

# Sediment Delivery to Freshwater Ecosystems Following Wildfire

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CSU-WATER Annual Conference (2023): Water Quantity Panel**



California State University  
**MONTEREY BAY**

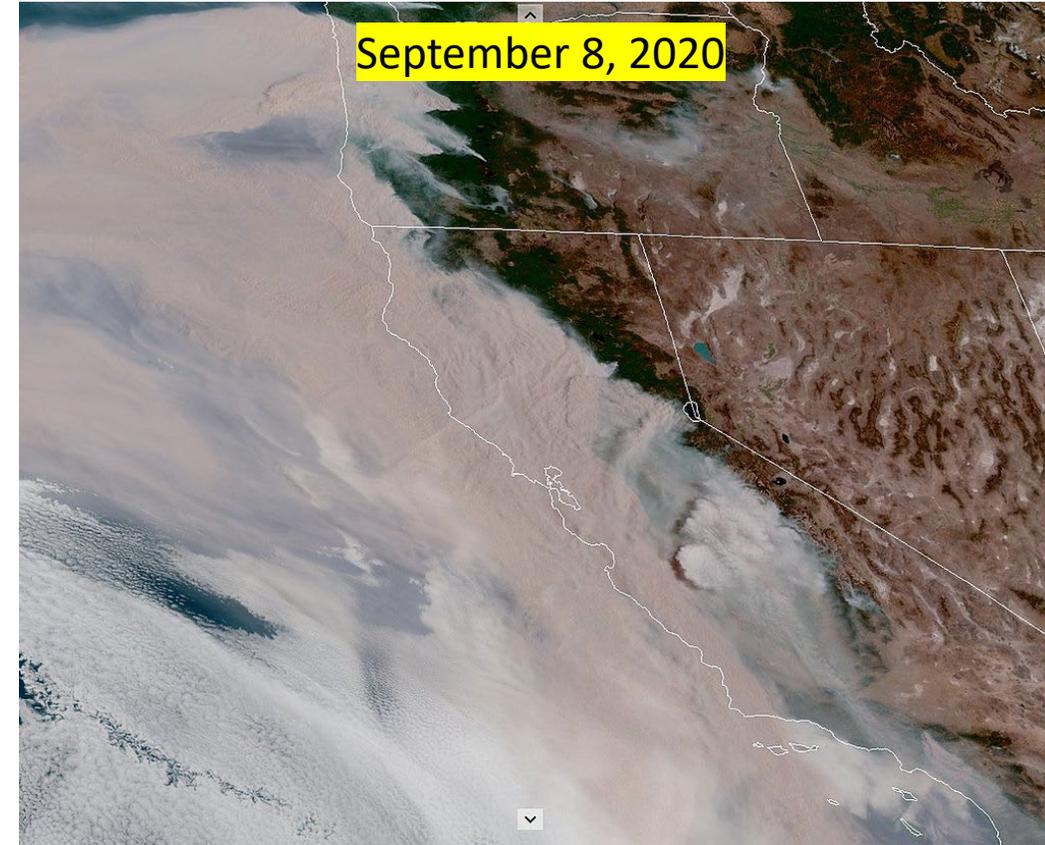
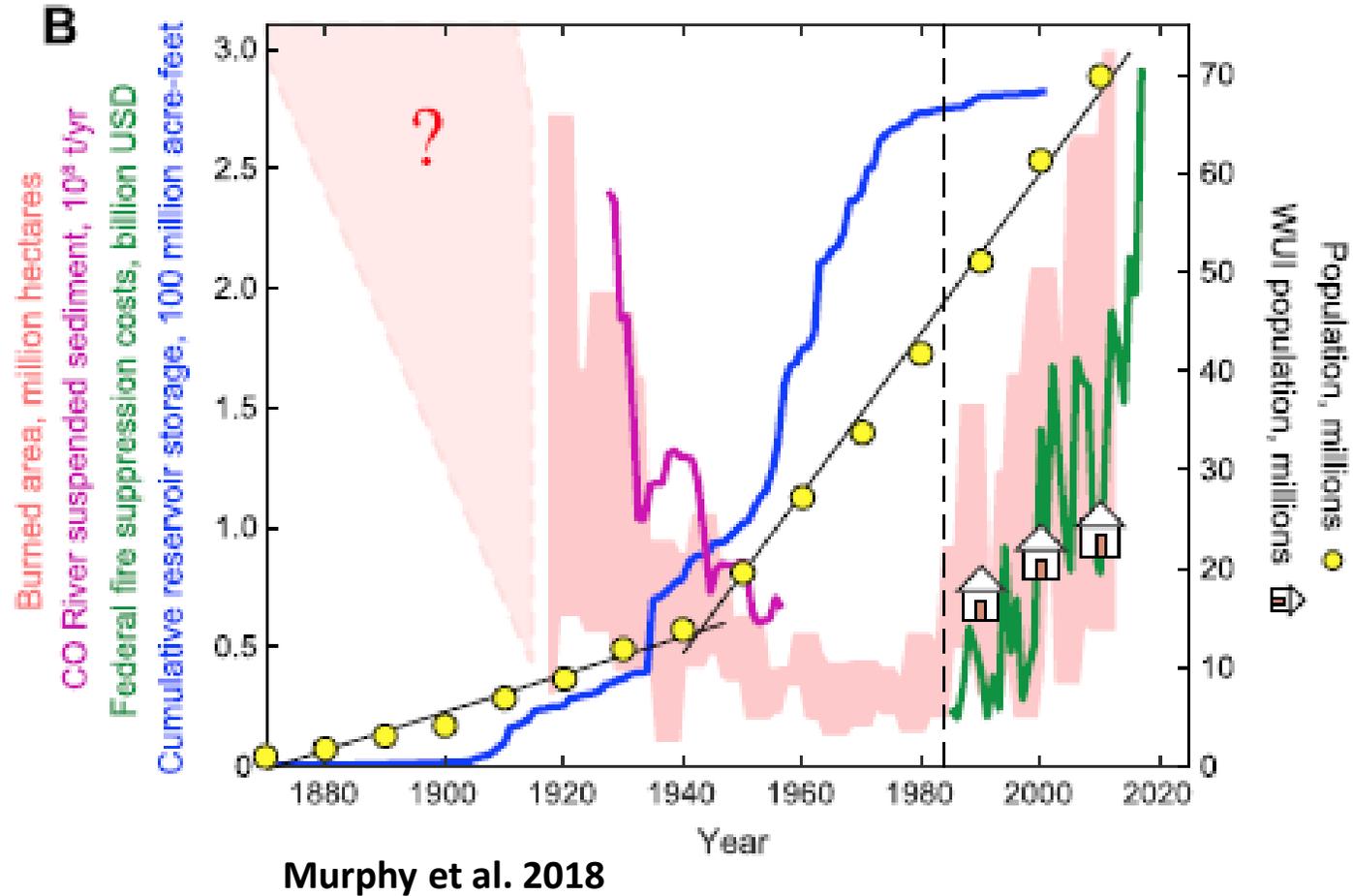


