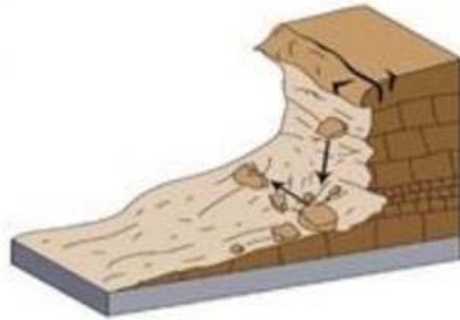# WERT Goals and Objectives
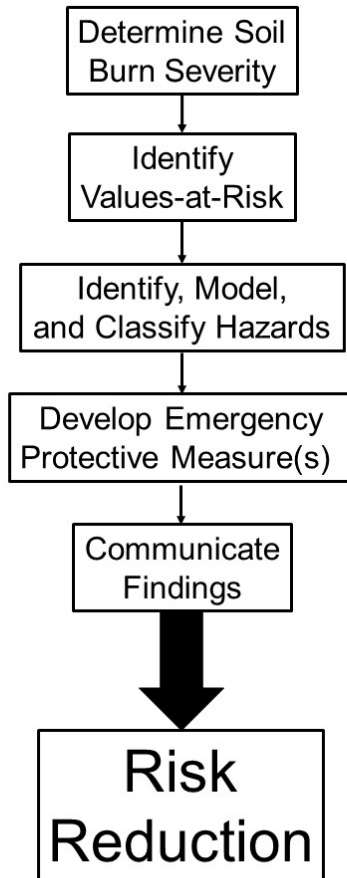
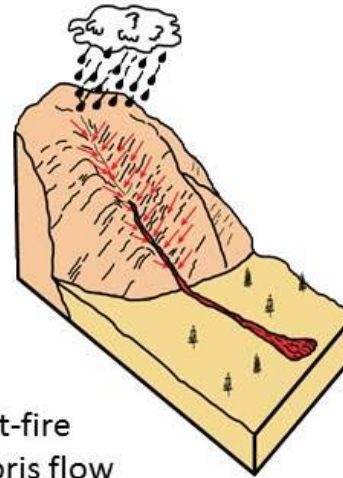

Co-led by CAL FIRE and CGS

- Rapidly determine where lives and property are at risk from post-fire:
  - Debris flows
  - Flooding
  - Rockfall
- Recommend emergency protection measures
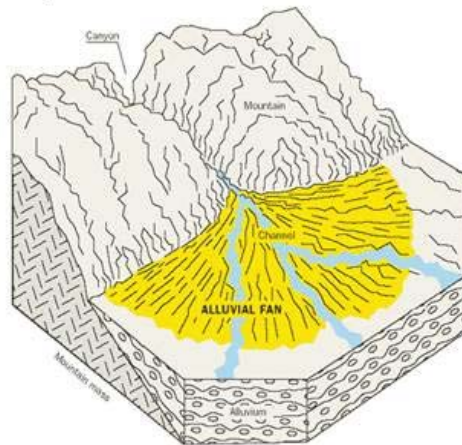- Communicate findings to responsible parties (i.e., local government)
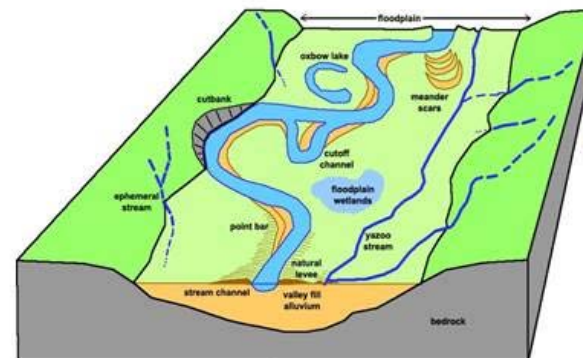
Processes and Landforms Sensitive to Wildfires

A) Rockfall

**B)** Post-fire debris flow

C) Alluvial fan

D) Floodplain

OWNERSHIP
Glass Fire
CA-LNU-015947

Glass Fire Ownership	Acres	Percent
Bureau of Land Management	137	0.2
CA Dept. of Parks and Recreation	7,050	10.4
Local Government	3,258	4.8
Non-Profit Conservancies and Trusts	4,545	6.7
Other State Lands	2,237	3.3
Private	50,257	74.5
Total	67,484	100.0

Fire Perimeter
Bureau of Land Management
CA Dept. of Fish and Wildlife
CA Dept. of Forestry and Fire Protection
CA Dept. of Parks and Recreation
Local Government
Non-Profit Conservancies and Trusts
Other Federal Lands
Other State Lands
All other land privately owned

