Watershed Conditions Due to the Thomas Fire

A Report from U.S. Forest Service, CAL FIRE and CA Geological Survey

Presented to the Santa Barbara County Board of Supervisors

May 1, 2018

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Introduction

- What is BAER and WERT?
- Significance of BAER & WERT Findings
- Potential for Future Threats of Debris Flow/Flooding

Burned Area Emergency Response

Thomas Fire BAER Assessment

January 2018

Los Padres National Forest

What is BAER ?

A program to identify imminent post-wildfire threats to human life and safety, property and critical natural or cultural resources on federal land and take immediate actions to manage unacceptable risks.

Loss of Vegetation Leads to Increased Erosion

Sedimentation

Flooding

RockFall

Debris Flows

Thomas Fire BAER Assessment

Burned Acres: 282,249 Acres

- NFS 161,600
- BOR 1,170
- State 156
- Private 110,660

Thomas Fire BAER Assessment

The BAER Timeline

BAER 1: Ojai Area – Dec. 5 -12

Interagency Coordination Calls

- USFS BAER facilitates assessment calls Dec. 12 – Jan. 13
- Cal OES facilitates post flood work call Jan. 13 –

BAER 2 Soils/Hydro/Geo pre-work Dec. 26 –Jan. 3

BAER 2 full team. Jan. 3 – Jan. 15

Coordination Meeting Jan. 3
WERT team – VARS on non-FS

Implementation Jan. 12 - ?

Monitoring

Soil/Veg monitoring
Road/trail/infrastructure

Thomas Fire BAER Assessment

- Soil Burn Severity Map
- Establish Watershed Response
- Determine Threats to VAR's
- Propose Treatments

- Develop BAER Report
  - 7 Days After Containment
- Implementation

Thomas Fire BAER Assessment

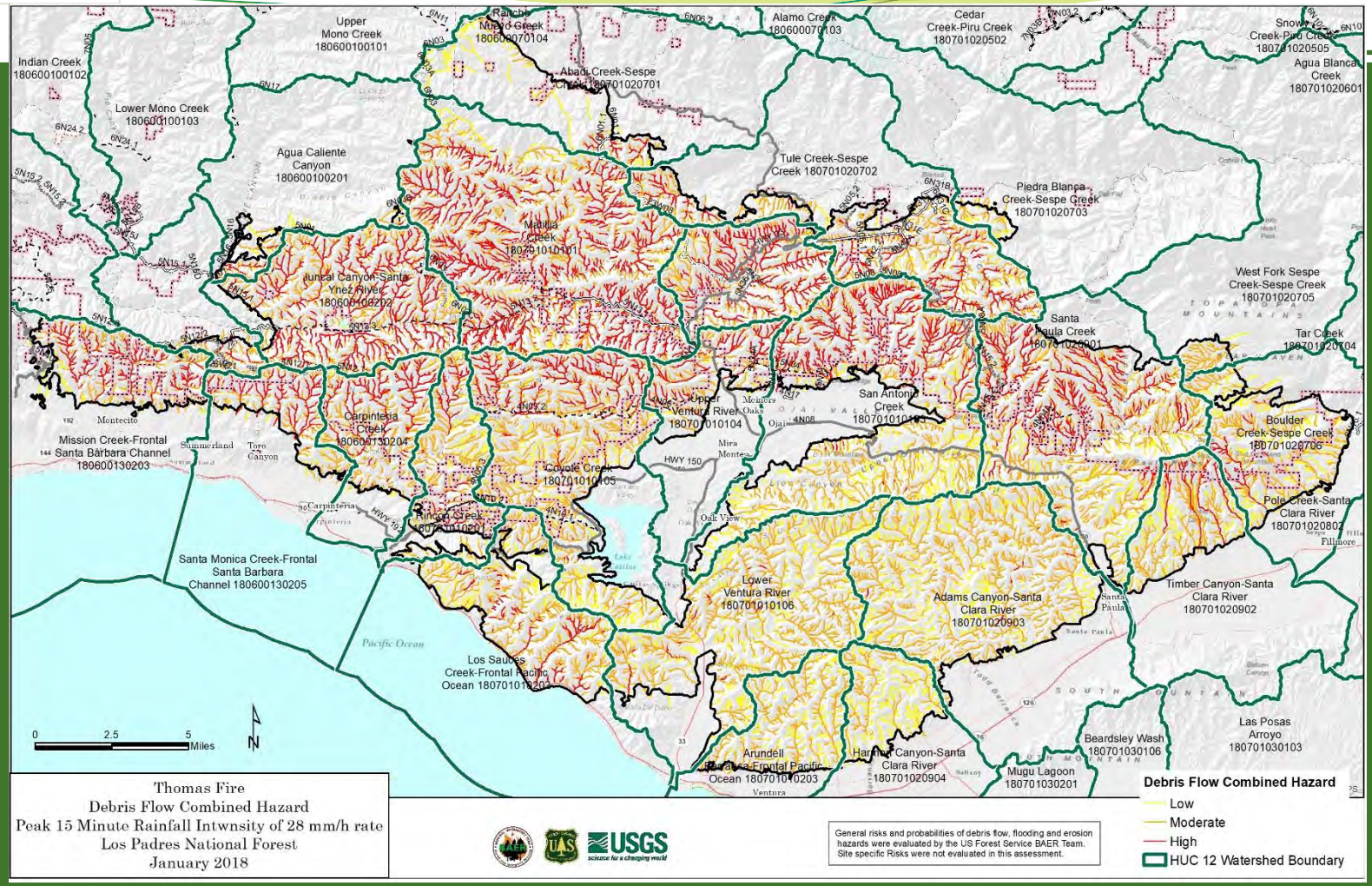




Soil burn severity effects shown in pictures above (left to right): high, moderate, low soil profiles, and high and moderate soil burn landscapes.