**wood.**



**N|V|5**  
ALTA  
ENVIRONMENTAL

# Wildfire: Dual threat of hazard and increased exposure



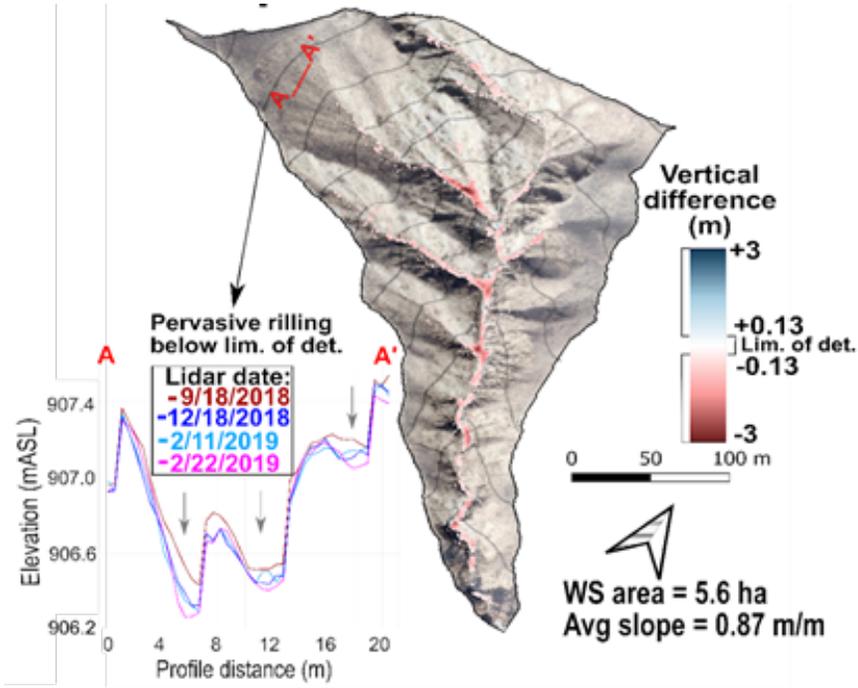
Source: NASA GOES-17

# Case study from SoCal (2018 Holy Fire)

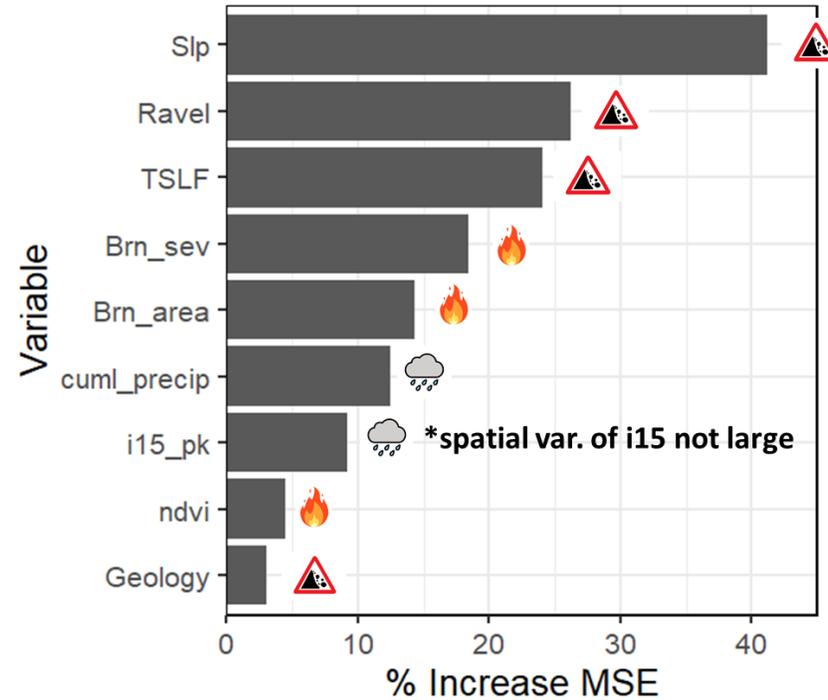


# Upstream monitoring and modeling

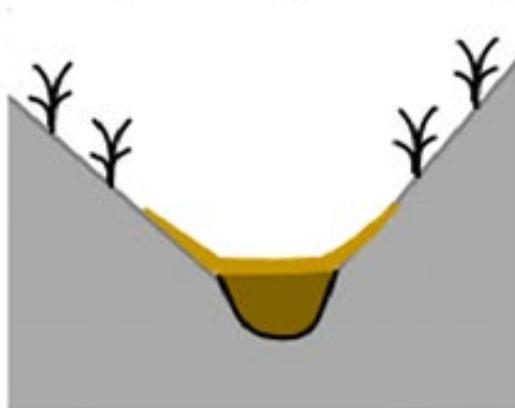
Topography and sediment supply are strongest drivers of yield\*



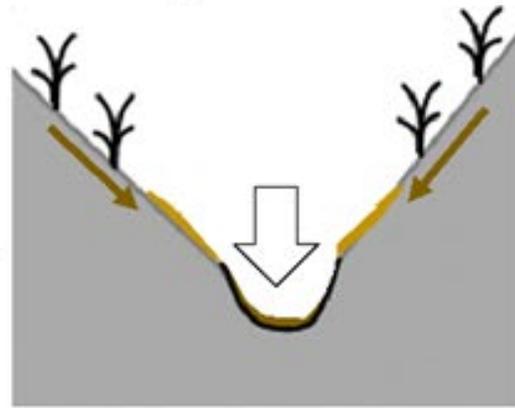
Data-driven modeling (n=566)



