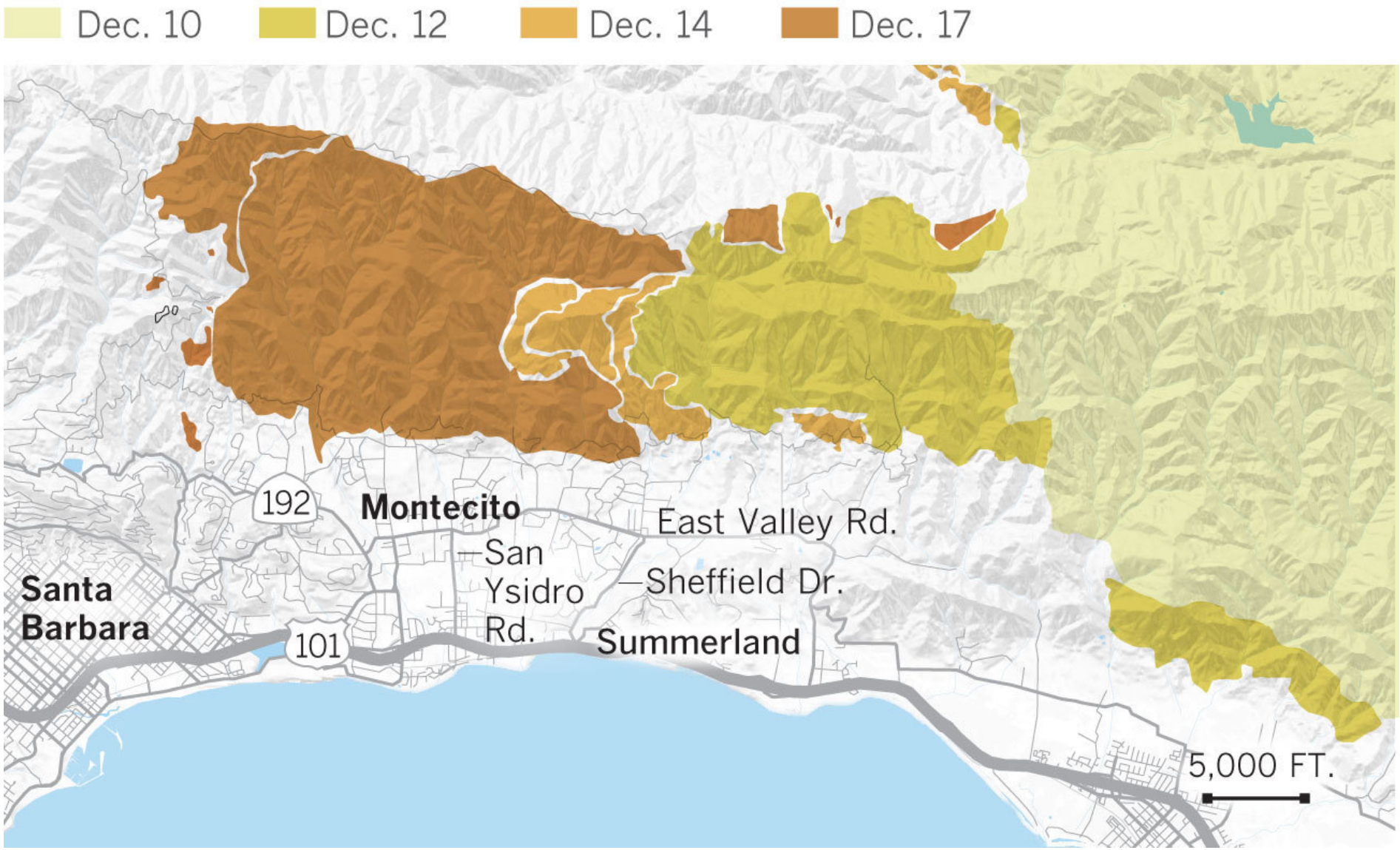
Stage 1: accumulation of debris in canyon floor (may take hundreds of years)

Stage 2: Wildfire (occurs every 30 -50 years) and can form water repellant soil

Stage 3: Intense precipitation (example 1 inch in a half hour) that occurs every few hundred years

