CLIIMATE CHANGE (D): WEATHERIING EXTREMES TOGETHER
MODULE 3

WATERSMART

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Berkeley Lab Earth and
Environmental Sciences Area

NBWA
NORTH BAY WATERSHED ASSOCIATION

Wildfire Impacts on Water Systems

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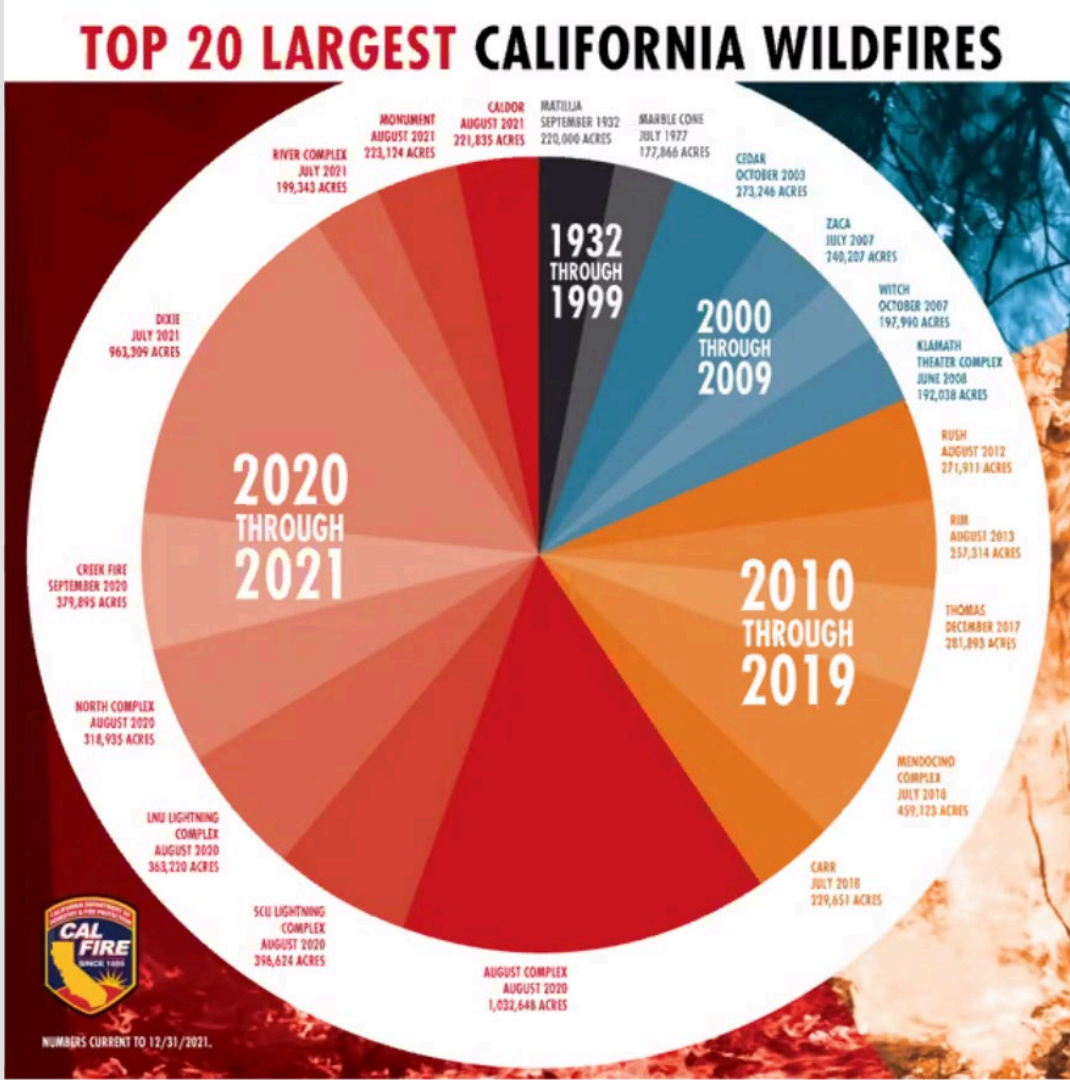
Climate Change(d): Weathering Extremes Together
04/08/202

Wildfires are increasing in frequency, severity, and extent

- Climate change
- Fire suppression regimes
- Human encroachment into wildlands
- Fire and climate management policies
- Pest and disease



Sections

Los Angeles Times

LOG IN

CLIMATE & ENVIRONMENT

As drought lingers, larger and more destructive wildfires pose new threats to water supply

BY HAYLEY SMITH | STAFF WRITER

FEB. 21, 2022 12 PM PT

Lightning Complex fires caused significant damage to Bay Area drinking water infrastructure

By Kiley Russell | Published January 21, 2021 | Wildfires | Bay City News Foundation

WILDFIRE

Burn areas from 2020 wildfires can impact water supply as snow melts

Last year, Greeley City Council declared a disaster emergency related to the watershed damages from the Cameron Peak fire.