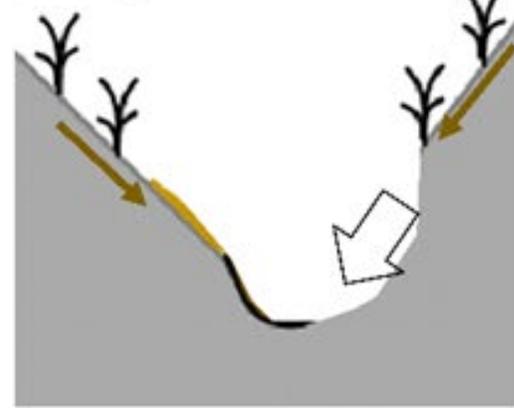
Stage I. Dry Loading



Stage II. Incision

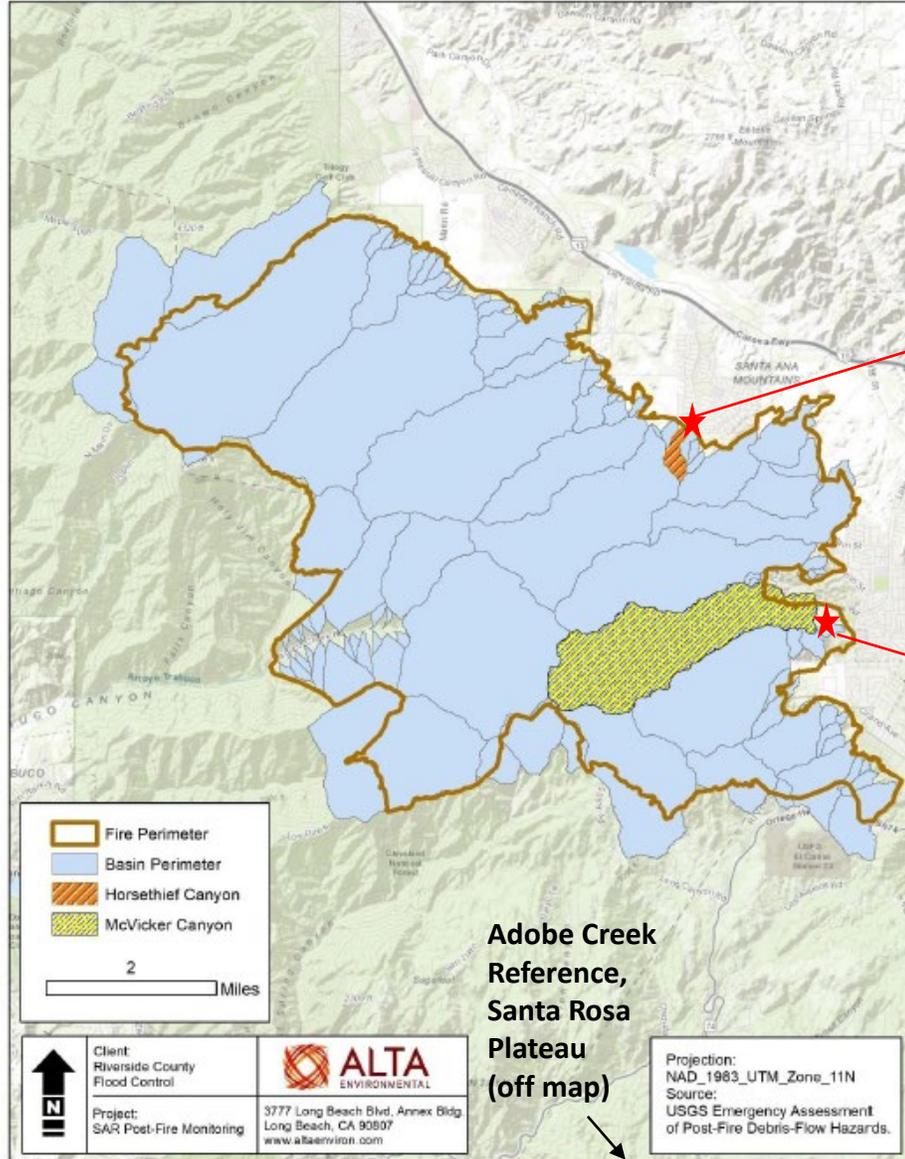


Stage III. Lateral sources



What are downstream impacts?