As a result a large debris flow that comes out of any one canyon is a rare event

Debris flow sources are on steep slopes above foot of mountains
Debris flows are deposited on debris-flow fans, a type of alluvial fan
Debris flows may be high speed and of large volume
Debris flows need a source of boulders and a source of fine sediment (mud)
Debris flows have a viscosity about 200 times that of water
Density of the mud is about 120 lb. per cubic foot
Debris-flow boulders have a density of about 150 lb. per cubic foot
As a result of boulders are carried near the surface at front or sides of the flow ---boulders bob along like corks
When the flow slows down the mud moves out from the boulders leaving a boulder field
If debris flow is blocked by a bridge or other structure or goes around a tight bend it may leave the channel and spread out or form a new channel



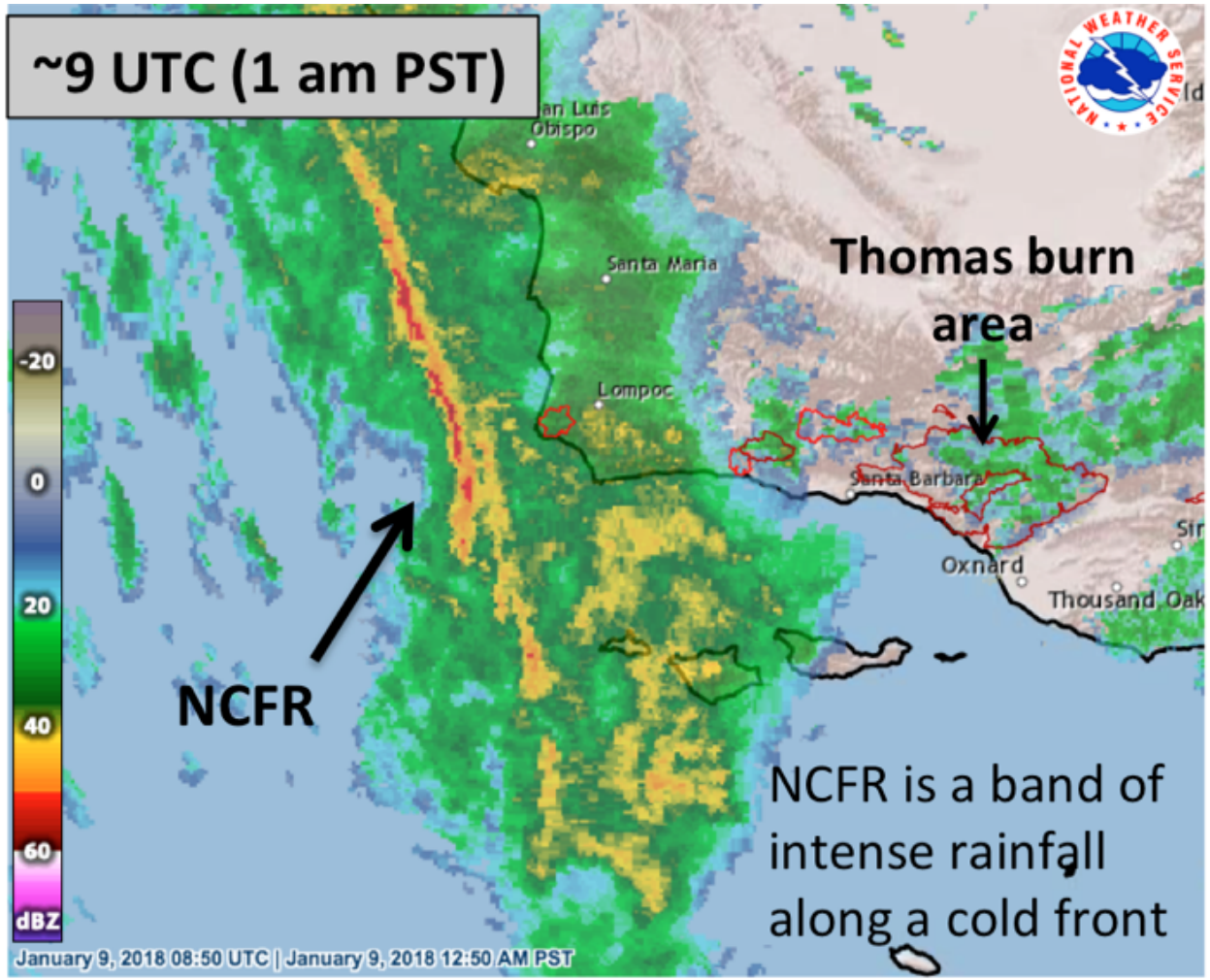
Thomas Fire in Montecito : L A Times

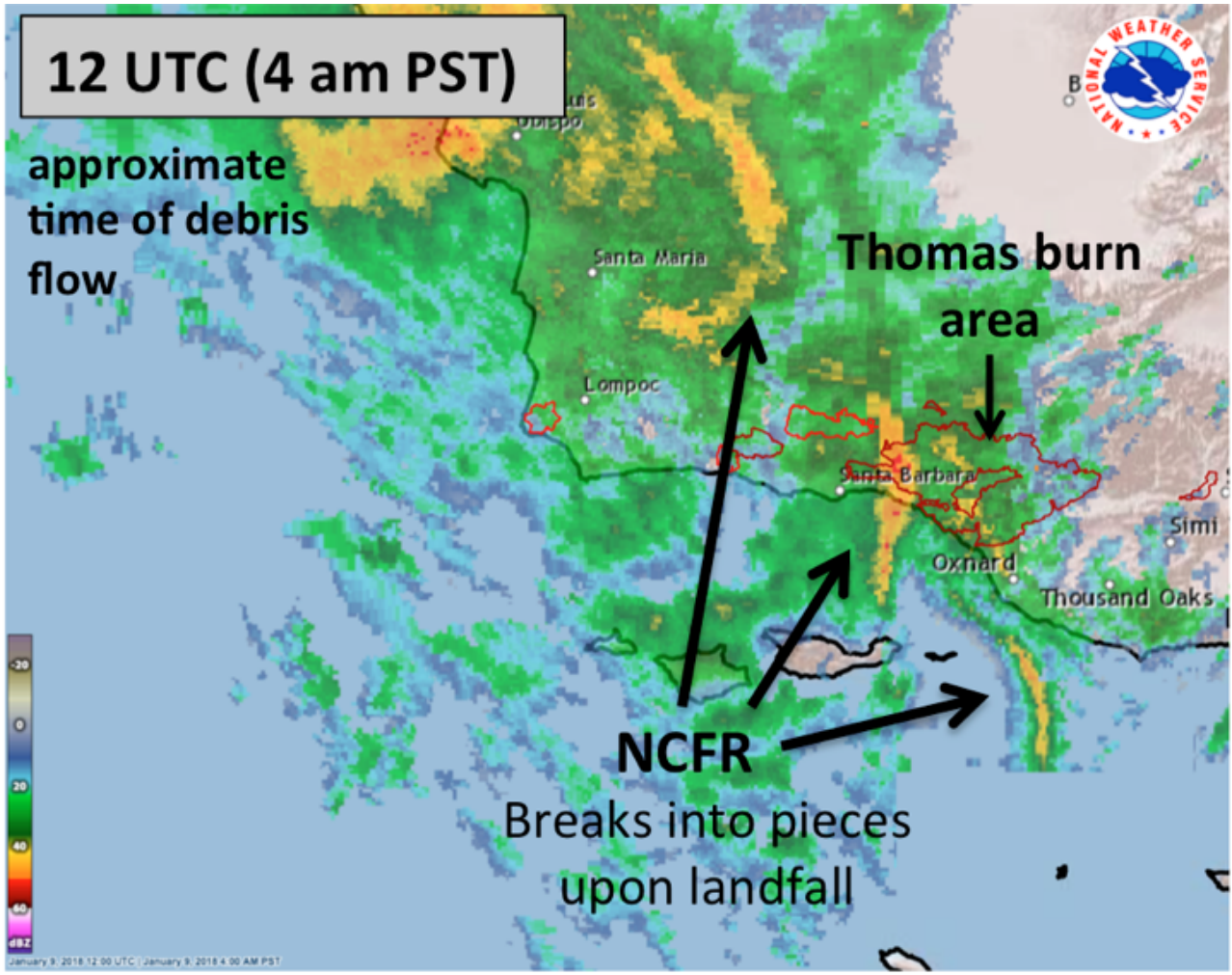
http://www.latimes.com/projects/la-me-thomas-fire-40-days-of-devastation-3d/