Geology Assessment

Debris Flow Hazard Map
USGS/USFS



Debris flow potential map

Geology Assessment

Potential geologic hazards:

- Debris flows
- Rock fall
- Rock slides

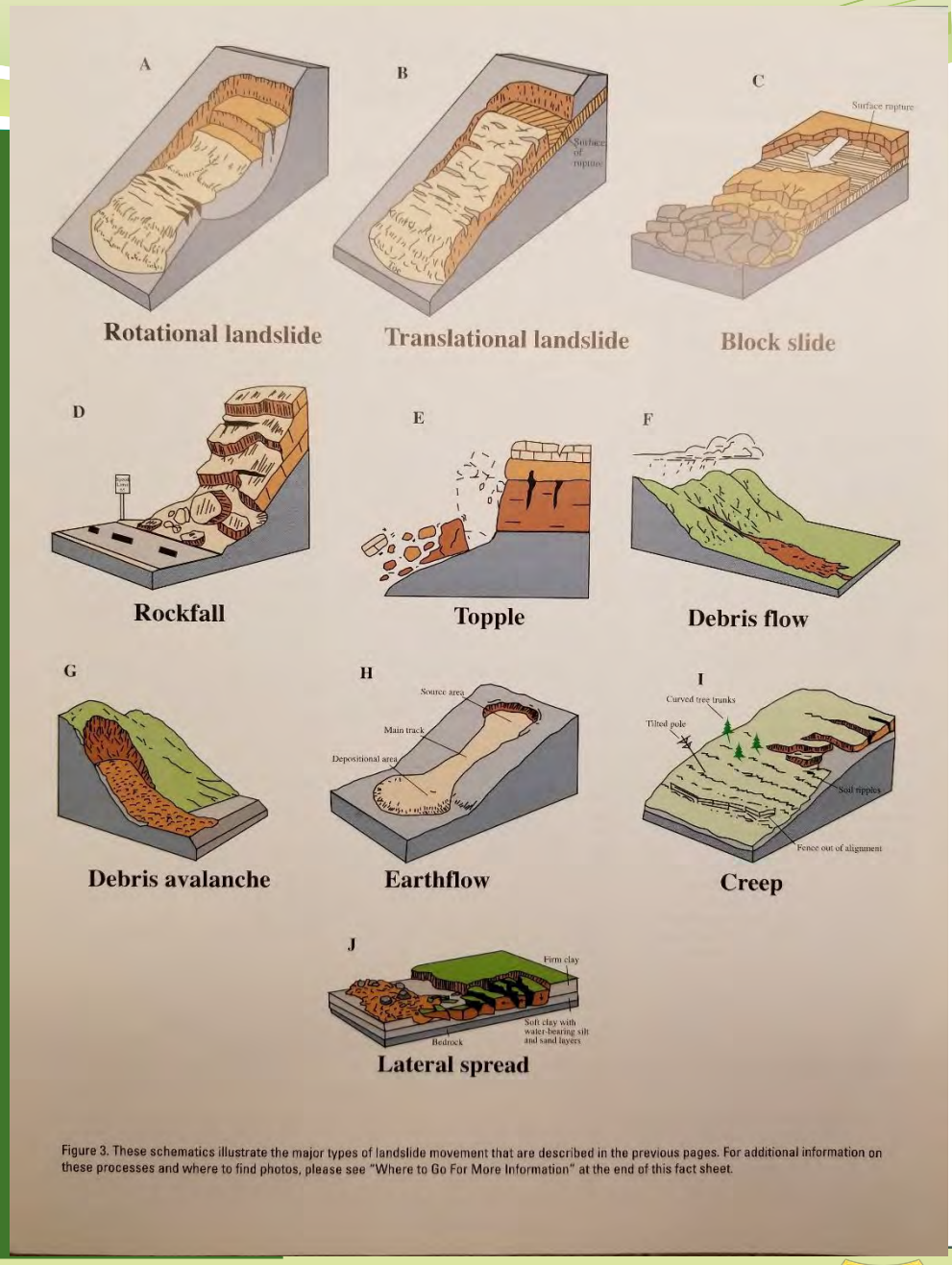


Figure 3. These schematics illustrate the major types of landslide movement that are described in the previous pages. For additional information on these processes and where to find photos, please see "Where to Go For More Information" at the end of this fact sheet.

Findings: Watershed Response

- Flooding, Sedimentation
- Evidence of past debris flows
- Reservoirs trap sediment

ROAD HAZARD ASSESSMENT

Assessment Results

- Moderate/High Severity above many roads
- Rockfall/dry ravel hazard
- Road washouts expected

Trail Impacts

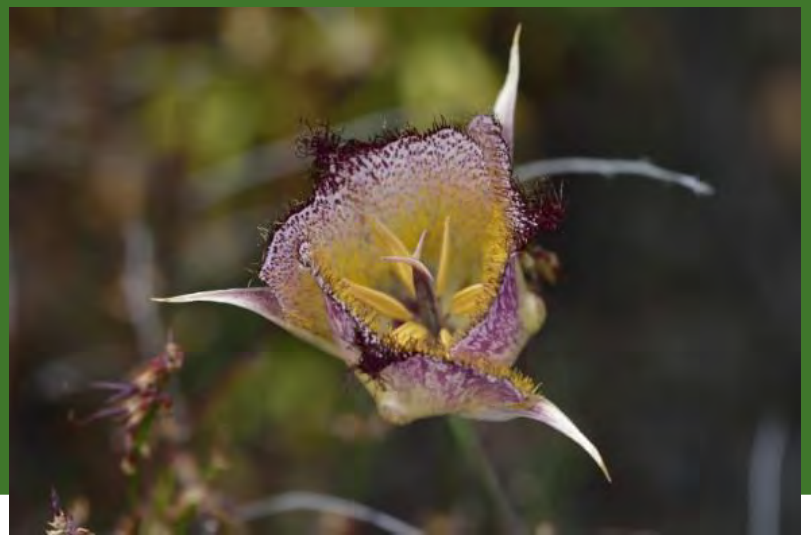
San Ysidro Trail

Invasive Plant species

yellow starthistle (Photo: 2004 Carol W. Witham)

Threat to agriculture/recreation

- 142 Miles of dozer line
- Repeated use from recent fires
- Invasive plants were observed