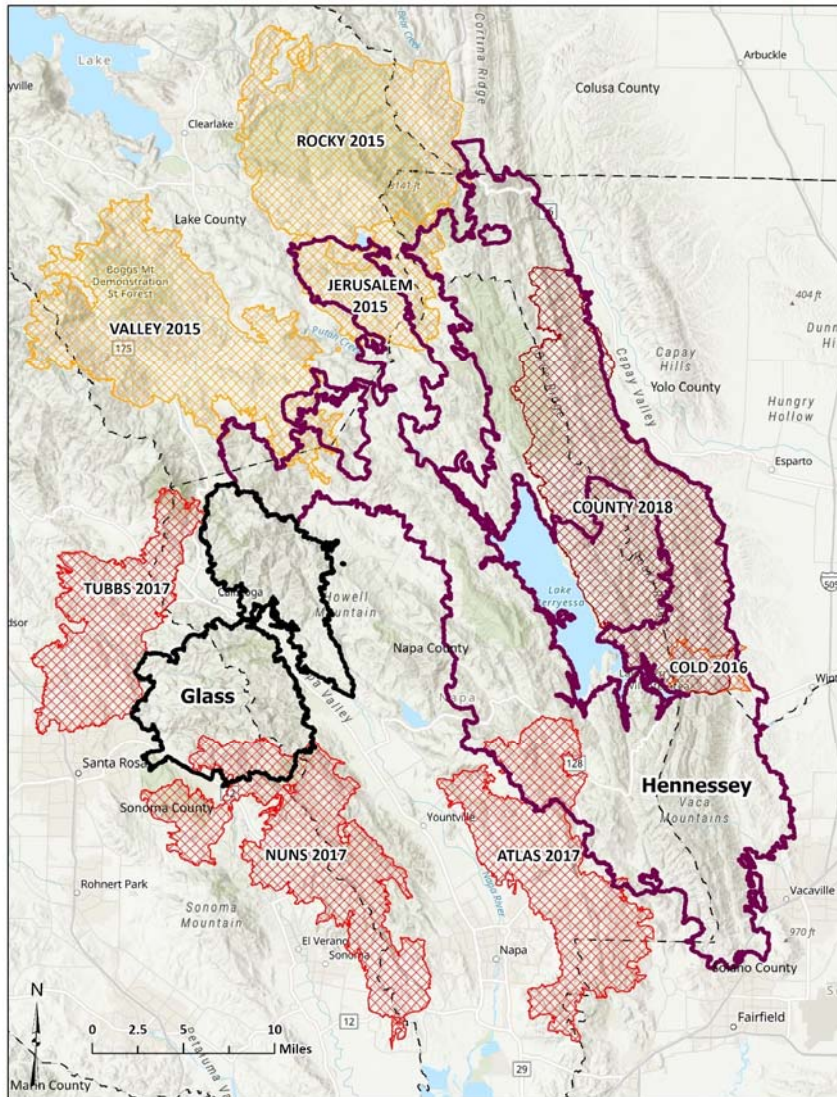0   0.75   1.5   3
                          Miles

Glass Fire Summary

67,484 acres burned in Napa and Sonoma counties
1,555 structures destroyed
Approximately 650 homes and 31 wineries destroyed or damaged
No injuries or deaths
Full containment on October 20, 2020.

Ownership

75% private lands
10% park lands
7% conservancies and trusts
5% local government lands
3% other state and federal lands
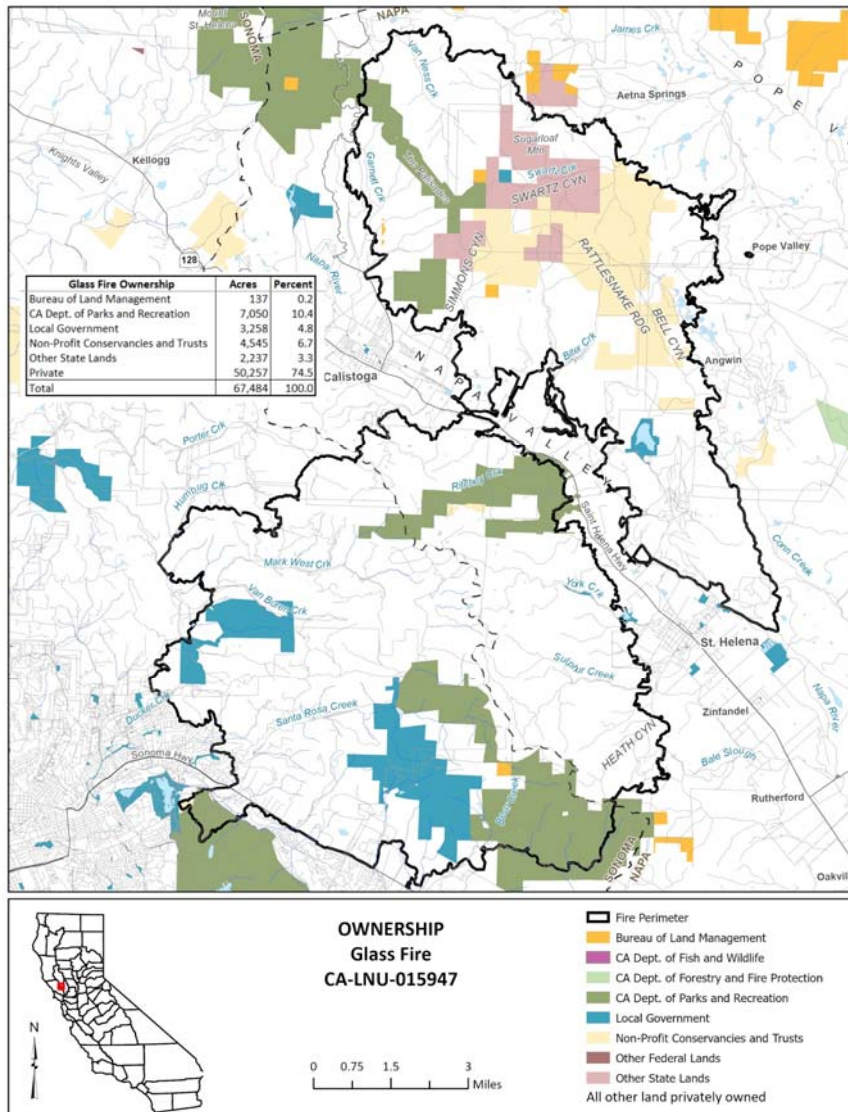
Fire History