# Downstream monitoring



**Horsethief**

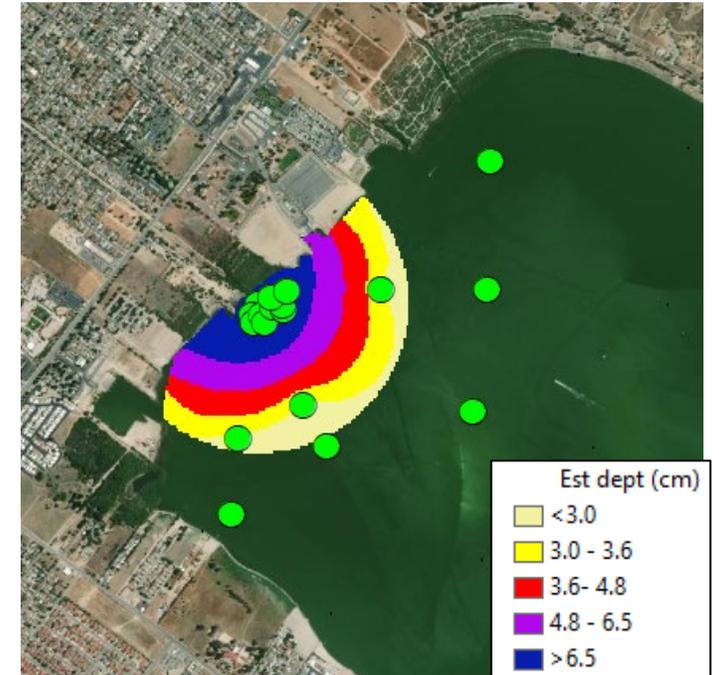


**McVicker**

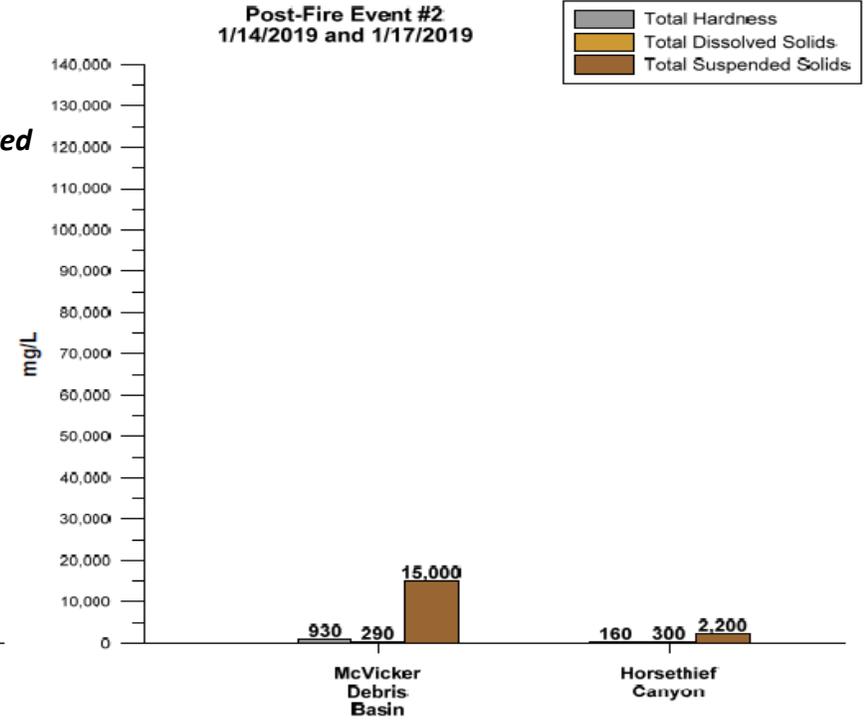
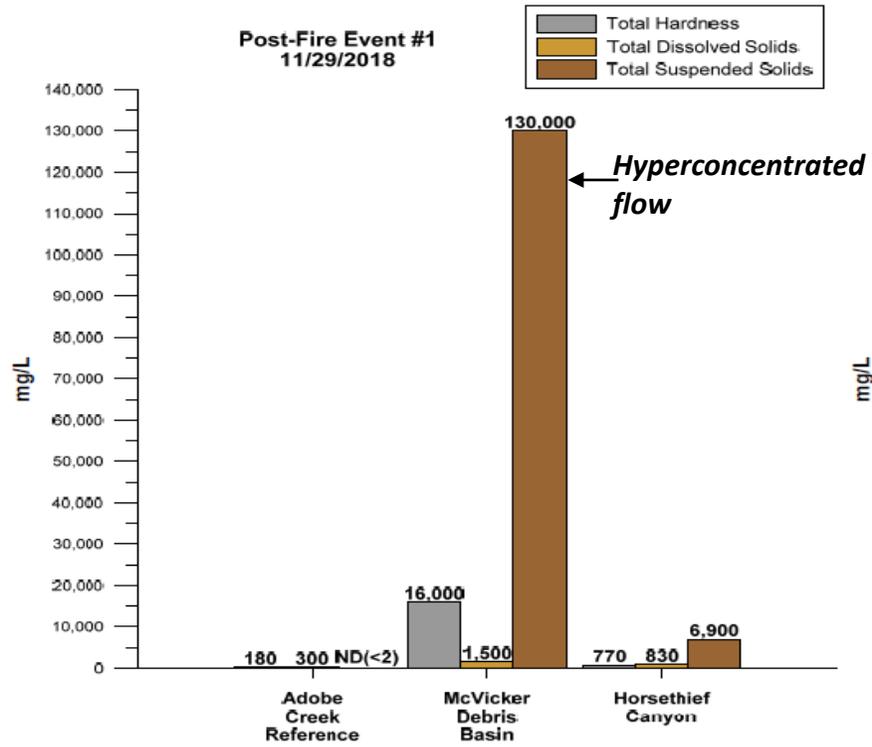