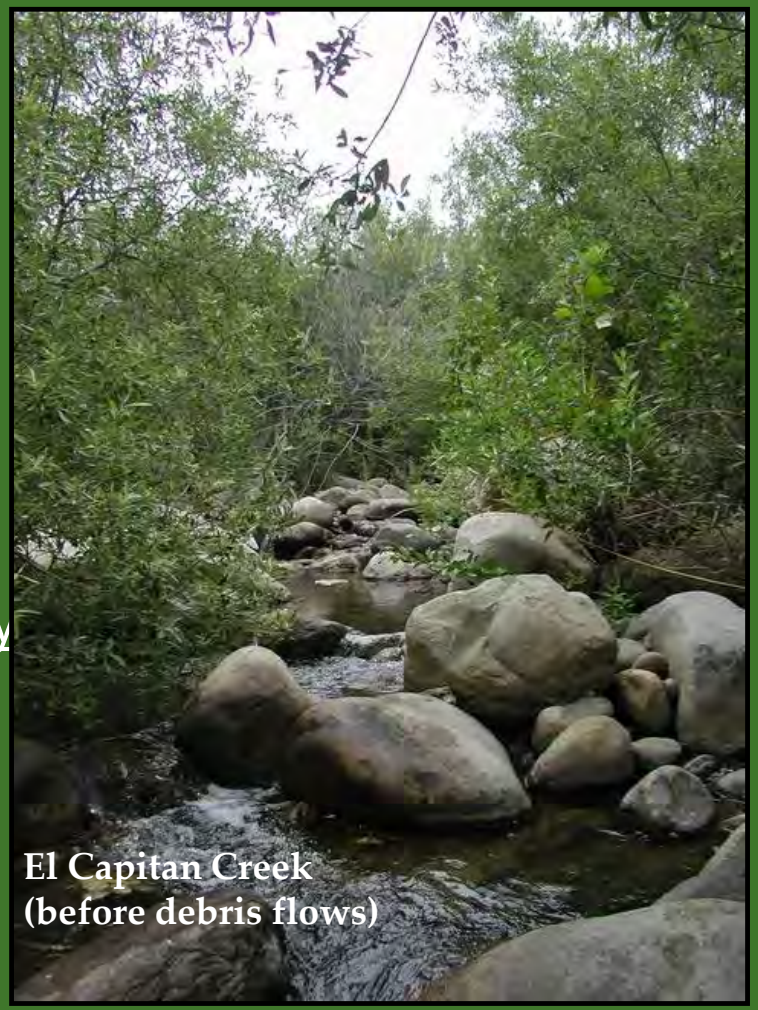
Late-Flowering Mariposa Lily (Photo: Lloyd Simpson, USFS)

Fisheries Assessment

Potential Threats:

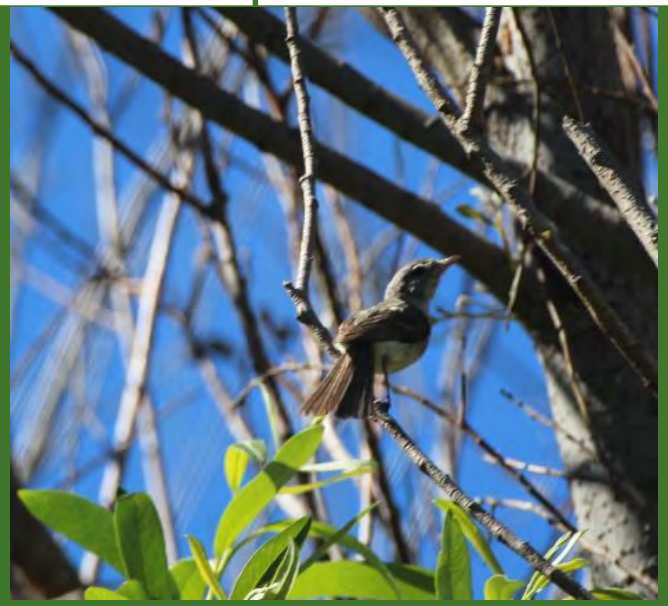
- Debris flows
- Sedimentation
- Water quality

Probability of Damage or Loss: Very Likely
Magnitude of Consequences: High
Overall Risk: High


El Capitan Creek
(before debris flows)


El Capitan Creek
(after debris flows)

Wildlife Values at Risk Assessment



- California condor
- Least Bell's vireo critical habitat
- Arroyo toad populations and critical habitat
- California red-legged frog populations and critical habitat

Cultural resources

- **Values at Risk**
  - Native American and Historic Archaeological Sites
  - Ceremonial and Gathering Locations

- **Potential effects include:**
  - Increase of on-site erosion, displacement of primary cultural deposits
  - Increased vulnerability to looting

Thomas Fire BAER Assessment – Post 1/9

Slow Re-growth

- Dry Soils
- Hot Fire
- Soil Loss
- Late Rains

Thomas Fire BAER Assessment – Post 1/9

Slow Re-growth

- Dry Soils
- Hot Fire
- Soil Loss
- Late Rains

Thomas Fire BAER Assessment – Post 1/9

Hazardous 2019

- 5 – 10% cover now
- More expected?

Thomas Fire BAER Assessment – Post 1/9

Chamise and marah sprouting.

Black-headed grosbeak.

