A pilot study of inundation from Copeland Creek overbank flow

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Copeland Creek Flooding at Lichau Road and Cold Springs Road (avulsion site) (Source: SCWA)

Introduction

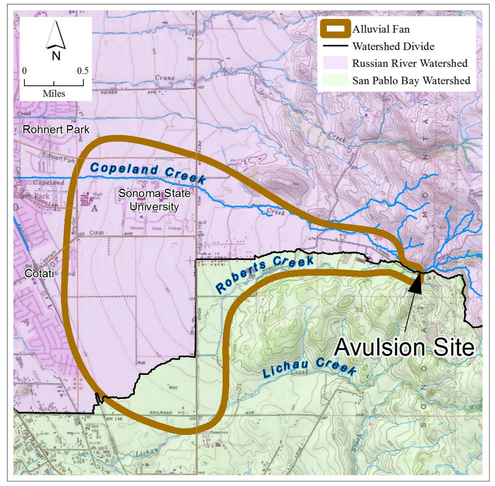
- Copeland Creek floods its bank north of the intersection of Lichau Road and Cold Springs Road (the **avulsion site**)
- Overbank flow from the avulsion site leaves the Russian River watershed and enters the San Pablo Bay watershed (see image, left)
- Residents and state officials believe floodwaters from Copeland Creek cause flooding in Penngrove and Petaluma
- To date, no studies have modeled Copeland Creek overbank flow to observe where Copeland Creek floodwaters travel
- Understanding the conditions that cause Copeland Creek to flood, and where the floodwaters travel will assist in finding a solution

Research Questions

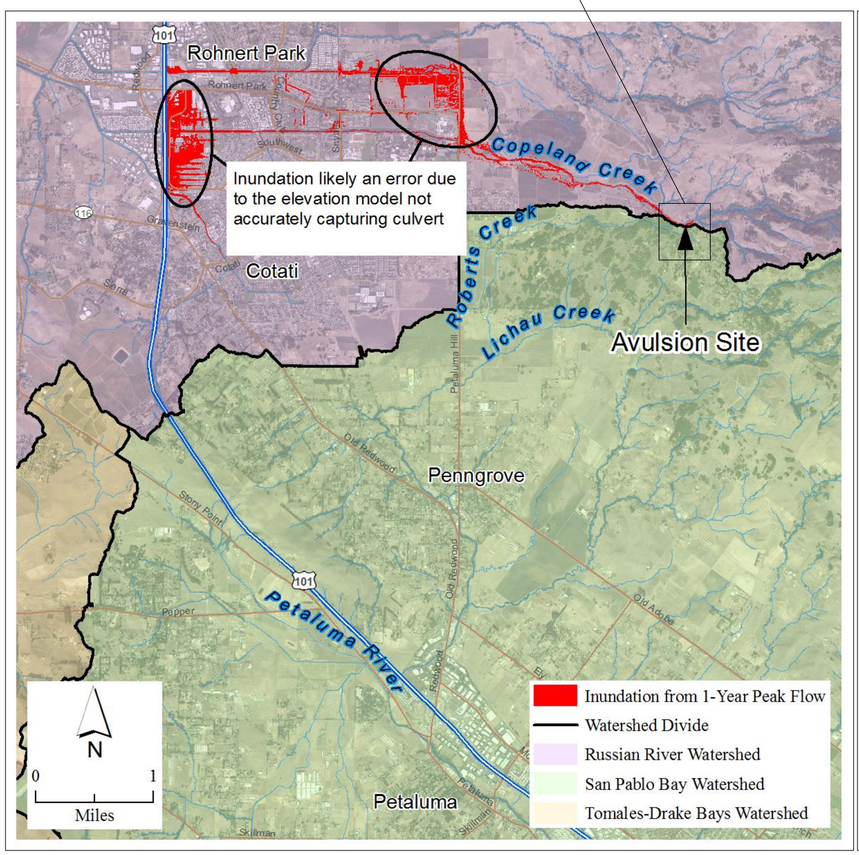
- When does Copeland Creek jump its bank at the avulsion site?
- Where does overbank flow from Copeland Creek go?

Conclusion

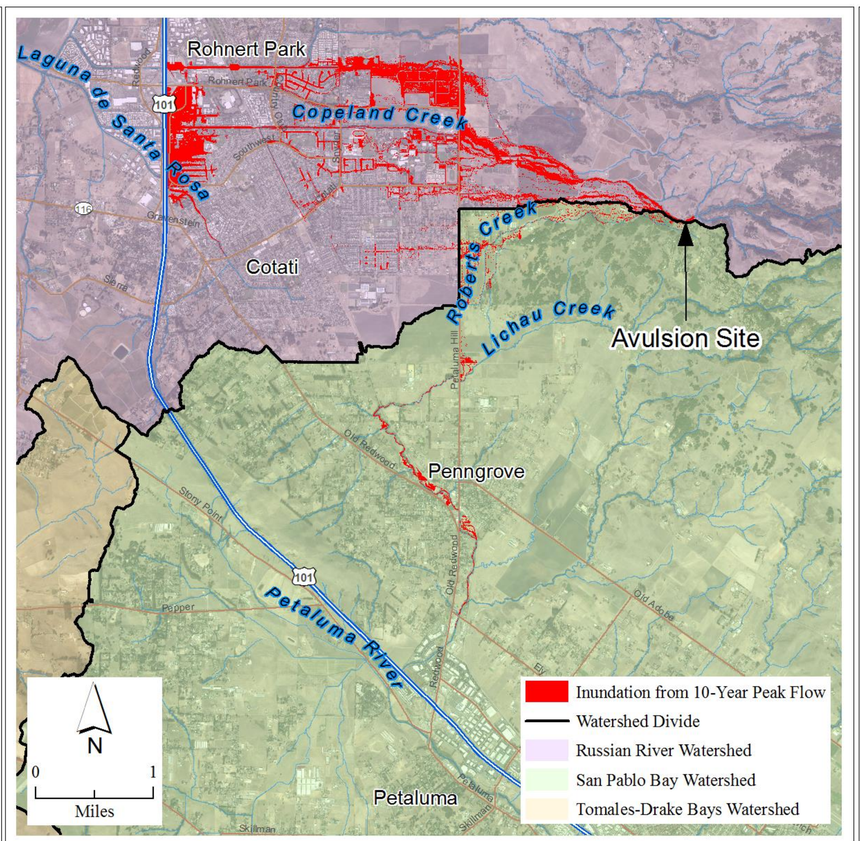
- Presence of an alluvial fan (see image, right) suggests Copeland Creek has switched watersheds for millennia
- 10-year or higher peak flow events cause Copeland Creek to jump its bank at the avulsion site
- Overbank flow from the avulsion site jumps watersheds from the Russian River watershed to the San Pablo Bay watershed
- Copeland Creek overbank flows entering Lichau Creek and Petaluma River may exacerbate flooding