North part of the northern lobe of the Glass Fire last burned in the 1964 Hanly Fire.

Most of the southern lobe of the Glass Fire had not burned in recent history, except for 2017 Nuns Fire.
- Approximately 9% of the Glass Fire previously burned in the Nuns Fire.

Recent large fires near the Glass Fire:
- 2015 Valley Fire
- 2015 Rocky Fire and 2015 Jerusalem Fire
- 2016 Cold Fire
- 2017 Tubbs Fire, 2017 Nuns Fire, 2017 Atlas Fire
- 2018 Country Fire
- 2020 Hennessey Fire

Monitoring Results from 2017 North Bay Wildfires

Debris flow monitoring study (Longstreth et al.)

- CGS study at Hood Mountain Regional Park and Sugarloaf Ridge State Park in the 2017 Nuns Fire.

- No debris flows occurred the first two winters.

- Low to moderate severity burn severity; rainfall intensities not high enough (max 39 mm/hr rate in 15-min).

- A shallow landslide that mobilized as a debris flow placed rocks/debris on Hwy 121 causing a fatality in area burned by Atlas Fire (low severity).

Water Quality Monitoring (NCRWQCB and SFBRWQCB)

- Little water quality impacts the 1st winter.

- Greater impacts the 2nd winter with larger, intense storms, but residues were not at levels that caused aquatic toxicity or threats to human health.
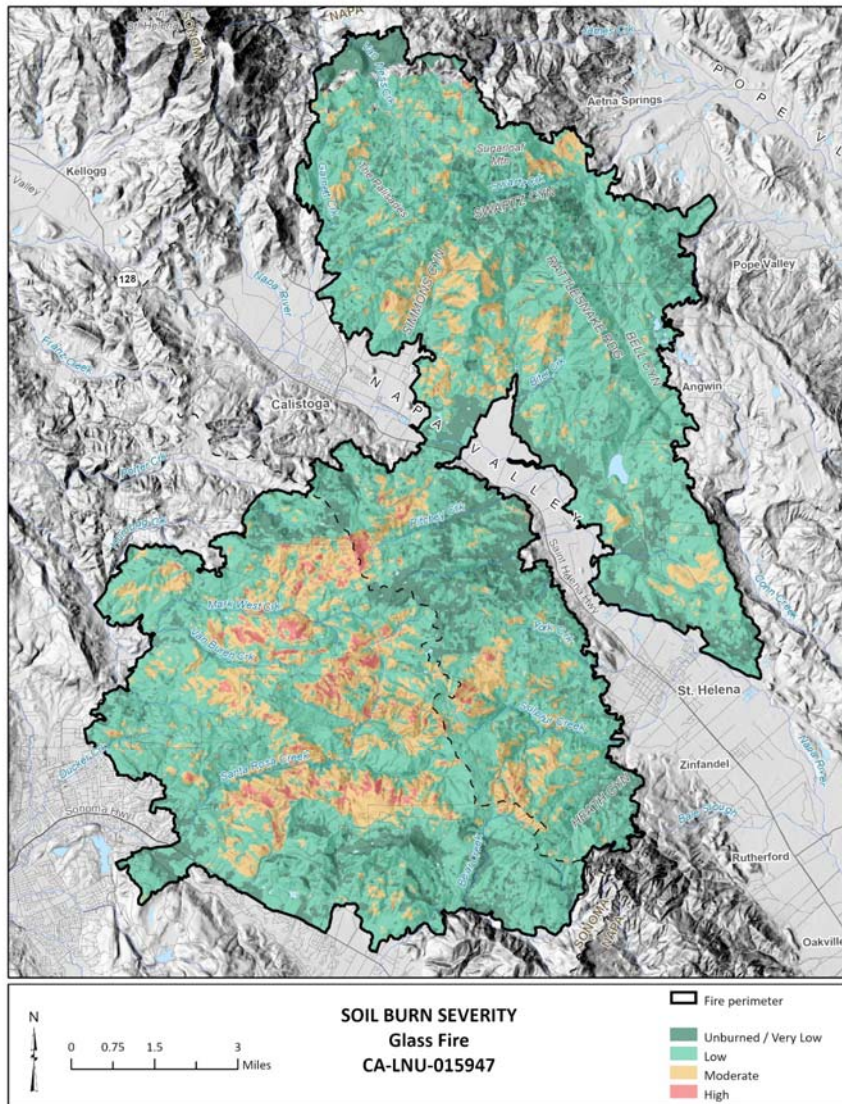
USGS Post-Fire Study—Tubbs and Nuns Fires (Perkins et al.)