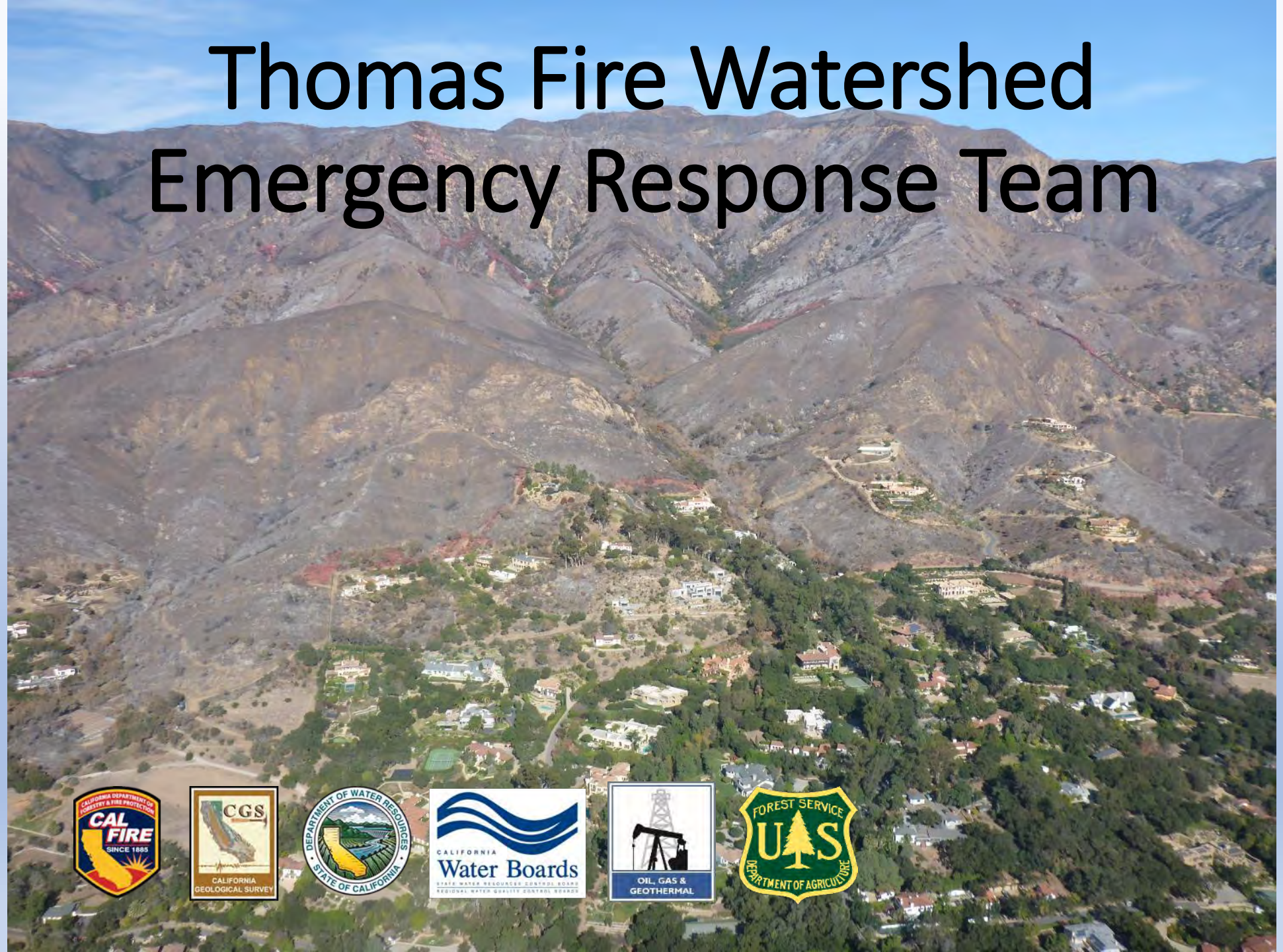
Whittier Fire Recovery is stronger

- North slopes wetter
- 20-50% cover
- South slopes less

Thomas Fire BAER Assessment – Post 1/9

Woody Material and much debris removed, but much left in channels and on slopes.

Thomas Fire Watershed Emergency Response Team



WERT Goals

Assessing soil burn severity

- Assist Communities
- A rapid evaluation of values-at-risk (**VARs**) subject to post-fire hazards, including:
  - Debris Flows
  - Flooding
  - Rock fall
- Life-safety-property focus

WERT Process

- Develop soil burn severity map
- Spatially explicit modeling and evaluation of post-fire debris flow potential, erosion rates, and peak flow
- Identification of values-at-risk (VARs) on non-federal land
- Hazard determination for VARs
- Preliminary/general recommendations to mitigate hazard(s)
- Communication to affected and/or responsible parties

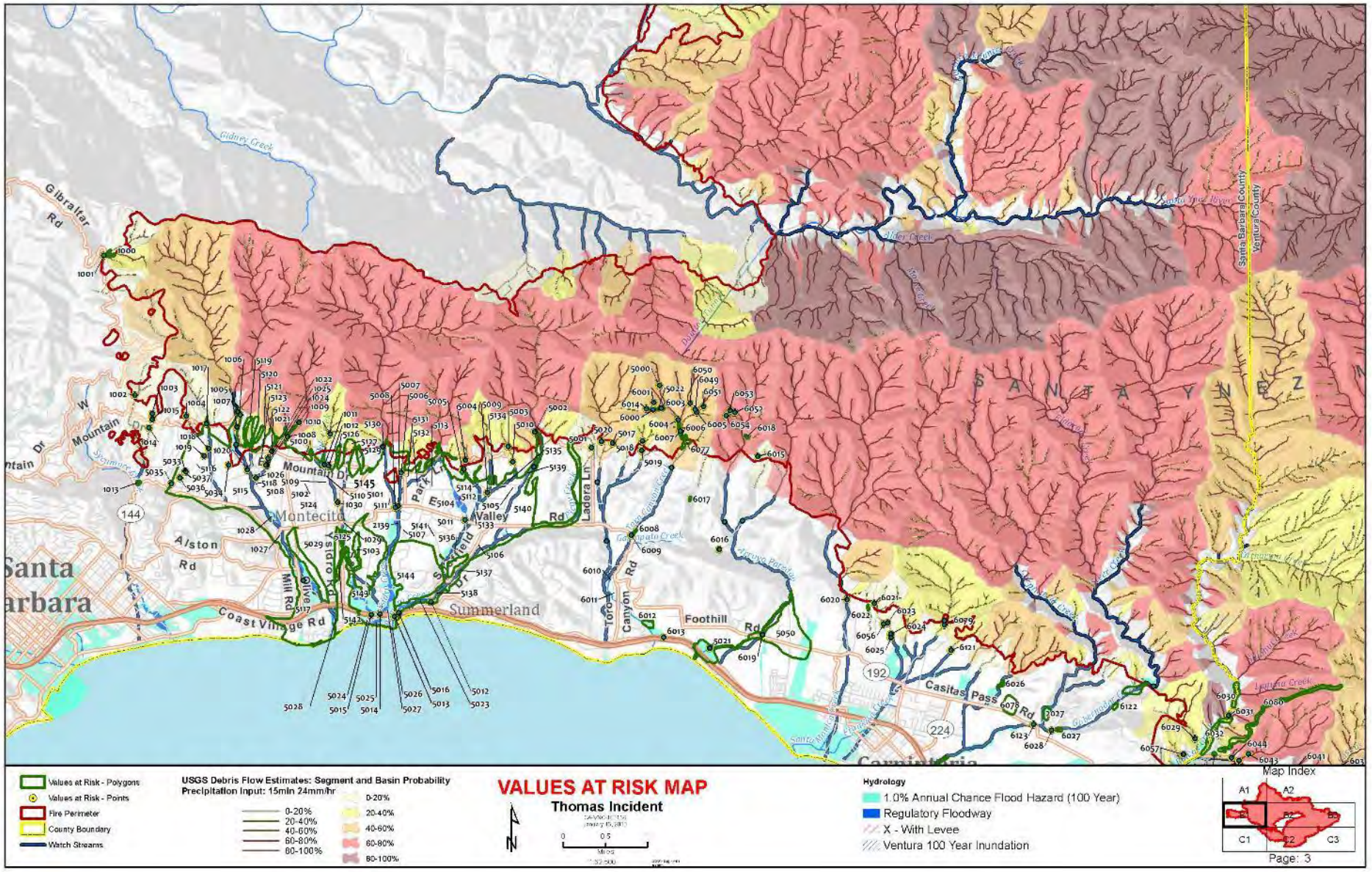
WERT Process (Cont.)