Author: Kelly Reinke (9NEWS)
Published: 9:35 PM MDT April 28, 2021
Updated: 4:39 AM MDT April 29, 2021

Colorado Public Radio

I-70 Is Open Through Glenwood Canyon Again After Mudslides From The Grizzly Creek Fire Burn Scar Closed It. That Could Be A Sign Of Things To Come

By Paolo Zialcita | June 27, 2021

WINTER WEATHER

New rain system triggers mandatory evacuation order in Orange County burn scar area

By Jade Hernandez

Thursday, December 23, 2021

NEWS

Water quality could be impacted for a decade from Oregon wildfire fallout for 200k people

Bill Poehler
Salem Statesman Journal

Published 3:24 p.m. PT Sept. 25, 2020 | Updated 3:25 p.m. PT Sept. 25, 2020


Wildfire
Water Quality
Water Quantity
Infrastructure
Surface Water Contamination
Groundwater Contamination
Treatment Capacity Exceedance
Distribution Network Contamination & Damage
Reservoir Sedimentation
Landslides & Debris Flows
Flooding/ Irregular Water Yield
Early & Increased Snowmelt

Post-fire water quality, quantity, and infrastructure interactions, directly and indirectly, impair water availability. This is a SYSTEM level problem, however ...

Cascading Water Quantity Impacts

Wildfire

Early Snowmelt

Decreased ET

Elevated Runoff

Elevated Streamflow

Flooding

Erosion

Debris Flows

Landslides

Water Balance Disruptions

Adverse Outcomes

Cascading Water Quality Impacts

Wildfire

Trace Metals

Nutrients

Sediments

Organic Carbon

Mobilized Contaminants

Algal Blooms

Fish Kills

DBPs

Treatment Challenges

Adverse Outcomes

Cascading Water Infrastructure Impacts

Wildfire

Upstream Contamination

Flooding

Heat Exposure

Mudslides/Debris Flows

Hazards to Infrastructure

Infrastructure Damage

WDS Contamination

Reservoir Sedimentation

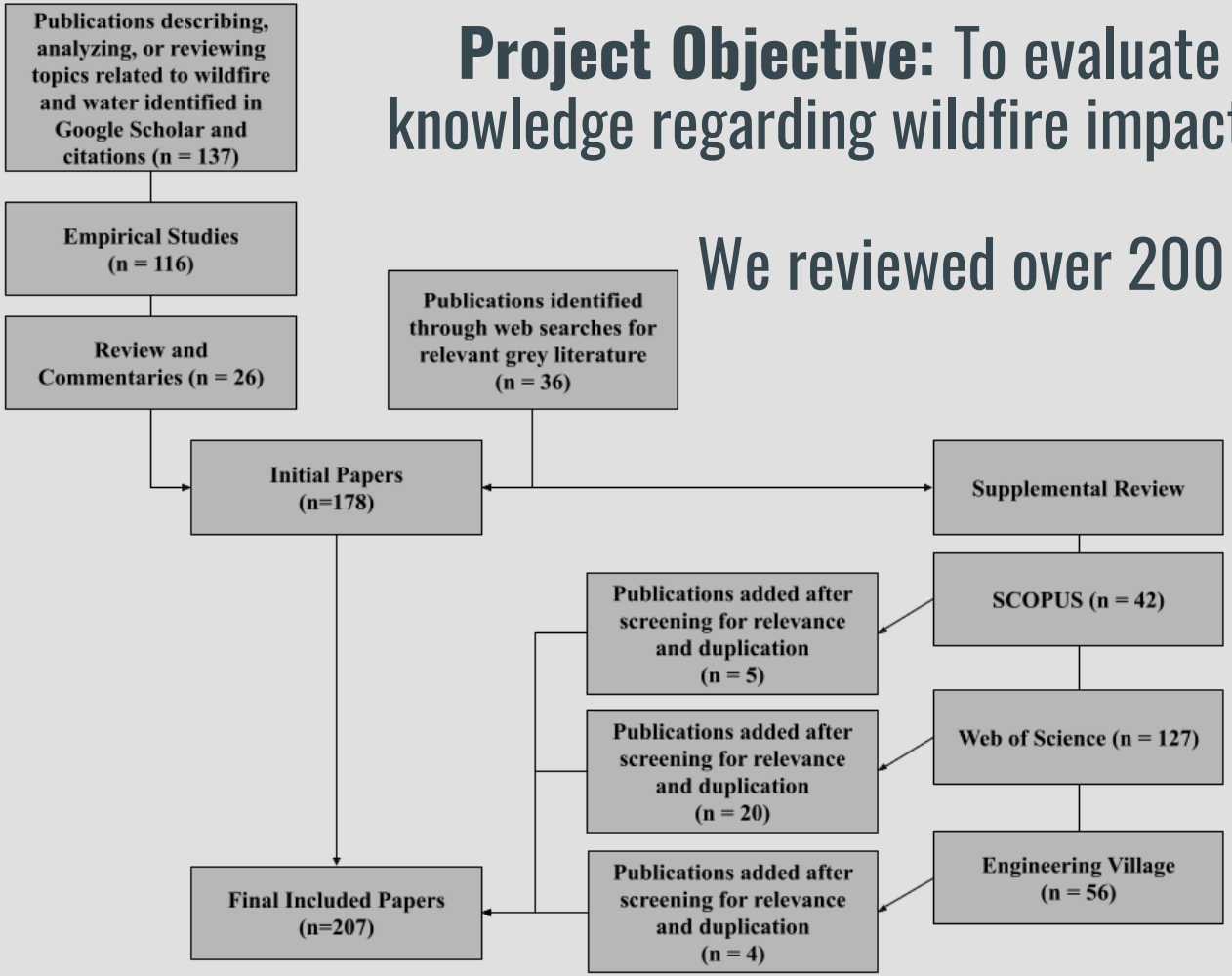
Service Interruptions

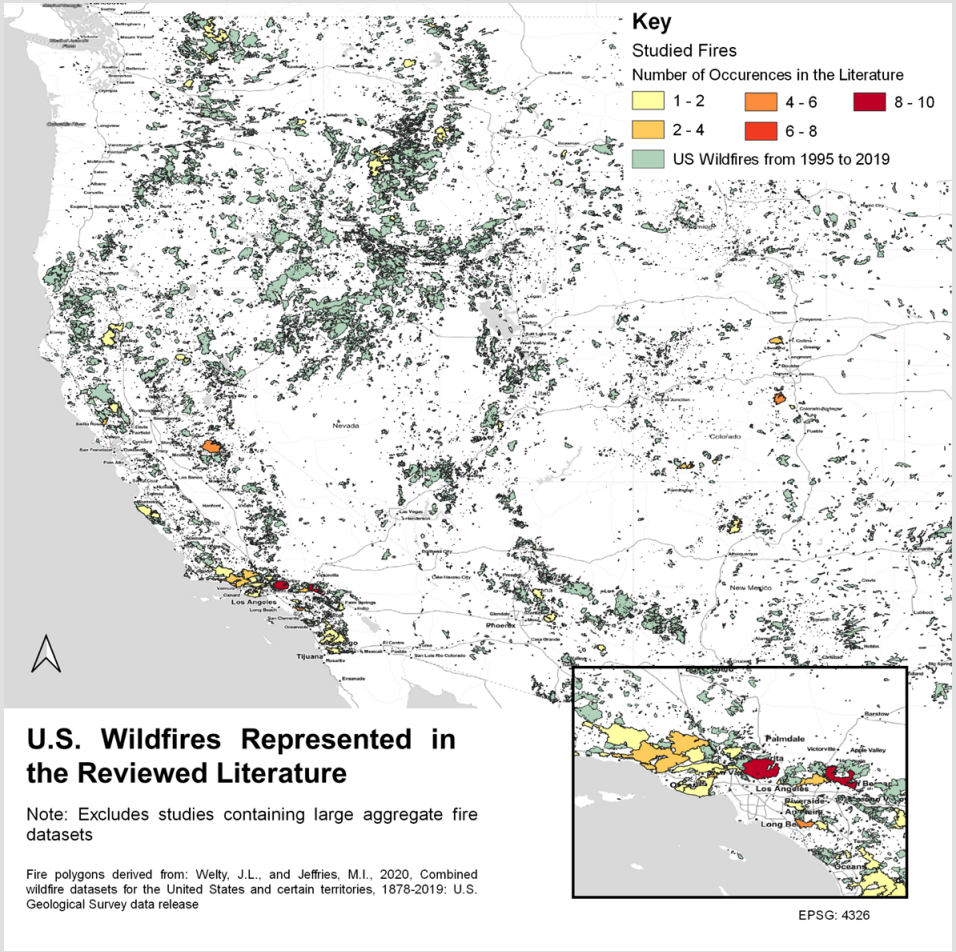
Adverse Outcomes

What is the state of knowledge?

Project Objective: To evaluate the current state of knowledge regarding wildfire impacts on water systems

We reviewed over 200 papers and reports!