- Saturated hydraulic conductivity (Ksat) reductions greatest in high burn severity area; dry ravel rates low compared to that in Transverse Ranges.

Soil Burn Severity Data

Glass Fire Soil Burn Severity	Percent of Fire
Very Low / Unburned	16
Low	64
Moderate	18
High	2

- **80% low and unburned/very low.**

- **Field verified at 18 sites over 2 days.**

- **Satellite-derived BARC map overestimated SBS and the thresholds for moderate and high were reduced.**

- **Very similar to 2017 Nuns Fire (81% low and unburned/very low SBS)**

SOIL BURN SEVERITY
Glass Fire
CA-LNU-015947

Fire perimeter
Unburned / Very Low
Low
Moderate
High

N
0   0.75 1.5   3
               Miles

Post-Fire Flood Flow Prediction

- **9 pour point watersheds established to estimate flow changes.**

- **USGS Magnitude and Frequency Method regional regression equations used to compute pre-fire peak flow for the 2- and 10-year events.**

- **Pre-fire peak flows were doubled for areas with moderate and high soil burn severity, and multiplied by a sediment bulking factor that was proportional to soil burn severity.**

- **Estimated post-fire bulked runoff for the 2-year recurrence interval storm event is expected to increase from 10 to 100 percent.**
    - **Greatest increases expected to occur in the Santa Rosa Creek and Simmons Canyon watersheds.**
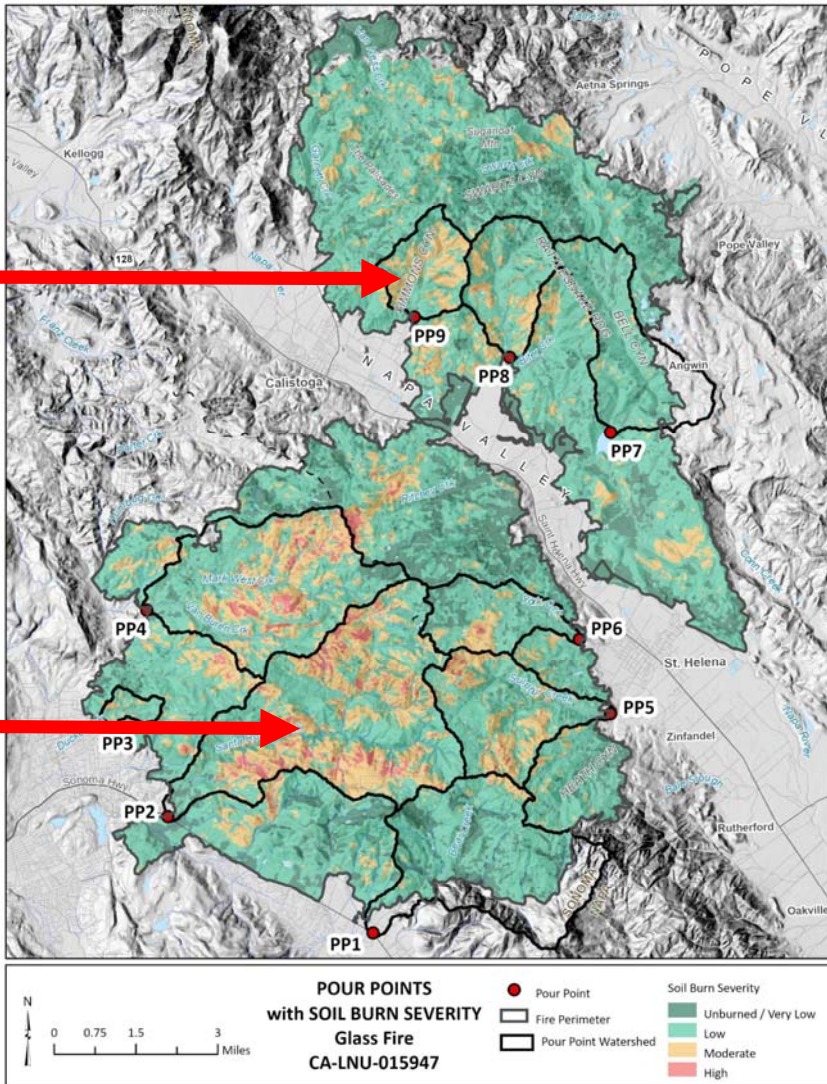
Pour Point No.1.5	Pour Point Watershed Name	Post-Fire Modifier	Post-Fire Combined Bulked Modifier	Percent Flow Increase	Predicted 2-Year Recurrence Interval Flow
1	Sonoma Creek @ Hwy 12	1.0	1.1	10	2-5
2	Santa Rosa Creek	1.5	2.0	100	5-10
3	Ducker Creek	1.1	1.4	40	2-5
4	Mark West Creek	1.4	1.8	80	5
5	Sulphur Creek	1.3	1.7	70	2-5
6	York Creek	1.2	1.5	50	2-5
7	Bell Creek	1.0	1.2	20	2-5
8	Dutch Henry Creek	1.2	1.6	60	2-5
9	Simmons Canyon	1.5	2.0	100	5