Burned land above Montecito

SBC FD

Heavy rain (high intensity) as much as ½ inch in 5 min





Center for Western Weather and Water Extremes
http://cw3e.ucsd.edu

Randall Road, Montecito

Ventura County Sheriff Air Unit

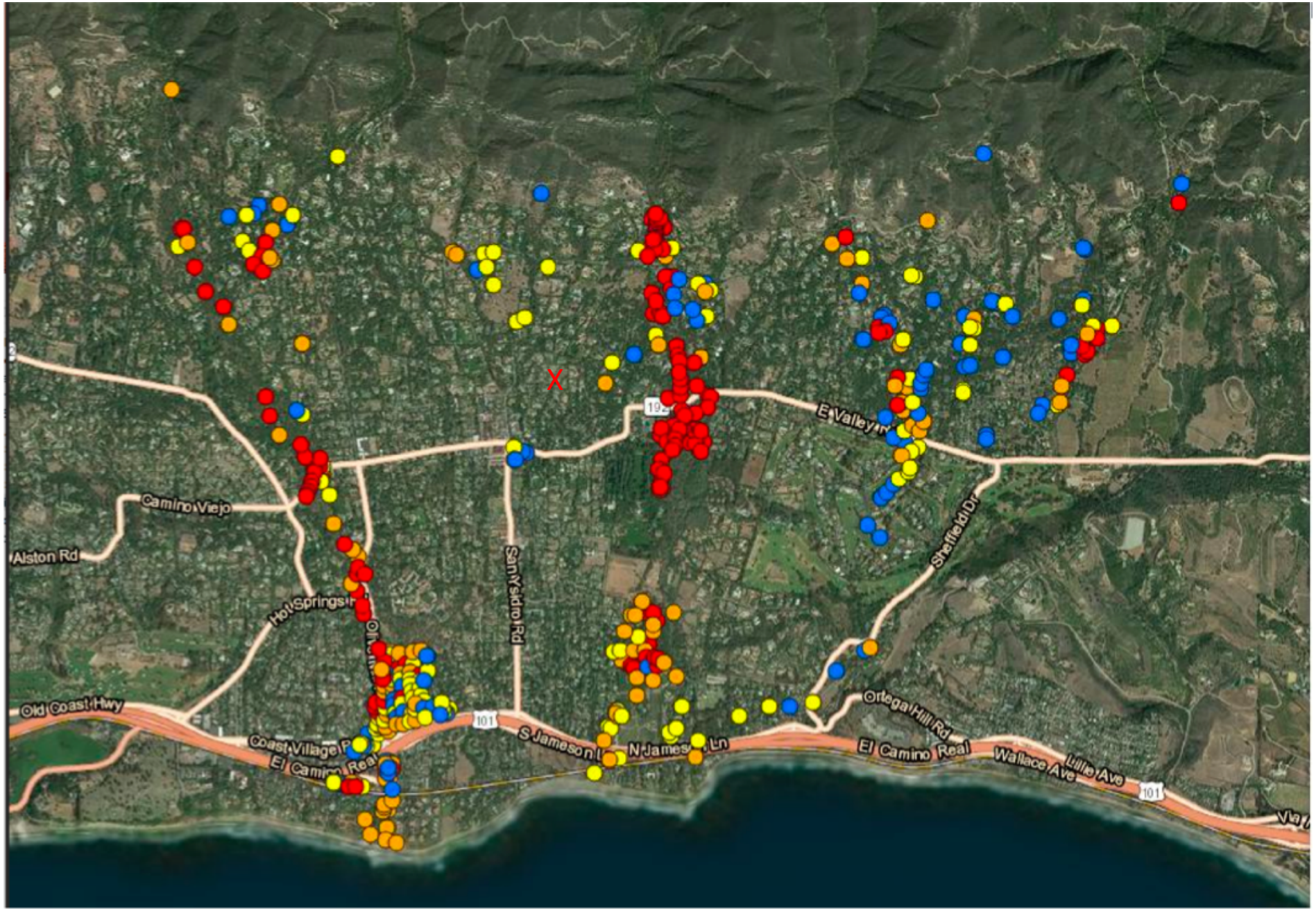
Google Earth

Cold Spring Cr. Before 2018 debris flow

Trail Quest

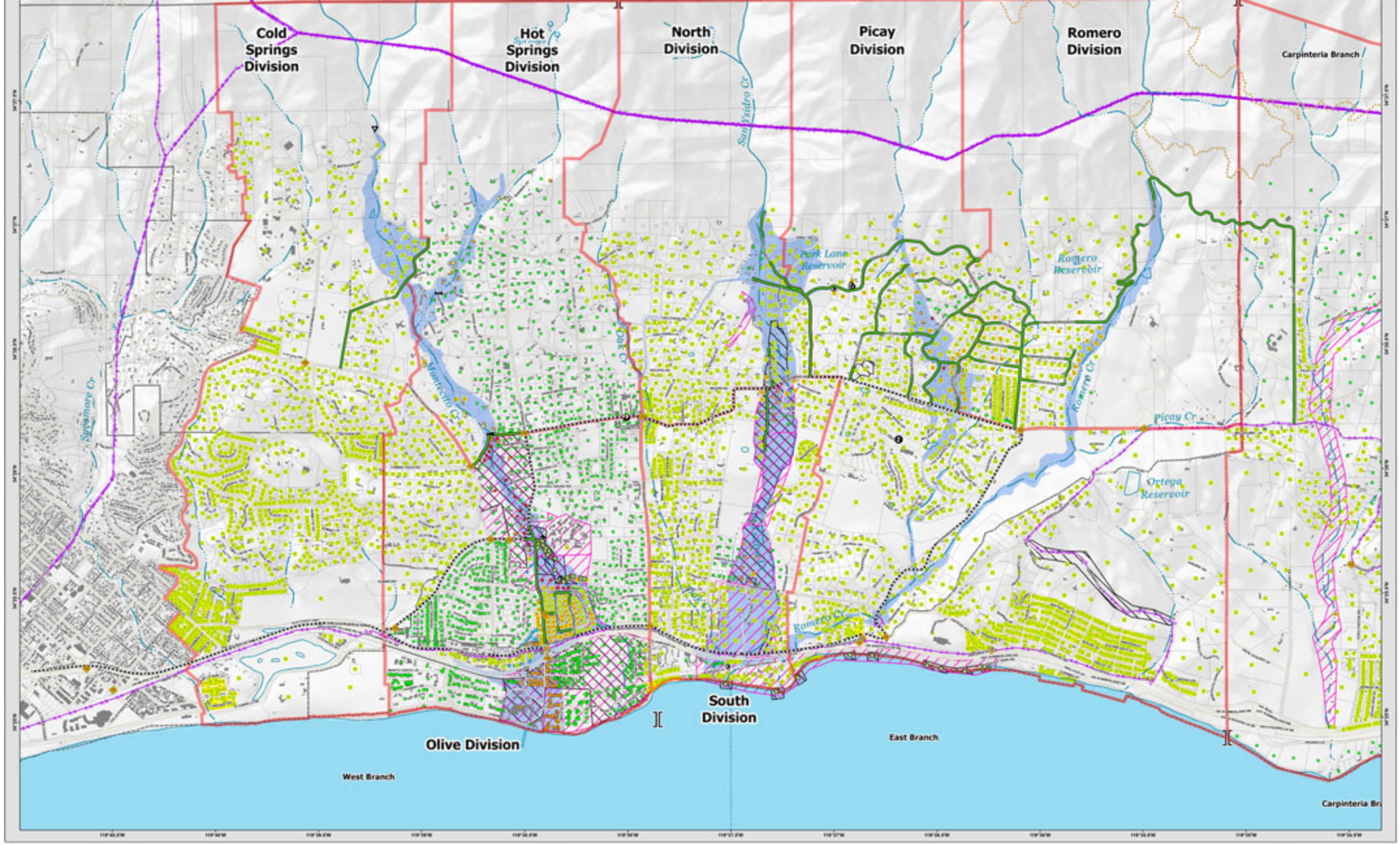
Cols Spring after 2018 Debris flow looking upstream Channel is scoured

T Dunne



As of January 14,2018

Red: Destroyed
Orange : Major damage
Yellow : Minor damage
Blue: Affected



Drop Point
Staging Area
Branch Break
No Search
Primary Complete
No Access, Primary Complete
Damaged, Primary Complete
Destroyed, Primary Complete
Secondary Complete
No Access, Secondary Complete
Damaged, Secondary Complete
Destroyed, Secondary Complete
Pipelines_20171122
Power_Transmission_Lines
County_Boundary
Fire Protection District
Live Dog
Cadaver Dog
Division Areas
Debris Field
Bridge Out
Car
Gate Lock
Debris Flow
Road Hazard
Road Hazards
Locking
Clear to Drive
Reservoir

0 1 Miles

N

1:8,660
NAD 83

2018 XSB
January Storm
CA-MTO-18-000071

OPS MAP
MONTECITO

Jan 14, 2018

Lessons Learned

Mandatory Evacuation Zones should include entire potential debris flow path from source to sink (mountains to sea).

Need more education of public about fire and debris flow.

Need to improve science of debris flow and fire recurrence. Are high magnitude debris flows after fire rare events? Is climate change increasing the intensity of wildfires as well as precipitation events?