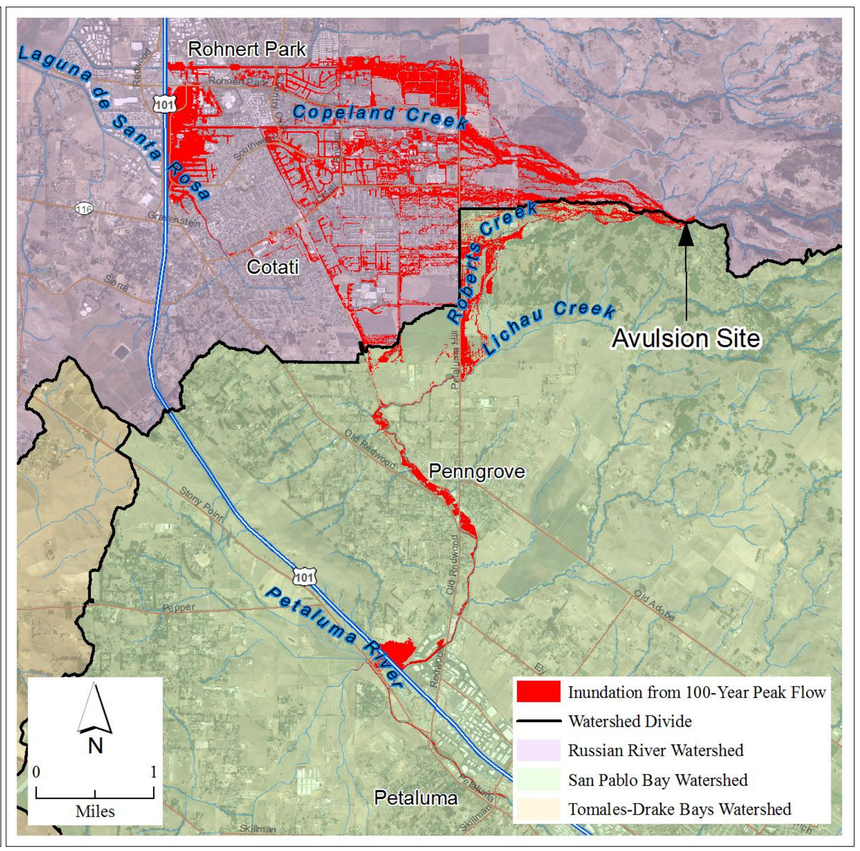
Copeland Creek Alluvial Fan



Inundation from Copeland Creek 1-Year Peak Flow



Inundation from Copeland Creek 10-Year Peak Flow



Inundation from Copeland Creek 100-Year Peak Flow

Methods

- Copeland Creek was modeled using U.S. Army Corps of Engineers (USACE) HEC-RAS version 5.0.3 hydraulic modeling software
  - Data inputs: 3' resolution LiDAR elevation data (Sonoma Veg Map), Land Cover (NLCD), Peak-Flow hydrographs derived from GHD HEC-HMS modeled peak flow
- HEC-RAS models were run for 1, 2, 10, 25, 50, and 100-year peak flow events; total model run-time = 62 hours
- HEC-RAS hydraulic model results for depth and inundation extent were exported to ESRI ArcMap for visualization (1, 10, and 100-year results shown above)

Findings

- 1-year peak flows do not cause Copeland Creek to jump its bank at the avulsion site
- 10-year peak flows cause Lichau Road to be flooded by approximately half a foot of water, and add approximately 1.5 feet to the river stage height of Lichau Creek in Penngrove
- 100-year peak flows cause Lichau Road to be flooded by approximately 1.5 feet of water, add approximately 5 feet to the river stage height of Lichau Creek in Penngrove, and approximately 2 feet to Petaluma River in Petaluma

Source for Copeland Creek flooding photo: SCWA. Source for creeks and watersheds: Sonoma Veg Map, Sonoma County Agricultural Preservation and Open Space District, Sonoma County Water Agency, Sonoma County Information Services (ISD), Quantum Spatial, Tukman Geospatial LLC, 2017. Source for roads: ESRI. Source for topography base map: 2013 National Geographic Society, i-cubed. Source for aerial photography: NASA Grant NNX13AP69G, the University of Maryland, and the Sonoma Vegetation Mapping and LiDAR Program.