Represents model results with a 50% probability (2 Year Event) in the first wet season after a storm event. Results and based on modeling of areas of the landscape with similar burn severity, soil type, rock content, slope, and vegetative cover type.
Results should be viewed as estimates of post-fire erosion only, and do not represent potential sediment routing, deposition, or downstream delivery.

Glass Fire perimeter
County boundary

ERMIT Post-Fire Surface Erosion Results
50% Probability (2-yr)
Minimal Post-Fire Surface Erosion
Moderate Post-Fire Surface Erosion
Maximum Post-Fire Surface Erosion

Mean erosion rate: 5.2 tons/acre

Elevation source: 2005 NEXTMap InSAR
Glass Incident
CA-LNU-015947

Glass Incident
Napa and Sonoma Counties

Surface Erosion and Water Quality

- **Pre-fire: 0.5 tons/acre/year based on Bell Canyon Reservoir bathymetric survey (Napolitano et al. 2009, Napa River TMDL). [43 year record]**

- **Post-fire: ERMiT model predicts mean of 5.2 t/ac/yr first year with a 2-year return period storm event. Mostly low to moderate level of increase.**

- **Localized high surface erosion rates generally consist of hillslopes with steeper slopes and/or areas burned at moderate to high soil burn severity.**

- **Plausible numbers based on Boggs Mountain Demonstration State Forest Runoff and Erosion Study results (Olsen 2016, Cole et al. 2020).**