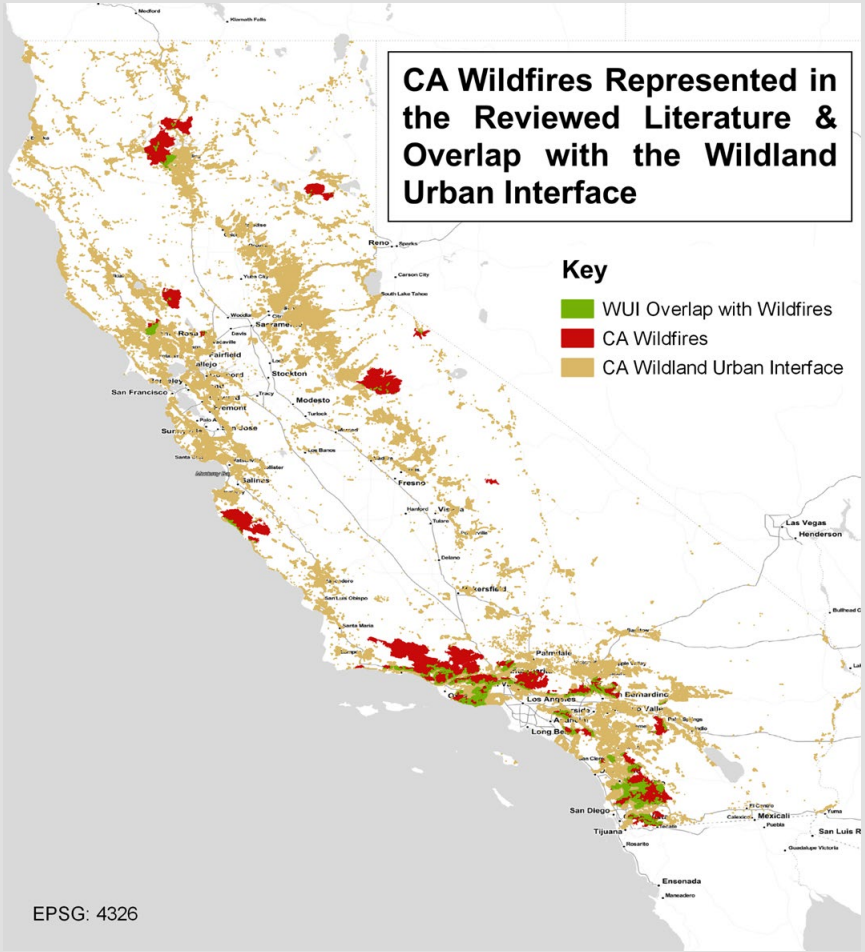


U.S. Wildfires Represented in the Reviewed Literature

Note: Excludes studies containing large aggregate fire datasets

Fire polygons derived from: Welty, J.L., and Jeffries, M.I., 2020, Combined wildfire datasets for the United States and certain territories, 1878-2019: U.S. Geological Survey data release

EPSG: 4326

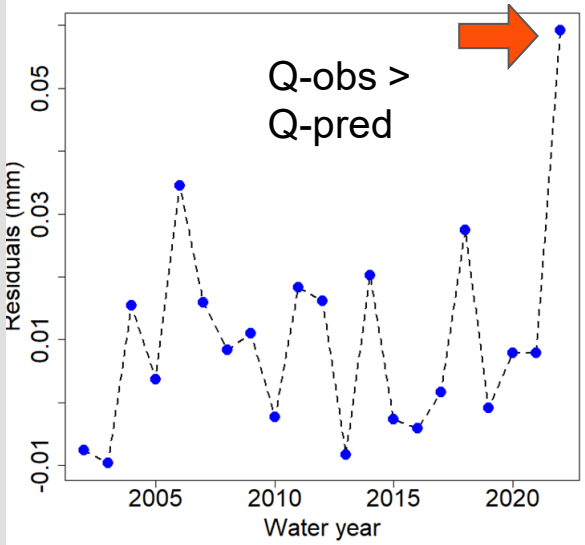


EPSG: 4326

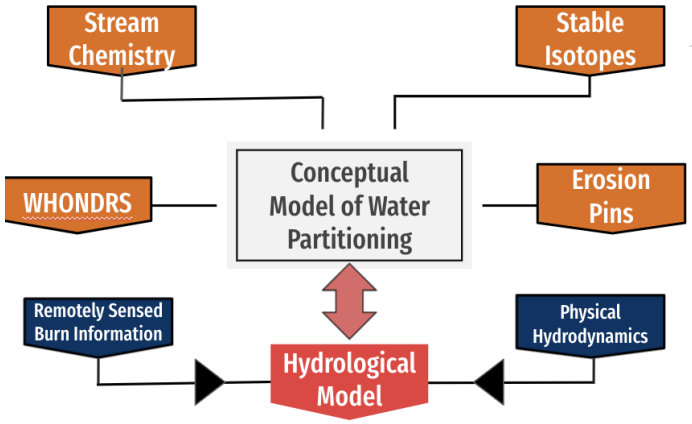
Assessing how watershed systems evolve and rebound after fires

Integrated water cycle: How does the hydrological functioning of watersheds and river basins respond to changes in precipitation patterns, land use, vegetation cover, geomorphology, nutrient and contaminant loading, and compounding disturbances?

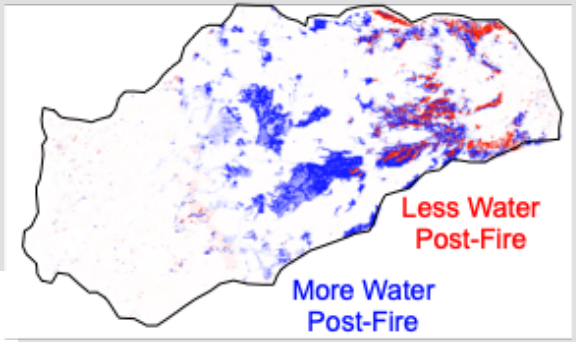
Drought suppresses wildfire impacts on hydrology



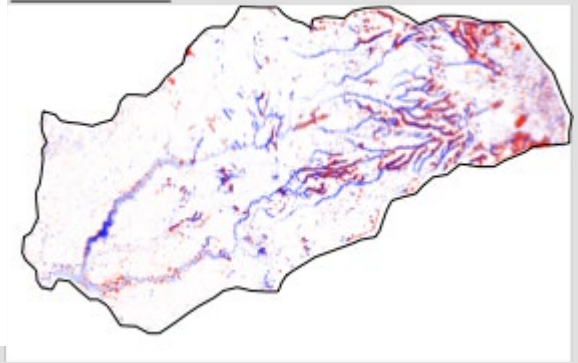
Newcomer et. al. (In prep)