- Rapid assessment data is advisory in nature and does not constitute detailed site-specific analysis.
- Ideally WERT assessment is completed well in advance of winter storms
- Sufficient time between assessment and storm season ideal so that affected communities can implement recommendations and perform detailed studies.

Soil Burn Severity

- Soil burn severity map gives WERT a spatially-distributed view of post-fire soil alteration
  - Drives hazard evaluation and modeling
- Generated from satellite imagery and validated through field assessment
- Not available for Thomas Fire until January 2, 2018

Spatially-Explicit Modeling

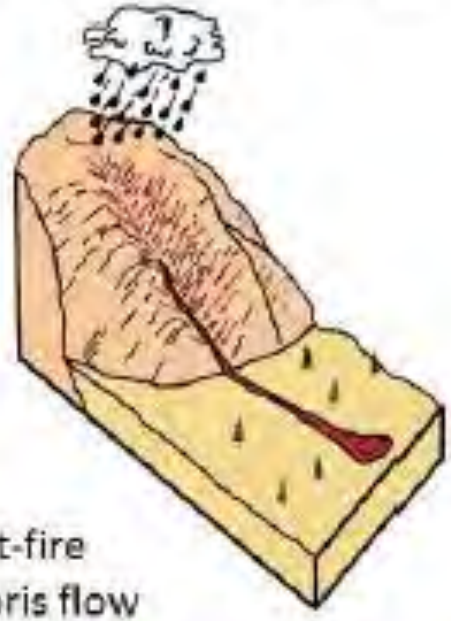


Field Evaluation

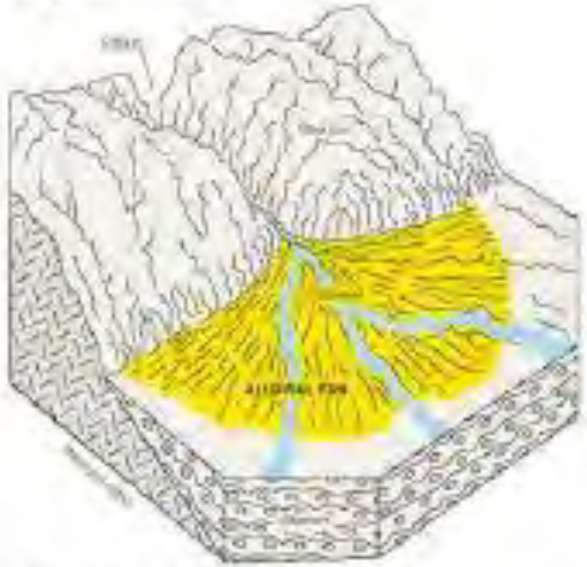
- Performed by licensed professionals
  - Engineering geologists, civil engineers
- Relative hazard to life and property determined by a combination of:
  - Professional judgement based on geomorphic evidence
  - Modeling
  - Spatial data (e.g., proximity to mapped flood inundation zones)

Processes and Landforms Sensitive to Wildfires

A) Rockfall



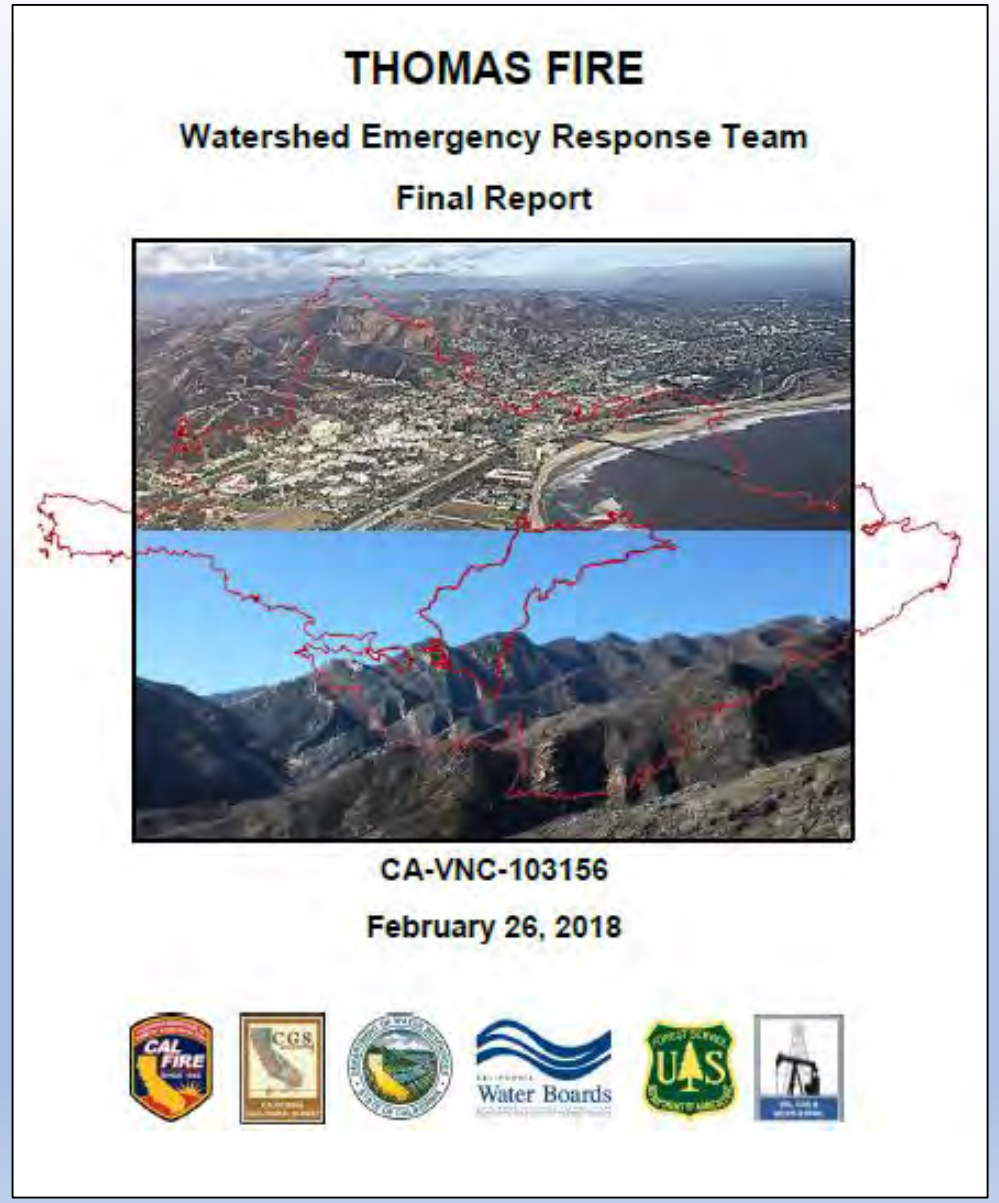
B) Post-fire debris flow



C) Alluvial fan

D) Floodplain

Hazard Identification: Uncertainties Due to the Complexities of the “Built” Environment