- **Impacts to Bell Canyon Reservoir predicted to be relatively minor due to low soil burn severity; additional hydrologic evaluation advised.**
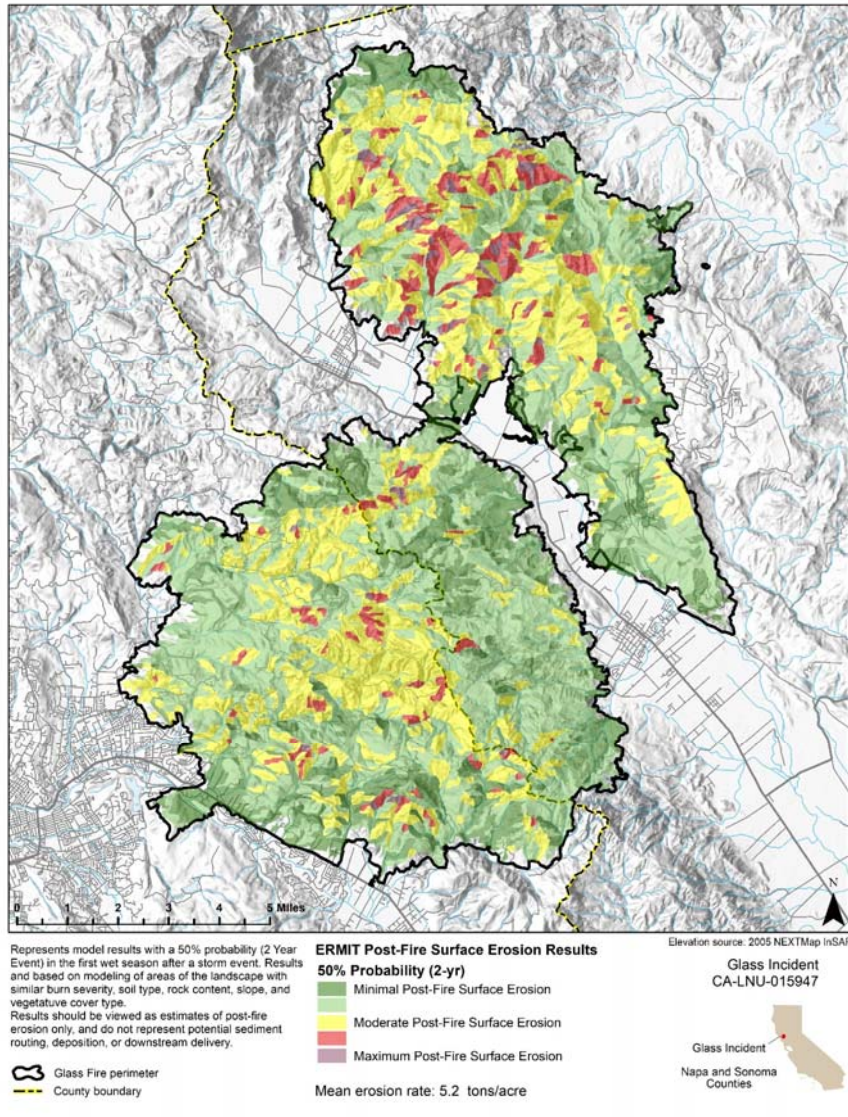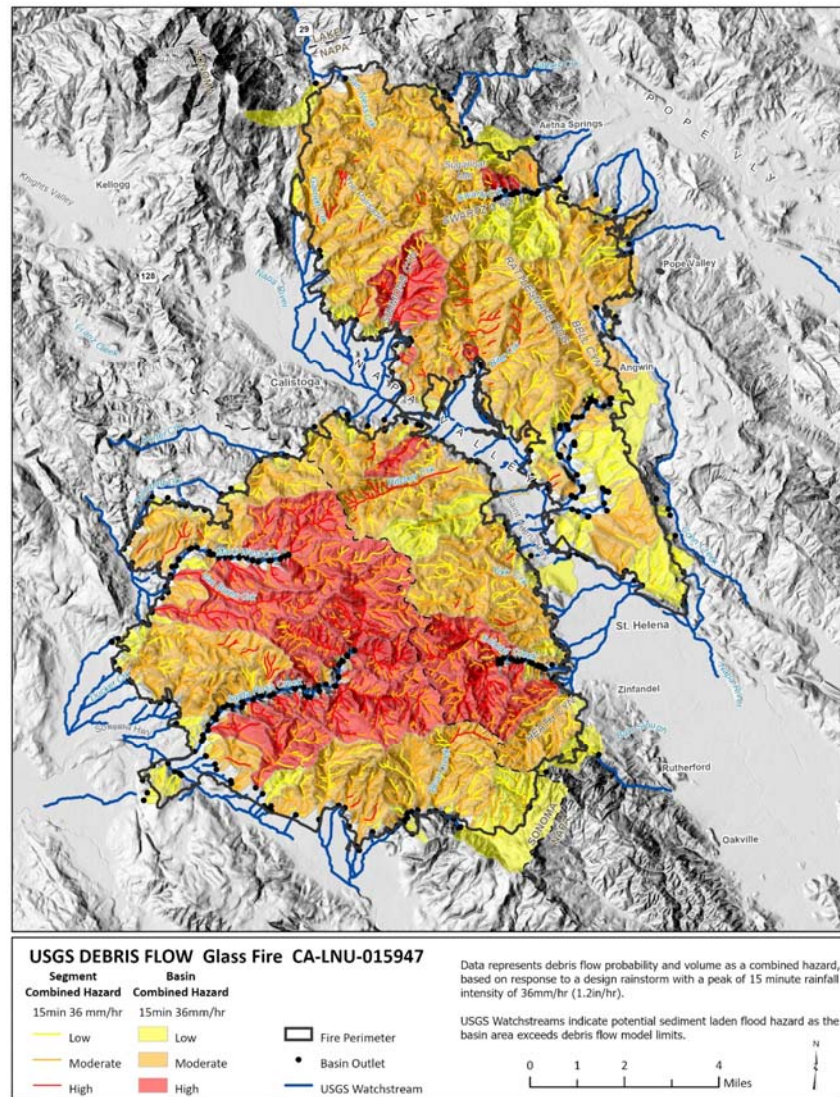
USGS Debris Flow Model
(Staley et al. 2016)

Debris Flow Likelihood Increases with:

- Slopes greater than 43 percent <mark>burned at moderate to high soil burn severity.</mark>

- Soil erodibility (K-factor) – Higher for finer textured material.

- Short duration rainfall intensity (15-minute).

USGS DEBRIS FLOW Glass Fire CA-LNU-015947

Segment Combined Hazard 15min 36 mm/hr	Basin Combined Hazard 15min 36mm/hr	
Low	Low	☐ Fire Perimeter
Moderate	Moderate	• Basin Outlet
High	High	— USGS Watchstream

Data represents debris flow probability and volume as a combined hazard, based on response to a design rainstorm with a peak of 15 minute rainfall intensity of 36mm/hr (1.2in/hr).

USGS Watchstreams indicate potential sediment laden flood hazard as the basin area exceeds debris flow model limits.