Winter



Summer



Maina and Siirila-Woodburn, 2020

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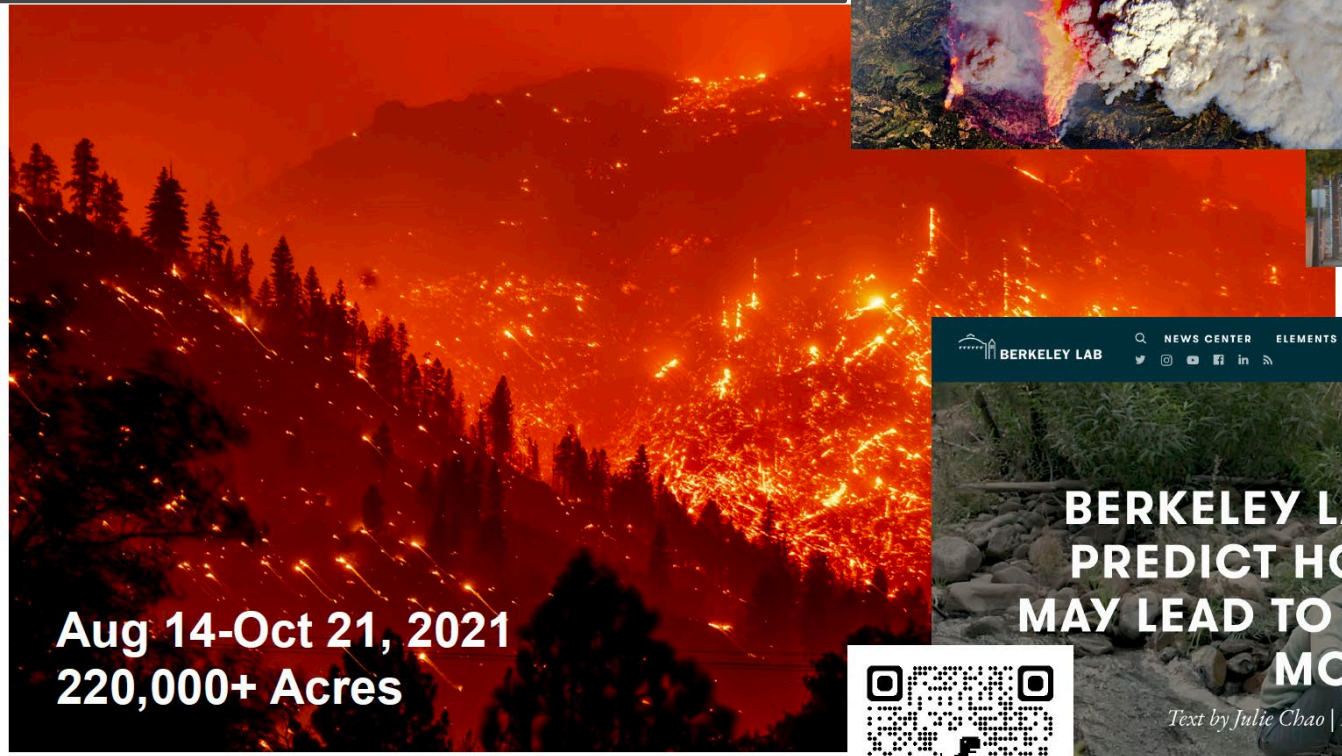
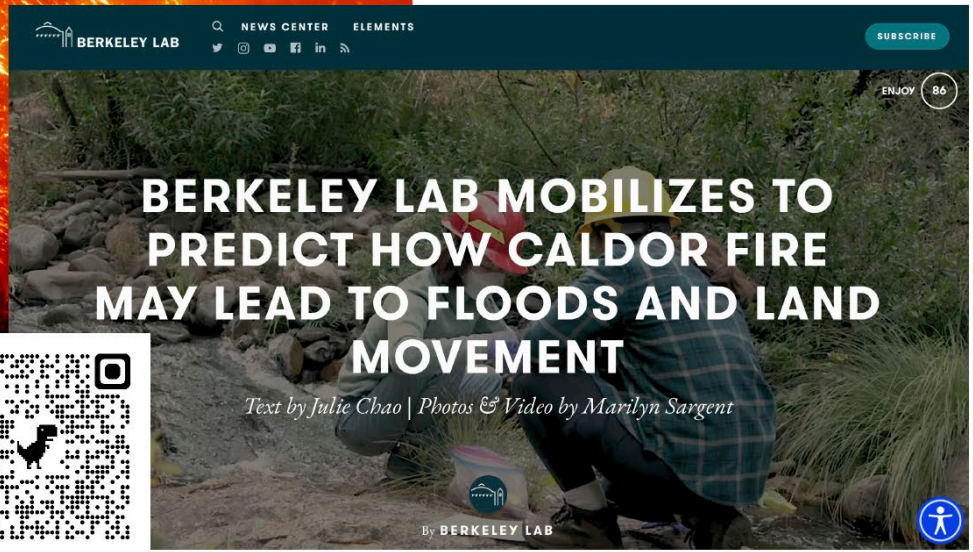
The Caldor Fire





Point your camera phone at me!

