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Climate Change and Wildfire in California: An Update on the Science

2018 IEPR Update Joint Agency Workshop on Climate Adaptation and Resiliency

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August 2, 2018

California Energy Commission

Outline

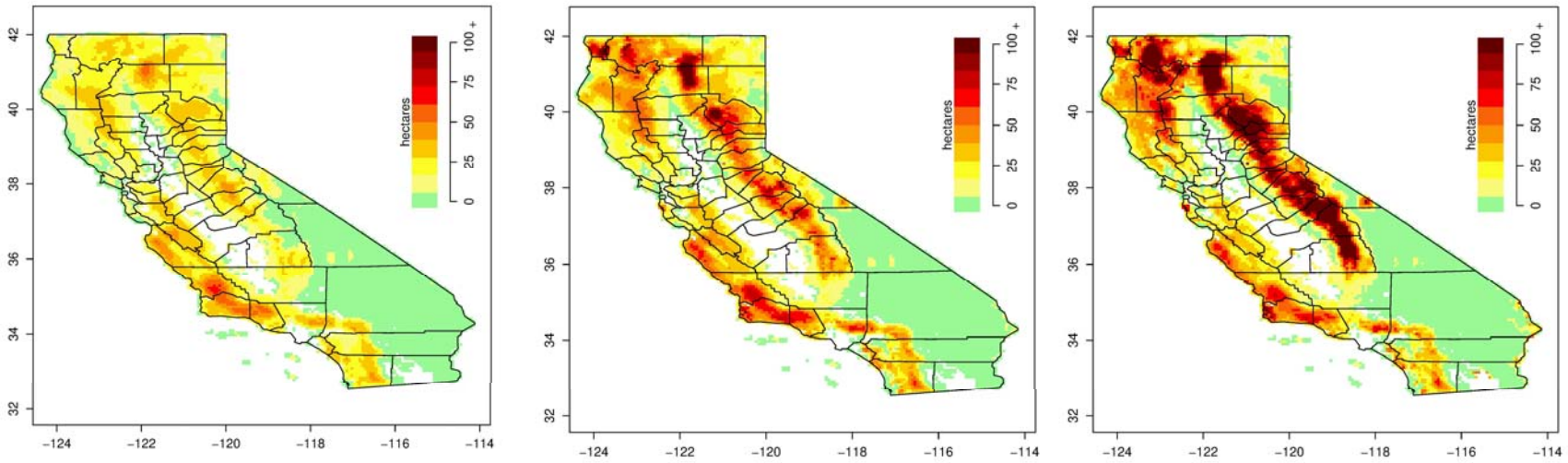
- Wildfire Scenarios from California's Fourth Climate Change Assessment
- Results from studies on impacts from wildfires
- Main findings from the climate science part of the July 25th Staff Workshop
- The future

Common Wildfire Projections for Assessment

- **Wildfire Simulations for the Fourth California Climate Assessment.** Leroy Westerling, UC Merced
  - Statistical model calibrated/trained with historical data (last few decades ending in 2016)
  - Uses land use/land cover and climate projections developed for the Assessment
  - Projects substantial increases in area burned

Mean Area Burned (hectares)

1961-2990 | 2035-2064 | 2070-2099



Source: Westerling, 2018

Wildfire, Climate Change, and California's Electricity Grid

- **Report investigates risk posed by wildfires to 40 transmission "paths" and seven urban "fringe" distribution areas.** Larry Dale et al, LBNL

  – Over the 2000-2016 period, wildfire damages to the transmission and distribution system, not including damages to others, in selected areas exceeded $700 million. These costs do not represent the total costs due to wildfire impacts as evidenced by the enormous impact of the wildfires in 2017 including damages to homes, building, and other assets.*

  – Climate change is expected to increase wildfire risk to transmission and distribution assets in Northern California, an impact made worse by the anticipated new transmission paths in the Sierra Nevada Mountains.

* In 2017 wildfires destroyed almost as many structures as were burned in all wildfires between 2000-2016.

California's Homeowner's Insurance Market and Changes in Wildfire-Related Risks

- **Uses ZIP-code level data on insurance policies as well as wildfire & population projections to explore expected changes in risk and potential implications for residential insurance markets.** Lloyd Dixon et al, RAND

  – Focus on Sierra foothills east of Sacramento and western San Bernardino County.

  – Premiums in the higher-risk areas are higher and have been growing more rapidly in recent years than those in lower-risk areas. Even so, insurers interviewed for this study believed that the difference between premiums for high- and low-risks structures still does not reflect the full difference in risk.