0 1 2 4 Miles

USGS Debris Flow Model

- **<u>Debris flow model indicates that there is generally a low to moderate hazard</u>.**

- **With a 15-minute rainfall intensity of 36 mm hr^{-1} (1.42 in hr^{-1}), 197 of 422 basins (47 percent) have a likelihood of 40-60 percent or greater to produce debris flows.**

- **2-5 year recurrence interval rainfall intensity.**

- **This threshold represents a 50 percent chance that debris flows may initiate within approximately 50 percent of the modeled basins.**

- **Based on the debris flow model, basins within the Mark West Creek, Santa Rosa Creek, Sulphur Creek, and Simmons Canyon have the highest probability of triggering a debris flow.**
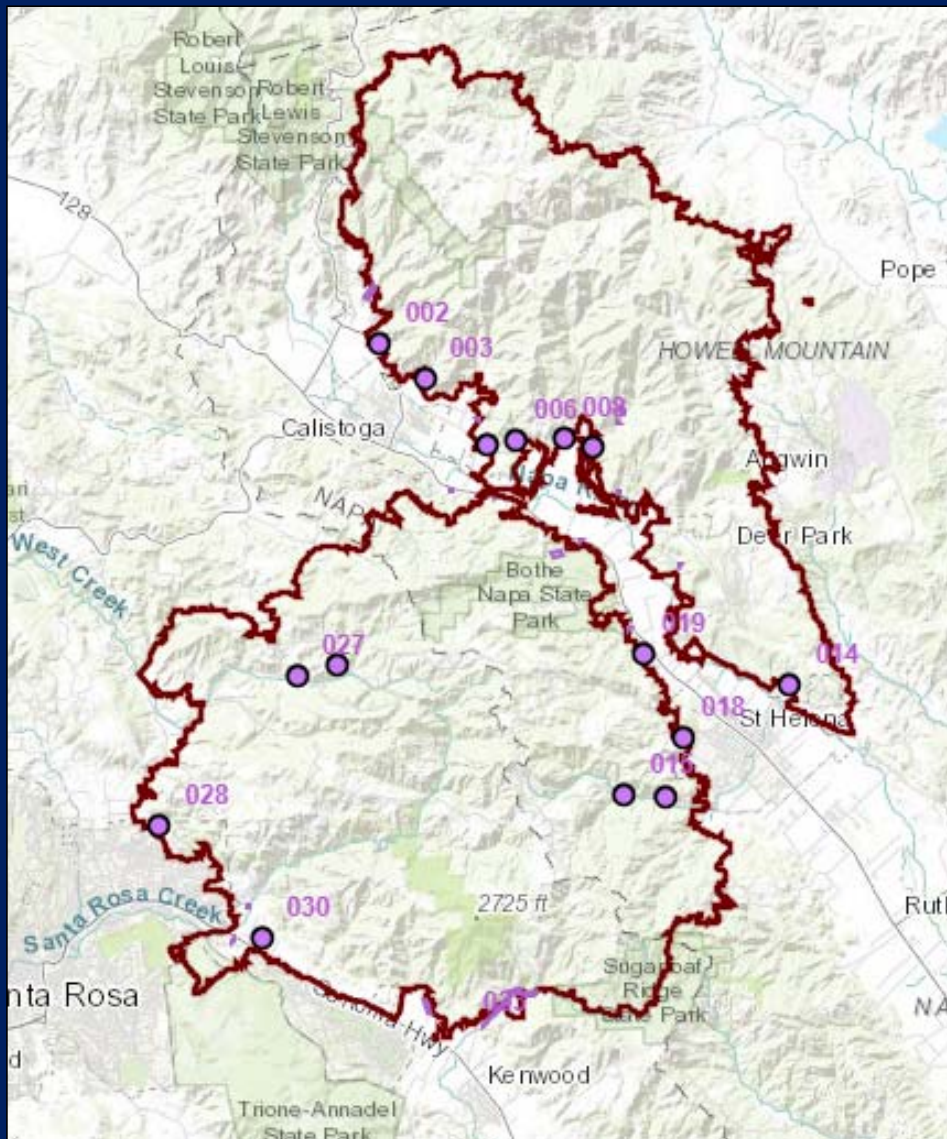
Values-at-Risk (VARs)

- **33 VARs were identified within and downslope/ downstream of the fire.**

- **25 VARs are located in Napa County, with 8 located in Sonoma County.**

- **18 VARs are polygons that encompass several individual structures or extended alignments of road.**

- **The majority of VARs are likely to be subject to localized flooding and/or localized potential for debris flows.**

- **2 VARs were determined to have a high threat to life-safety; 23 VARs were determined to have a moderate threat to life-safety.**