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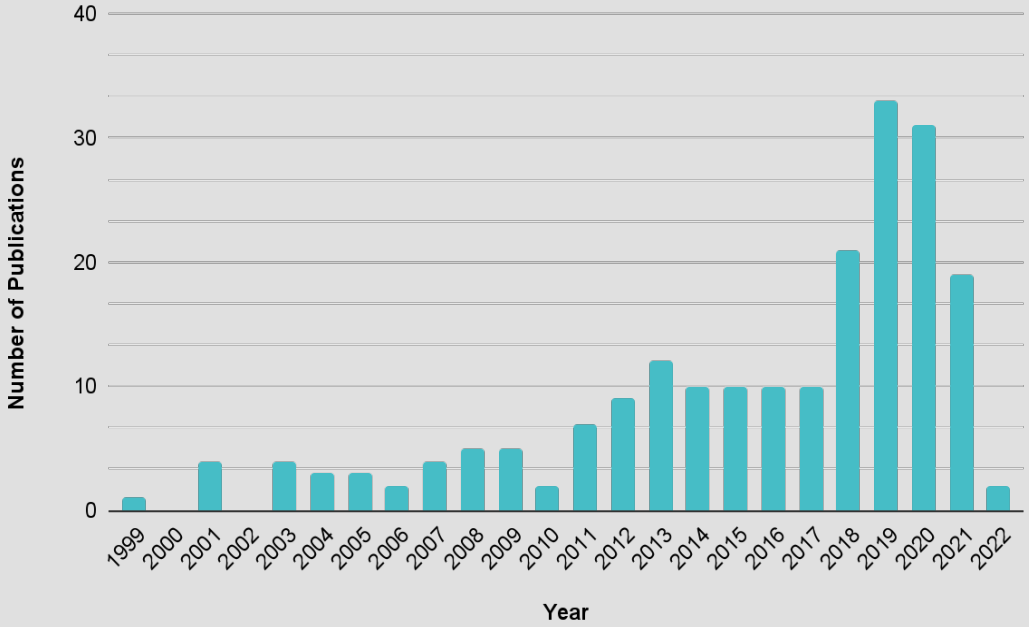
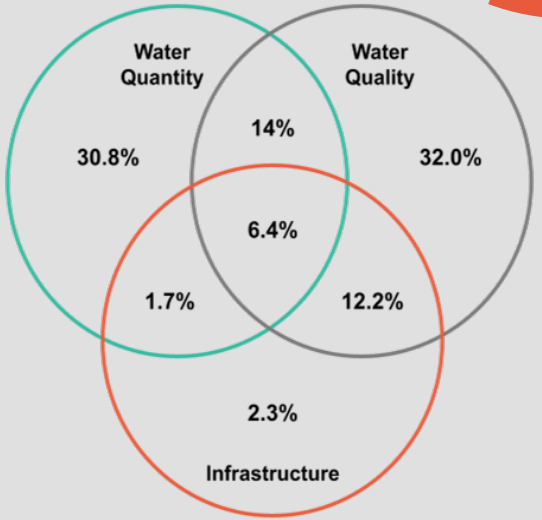
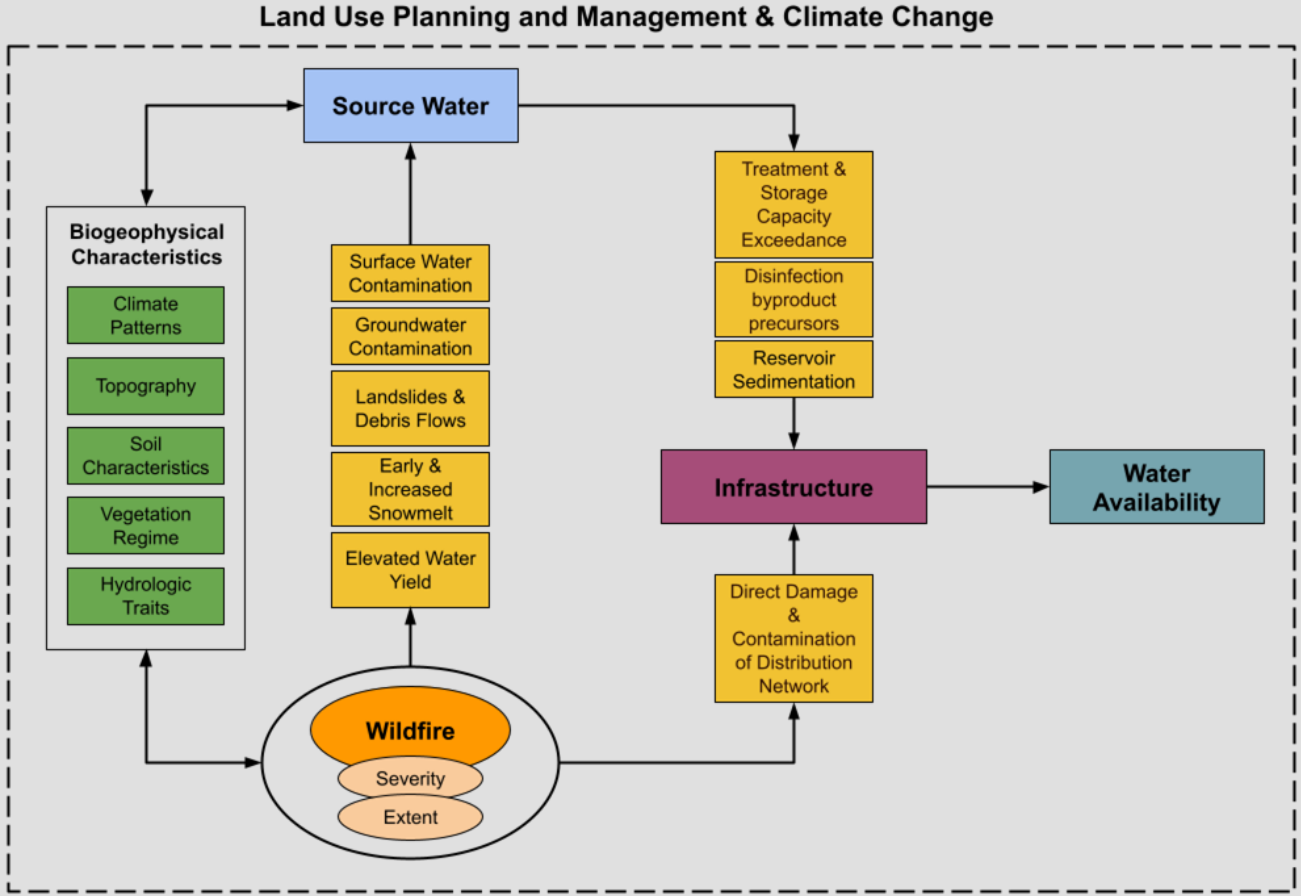
Research area is growing, but silos are still prevalent