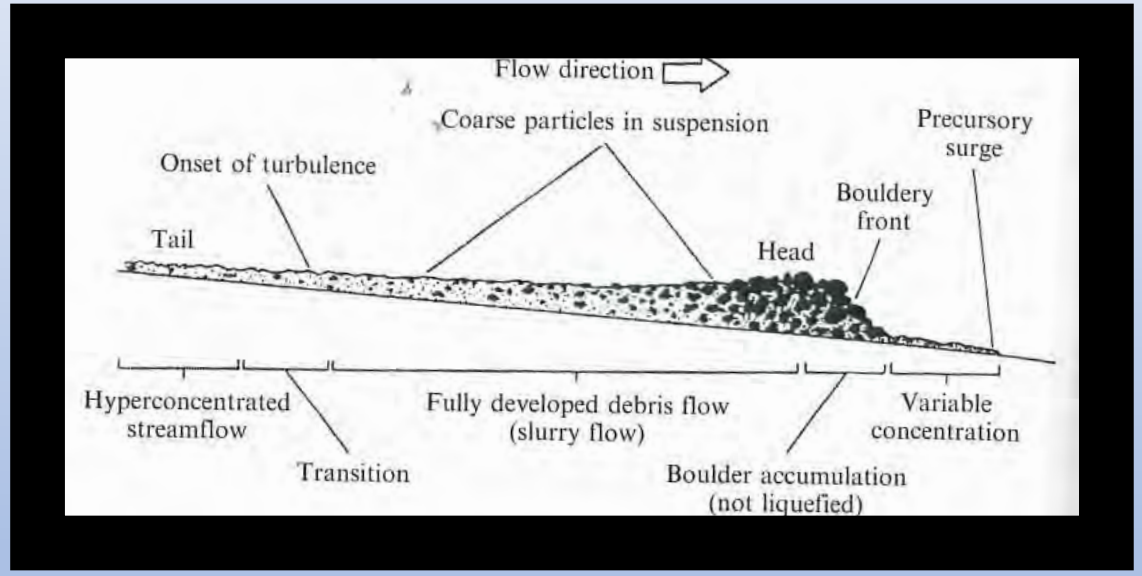
- 178 VARs in Santa Barbara County
  - Points reflect discrete VARs
  - Polygons reflect reflect groups of VARs and/or landforms affected by post-fire conditions

(http://cdfdata.fire.ca.gov/admin8327985/cdf/images/incidentfile1922_3383.pdf)

Highlights of WERT Report

- **Executive Summary** – Broad overview with highest hazard VARs highlighted by County
- **Chapter 4** – Specific and general observations of VARs and hazards in Santa Barbara County
  - Broken into geographic regions within County (e.g., Montecito, Carpenteria, etc)
- **Chapter 6** – Hazards related to oil field infrastructure
- **Appendix A** – Post-debris flow assessment and inundation mapping report
- **Appendix C** – VAR table; tabular data describing VARs, nature of hazard, preliminary recommendation, observations, etc
- **Appendix D** – VAR maps; Shows VARs relative to modeled stream segment/basin debris flow probability (24 mm hr^{-1}, 15-minute duration), 100-year floodplains, and flood control infrastructure (Ventura County)
- **Appendix G –** Predicted post-fire flow increases in 2- and 10-year flood event

Debris flow: a form of rapid mass movement in which a combination of loose soil, rock, organic matter, air, and water mobilize [and liquefy] in a slurry that flows down slope



Debris Flow to Muddy Water: There is a continuum of flow types between streamflow (flooding) and debris flow