- **26 VARs relate to either houses or house pads in close proximity to stream channels subject to inundation from sediment-laden flows or debris flows.**
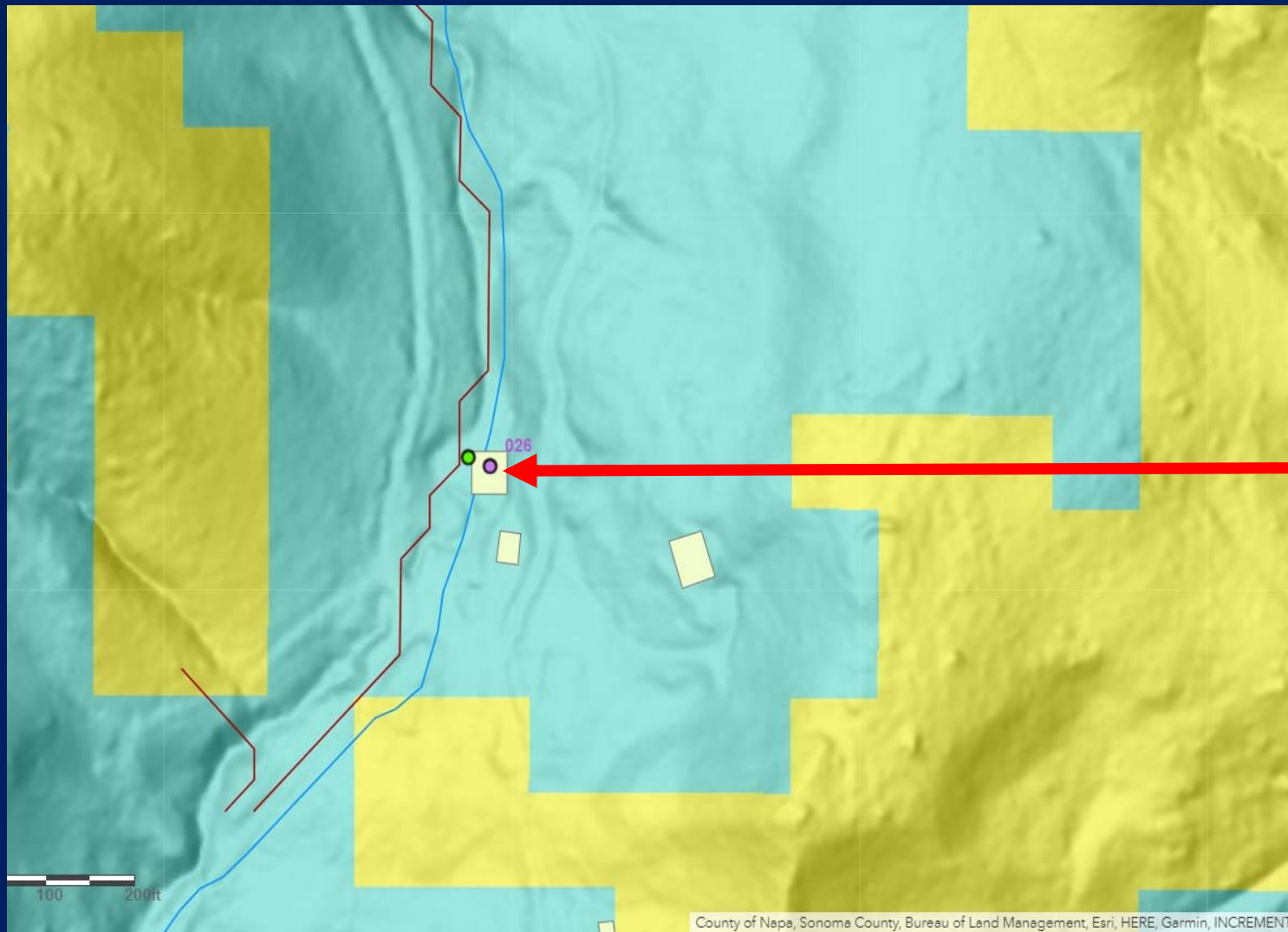
VAR Data Collection

- **Esri Arc Collector application loaded on iPads.**

- **43 data layers available for viewing in the field for VAR identification.**

- **VAR points and polygon locations recorded.**

- **Data uploaded to the cloud nightly.**

Data Layers
- Streams
- VARs (points)
- Building Footprints
- Segment Debris Flow Predictions (36 mm-15 min)
- Soil Burn Severity

VAR 26
- Hazard = flooding and debris flow
- Moderate life-safety; Moderate property risk.
- Emergency protection measure = Early Warning System.

House near channel in the upper Mark West Creek drainage (VAR 026)

Winery structure and tanks adjacent to channel near St. Helena (VAR 014)

House near channel outside of St. Helena (VAR 018)

Key General Emergency Protection Measures

- **Use early warning systems**.
  - Napa and Sonoma county-recommended emergency alert notification systems.

- Monitor and maintain road drainage and storm drain infrastructure.

- Utilize temporary flood control and structure protection (sandbags, K-rails) where appropriate.

- Place temporary signage and consider road and park closure in areas of potential post-fire flooding, debris flow, and rockfall hazards.

Timeline for Glass Fire WERT Report

- **Internal draft report submitted to CAL FIRE and CGS senior staff for review on October 29, 2020.**

- **Final report should be ready for Cal OES distribution in two weeks.**

Bell Canyon Reservoir