A New Holistic Framework

- Identify critical linkages
- Navigate increasing complexity in fire-affected areas
- Aggregate post-fire impacts at multiple scales
- Better assess risk
- Counter fragmentation



Reimagining Wildfire Research to Support Management & Policy

1. Long-term investment in data and information technology infrastructure
2. Improved and consistent metrics for dimensions of recovery and burn severity
3. Greater spatial and temporal coverage
4. Cross agency collaboration

Questions?

Thank you!

Connect!

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Checkout our wildfire website:

https://wildfire.lbl.gov/

Post-fire water quality, quantity, and infrastructure interactions directly and indirectly impair water availability

Water Quality: Wildfires accelerate erosion and liberate contaminants from vegetation, soils, and human structures. Sediment, nutrients, trace metals, and other contaminants enter surface waters, resulting in increased toxicity and turbidity

Water Quantity: Decreased evapotranspiration and altered soil structure often result in increased, but problematic water yield, e.g. flooding

Infrastructure: Wildfires can impair or destroy infrastructure necessary to store, treat, and distribute drinking water, leading to contamination and/or service interruptions

Climate Resilience: Wildfires

https://wildfire.lbl.gov/

BERKELEY LAB Bringing Science Solutions to the World

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BERKELEY LAB WILDFIRE RESEARCH