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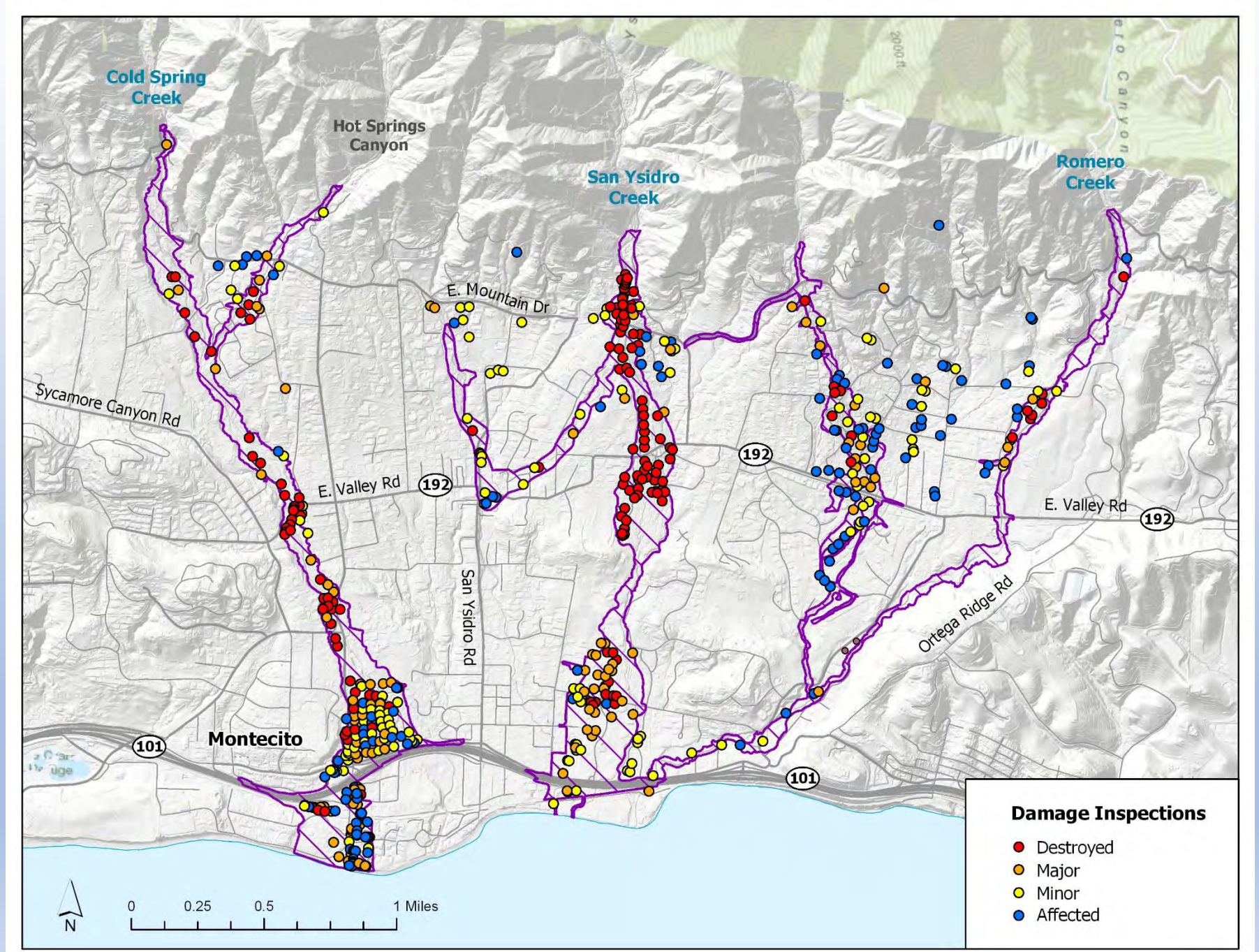
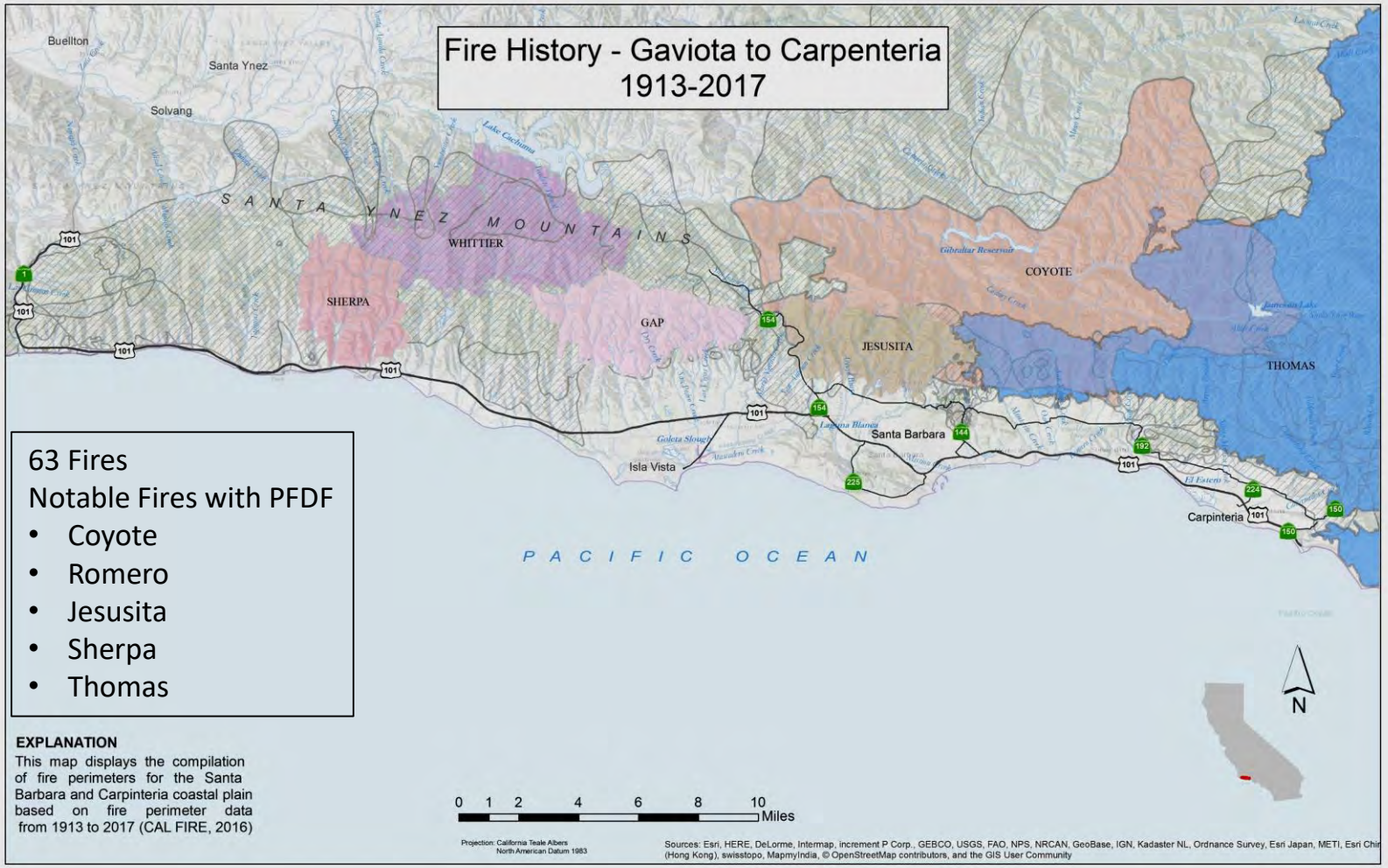

Cold Spring Creek
Hot Springs Canyon
San Ysidro Creek
Romero Creek
E. Mountain Dr
Sycamore Canyon Rd
E. Valley Rd
192
San Ysidro Rd
Ortega Ridge Rd
Montecito
101
0
0.25
0.5
1 Miles
N
Damage Inspections
Destroyed
Major
Minor
Affected

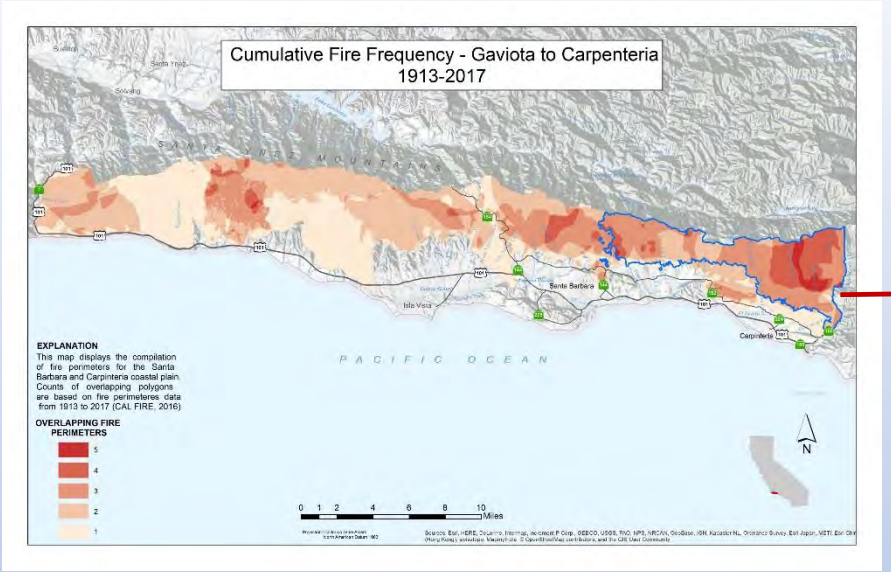
Continued Risk to Post-Fire Debris Flows and Floods