Source: Riverside County

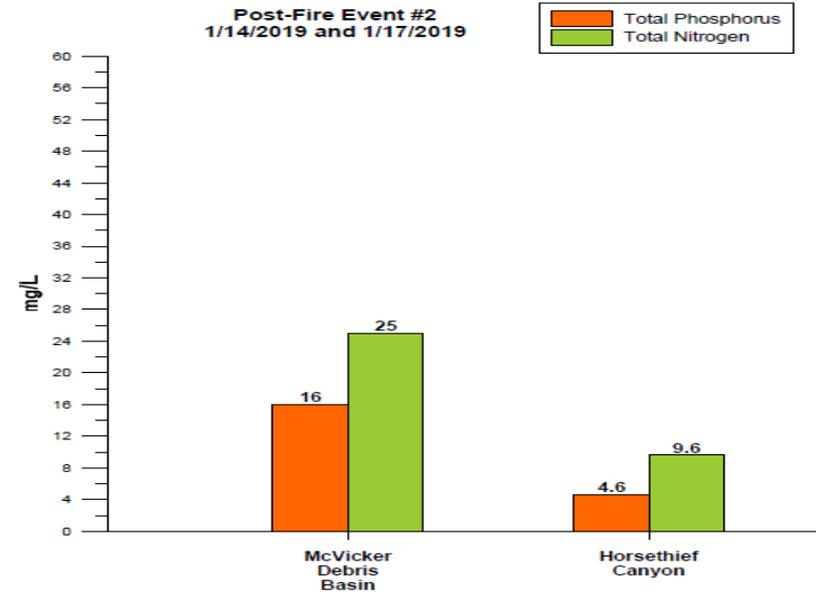
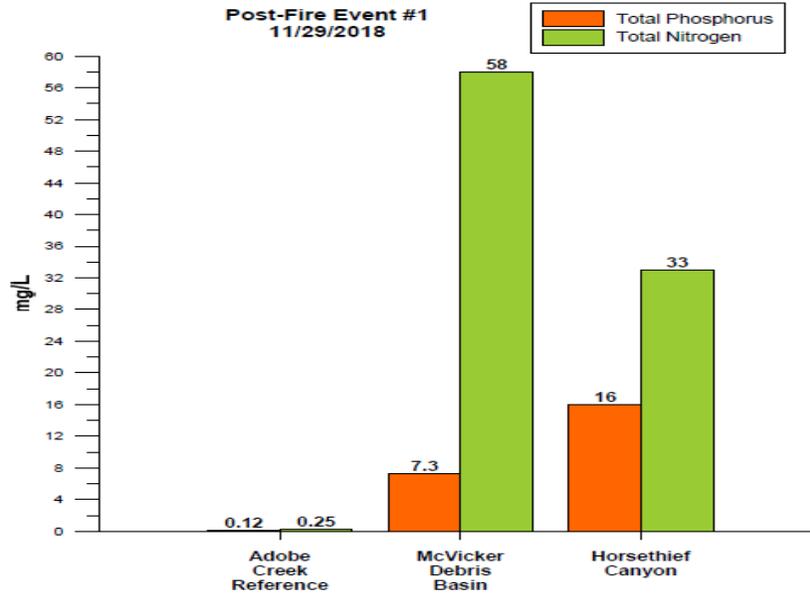
Photo 2: Arial View of Leach Canyon Sediment Deposition Resulting from the Holy Fire into Lake Elsinore on January 8, 2019 (Photo courtesy of Alta Environmental)