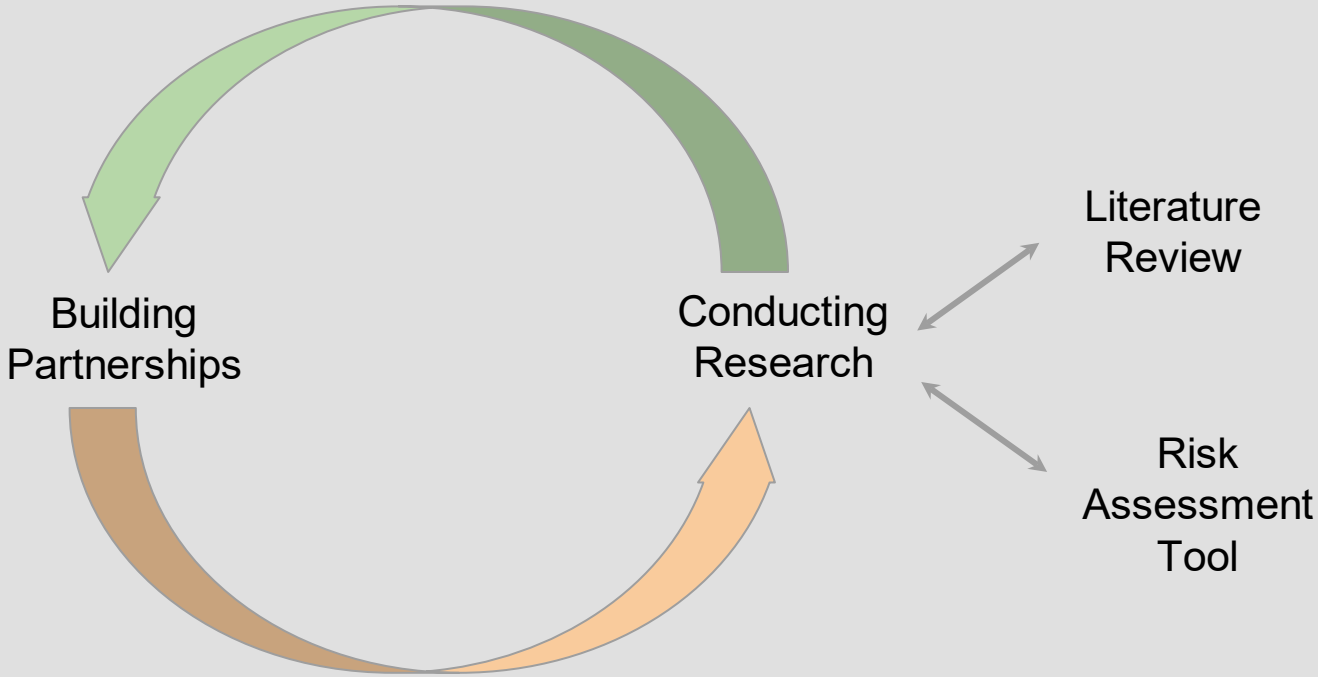
Activities People Events About Contact

- Wildfire and Ecosystems
- Wildfire and Water
- Wildfire and Air Quality
- Wildfire and Climate Change

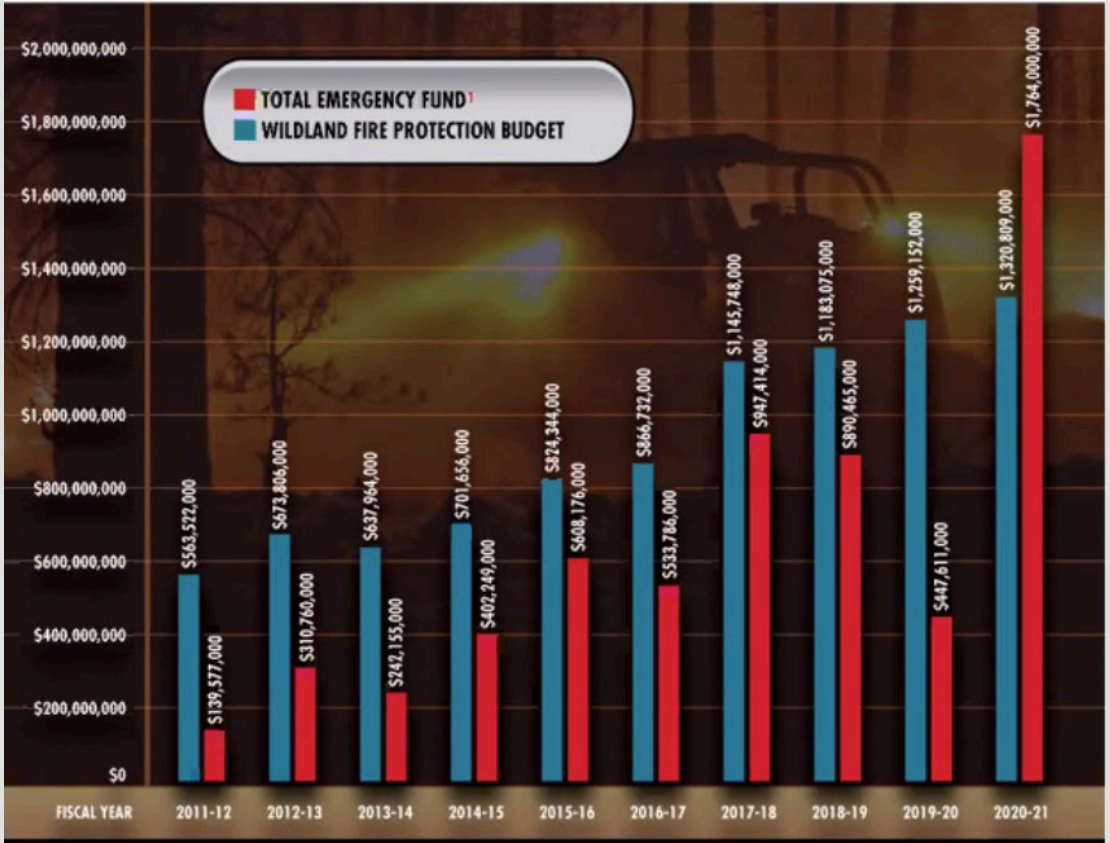
About Wildfires and Our Work

Climate change, weather extremes, prolonged droug sely vegetated forests, and lightning storms have all bee ildfires in the U.S. and beyond. These wildfires affect the water we drink and the air we breathe. They can reduce wildlife habitat, displace entire human communities, and disrupt energy and transportation systems.

Two-Pronged Impact Driven Project Design



CAL FIRE WILDLAND FIRE PROTECTION AND TOTAL EMERGENCY FUND BUDGET



[1]Wildland Fire Protection Budget consists of Fire Prevention - All Funds, Fire Control - All Funds, Cooperative Fire Protection - General Fund & GGRF (Former SRA Fund), Conservation Camps - All Funds.

Fiscal year 11-12 to 19-20 are actual expenditures. 20-21 is the amount CAL FIRE is authorized to spend up to.

NUMBERS CURRENT TO 12/31/2021