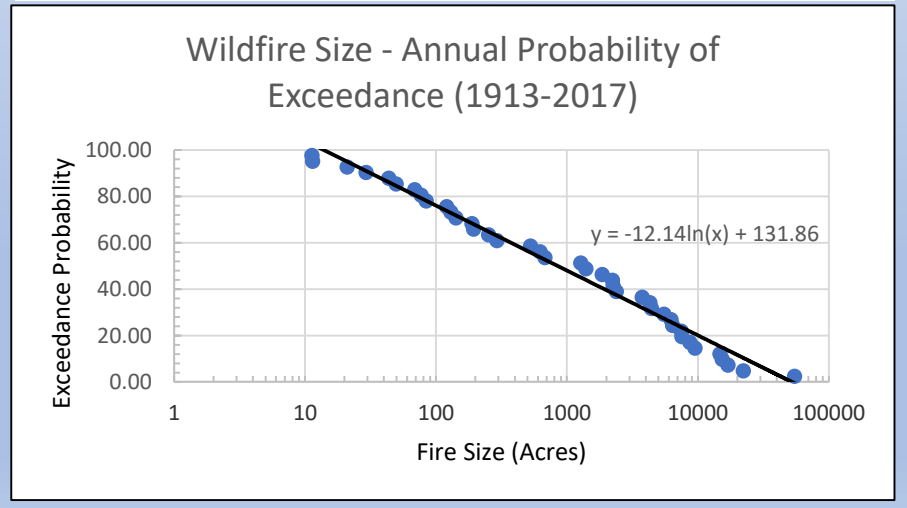
WHAT WE KNOW:

- ✓Debris Flows following fire are common and may occur several times in the same watershed.
  - Many examples, Station Fire 2009 LAC, Inyo County
  - Santa Barbara post fire debris flow years: 1964, 1969?, 1971, 2010, 2017, 2018
- ✓Considerable scour of hillslope and channel material from 1/9 event, but not complete.
- ✓Sediment will continue to recharge channels and swales for the next few years prior to watershed recovery.


Fire History - Gaviota to Carpenteria
1913-2017
Buellton
Santa Ynez
Solvang
SANTA YNEZ MOUNTAINS
WHITTIER
SHERPA
GAP
JESUSITA
COYOTE
THOMAS
Gibraltar Reservoir
Lake Cachuma
Isla Vista
Santa Barbara
Carpinteria
PACIFIC OCEAN
63 Fires
Notable Fires with PFDF
• Coyote
• Romero
• Jesusita
• Sherpa
• Thomas
EXPLANATION
This map displays the compilation of fire perimeters for the Santa Barbara and Carpinteria coastal plain based on fire perimeter data from 1913 to 2017 (CAL FIRE, 2016)
0 1 2 4 6 8 10
Miles
N
Projection: California Teale Albers
North American Datum 1983
Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri Chir
(Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Santa Barbara Coastal Fire Frequency





Fire Size (acres)	Return Period
500	1.8
1000	2.1
2500	2.7
5000	3.5
10000	5.0
20000	8.6
22301	9.7

1/9 Debris Flow Magnitude Comparisons

Fire Name	Area	Storm Date	# of Debris Flows	Max Depth (m)	Estimated Debris Flow Volume	Estimate of Innundation Area	Debris Flow Magnitude Classification (Jakob, 2005)
Coyote	Montecito, Hot Springs, Cold Springs, San Ysidro, Mission Creek	11/1/1964	>5	6.1	Unkown	>2 Km^2(est.)	**5**
Romero	Romero, Toro Canyon, Garrapata, Santa Monica, Franklin, and Carpenteria Creek	12/27/1971	>6	N/A	Unkown	>2 Km^2(est.)	**5**
Jesusita	Gibraltar Road	2/27/2010	1	N/A	Unkown	N/A	**1**
Jesusita	JS	3/3/2010	1	N/A	Unkown	N/A	**1**
Sherpa	El Capitan	1/20/2017	1	>3	>20,000 Cubic Meters	<0.5 Km^2	**4**
Thomas	Santa Barbara/Carpenteria	1/9/2018	>20	>6	>1.0 Million Cubic Meters	3-4 Km^2	**7**
Pickens	La Cresenta	1/1/1934	>15	6.1	>0.5 Million Cubic Meters	8 Km^2	**7**
Gran Prix - Old	Rancho Cucamonga/San bernardino	12/25/2003	41	N/A	3.7 Million Cubic Meters	N/A	**7**
Inyo Complex	Independence	7/12/2008	3	3.9m	1.5 Million Cubic Meters	3 Km^2	**7**

Continued Risk to Post-Fire Debris Flows and Floods

WHAT WE DON'T KNOW:

- ❑ Watershed recovery cycle 2yrs, or longer?
- ❑ Will sediment recharge channels and swales prior to vegetative recovery?
- ❑ Rainfall:
  - Was the 5-minute rainfall that extreme?
  - 200-yr? or less?
  - Will another squall line (NCFR) occur prior to recovery, but after sediment recharge?

Continued Risk to Flooding

WHAT WE KNOW:

- ✓Post-fire runoff regime remains unchanged
- ✓Channels and swales are clear of vegetation and incised
  - ✓Enhanced conveyance of water
- ✓Lower lying areas in mapped flood zones will continue to have increased flood risk.

Conclusion

- Next Steps
- Mapping: Evacuations, Rebuilding and FEMA Revised Flood Hazards
- Next Community Meeting:

  6 p.m. Tuesday, May 1
  County Administration, 105 E. Anapamu St.
  Fourth Floor Board Hearing Room
  OR
  Watch Live Stream: CSBTV 20, YouTube, FaceBook

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Questions?