# Sediment and TDS:

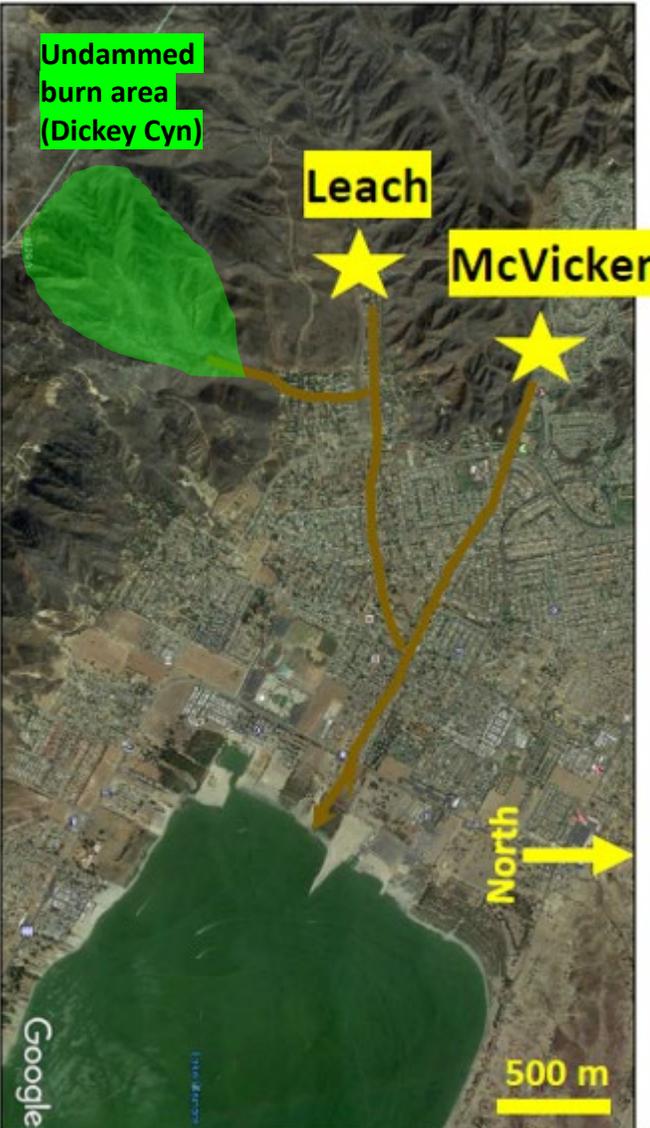


# Nutrients:

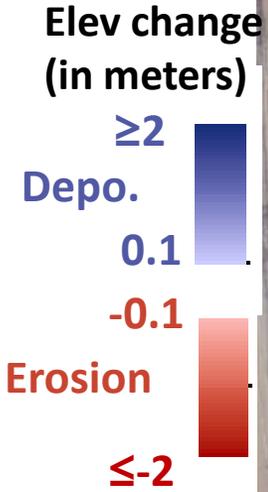
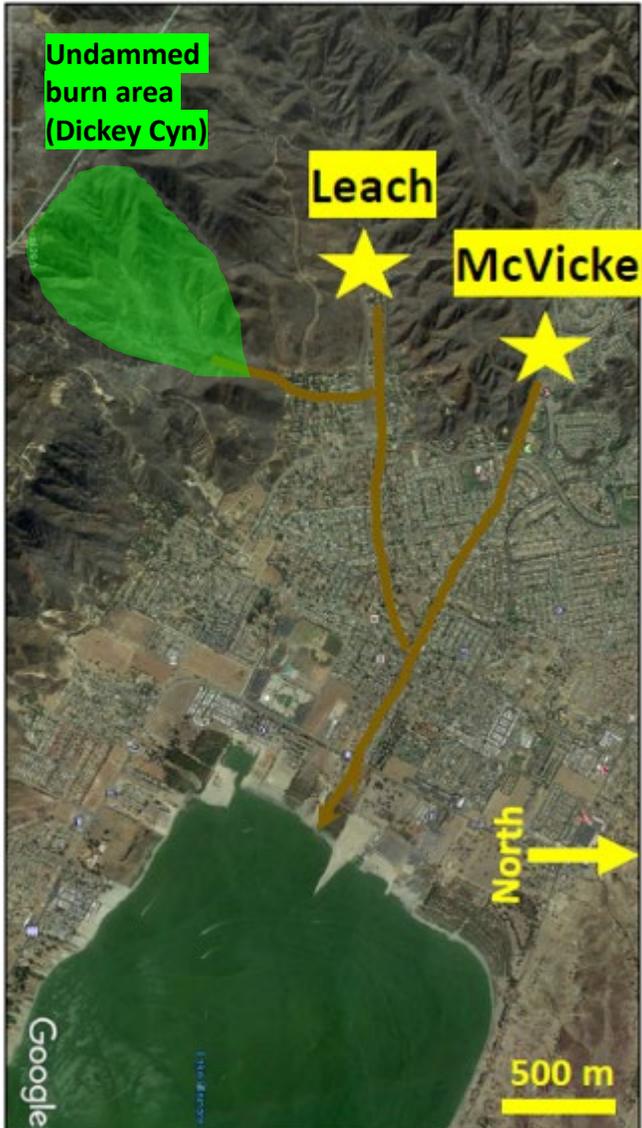


SAR Holy Fire PFM Report, 2019

# Downstream remote sensing



# Downstream remote sensing

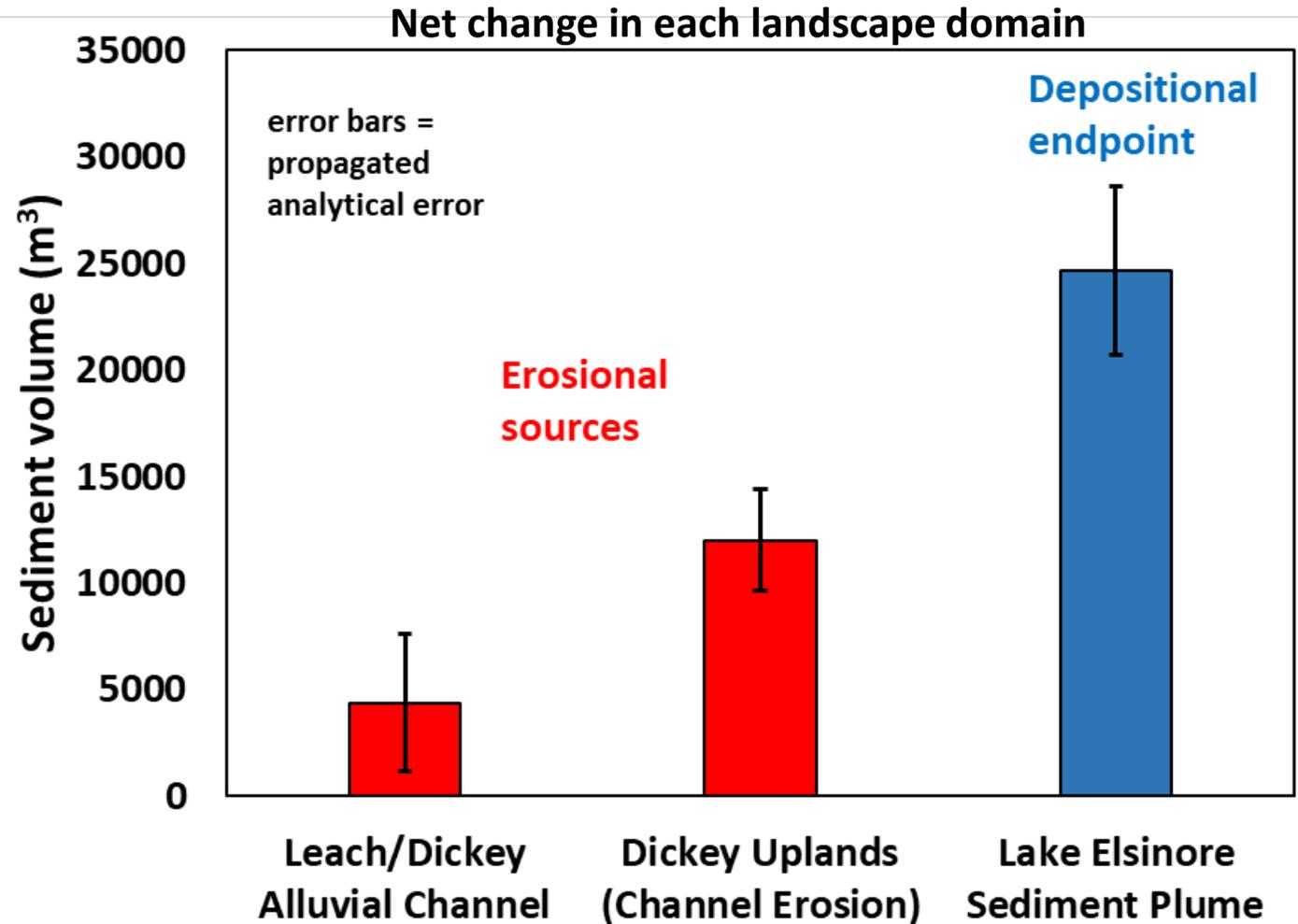
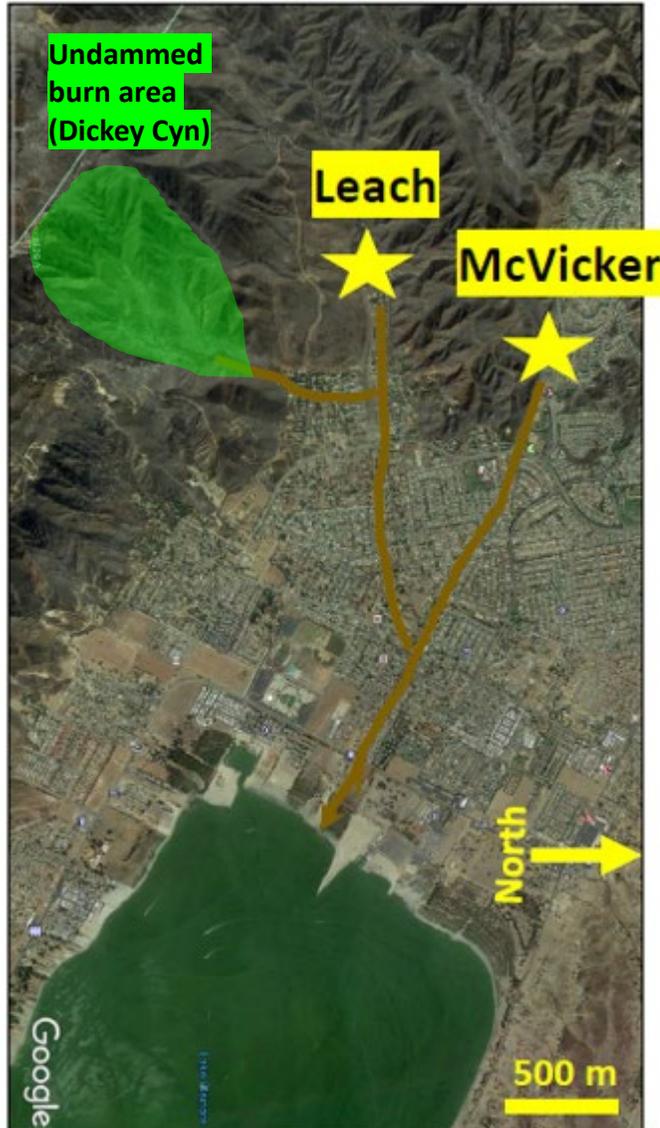


Feb 2019 Storm: Leach/Dickey Channel Change



Bank erosion volume exceeds in-channel and overbank deposition

# Putting it all together: sediment budget



Debris basins stored ~120,000 m<sup>3</sup>  
Assuming good estimates: ~8000 m<sup>3</sup> missing...  
which could be explained by fine sediment  
throughput and/or undammed inputs

**Dickey Canyon (undammed ~1km<sup>2</sup>  
catchment) likely a major contributor!**

# Take-aways

- What are patterns of sediment transfers from source (burned mountains) to sink (terminal lake basin)?
- **Major erosion in response to common rainfall intensities (1-5 year RI) and clear “first-flush effect” corroborated by all scales of monitoring.**
- **Significant buffering provided by Riverside County debris basins, un-dammed uplands likely major contributor of remaining sediment and phosphorus**
- **Adds to growing literature showing fire-flood cycles as a very important disturbance agent in freshwater ecosystems in CA and WUS... need for more studies across a wider array of systems!**

# Acknowledgments



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Conservation



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MONTEREY BAY



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Thank you!

Questions?

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