  – With regard to financial performance, insurers' experience between 2001 and 2017 illustrate how a large event can wipe out many years of underwriting profits. (2017 losses wiped out considerable portion of 2001-2017 profits)

California's Transportation Fuel Sector: Vulnerability to Wildfires

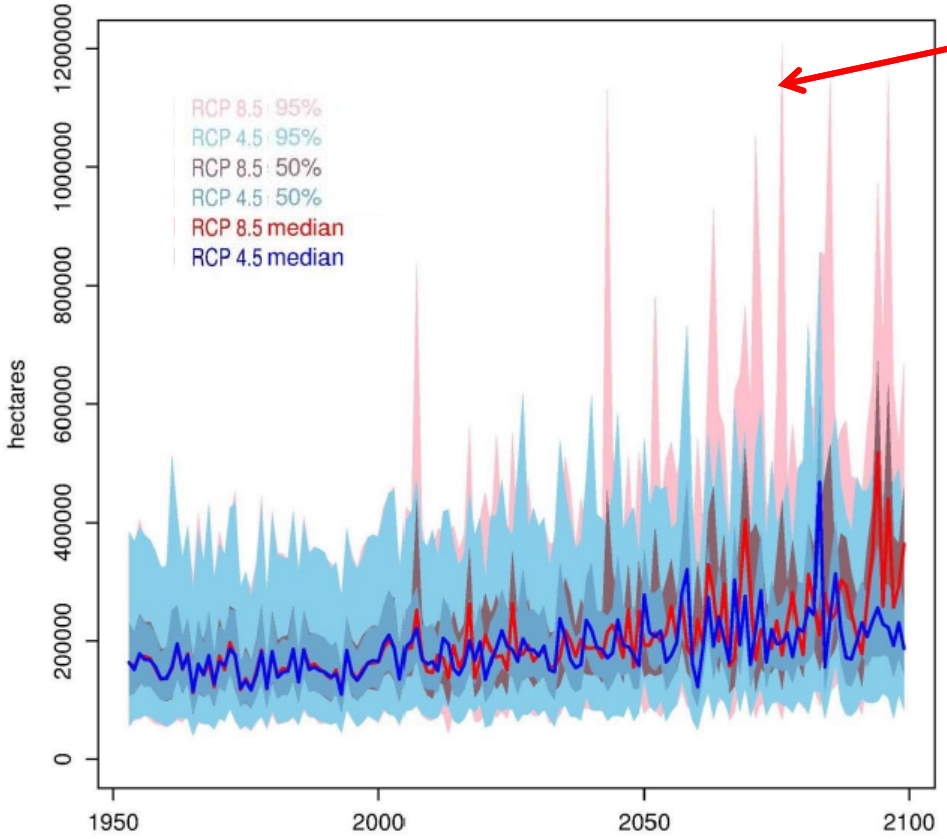
- **Considering California's transportation fuel sector as an organizationally connected, multi-sector network, the research team projects and analyzes climate-change-induced flooding and wildfire exposure.** John Radke et al, UC Berkeley

  – Many transportation system assets exist in high-risk areas, and although there is an excellent record of response and repair, long term chronic disturbances due to climate change are only now being discussed.

  – Roads and railroads, which are used to transport transportation fuels, are the most exposed and most vulnerable assets to wildfire.

Simulation of extreme conditions

- The studies on wildfire simulations in the Fourth Assessment used average projections (e.g., 10-year) of wildfire risks.
- The compete set of wildfire simulations from Westerling, 2018 included extreme wildfire years and found that these extremes (e.g., 95th percentile) could rise to unprecedented levels.



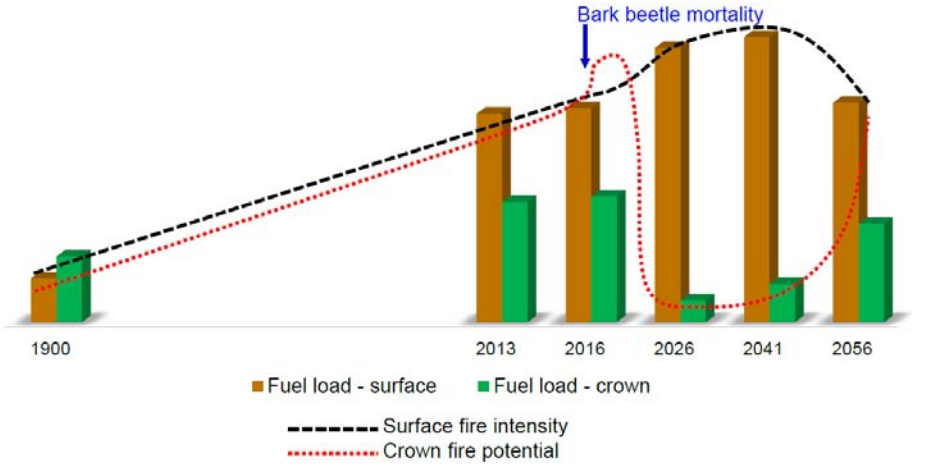
95th percentile

RCP4.5 vs 8.5 California Area Burned Quantities. Even though the model was developed using wildfire data prior to 2017, it captures high extreme wildfire events.

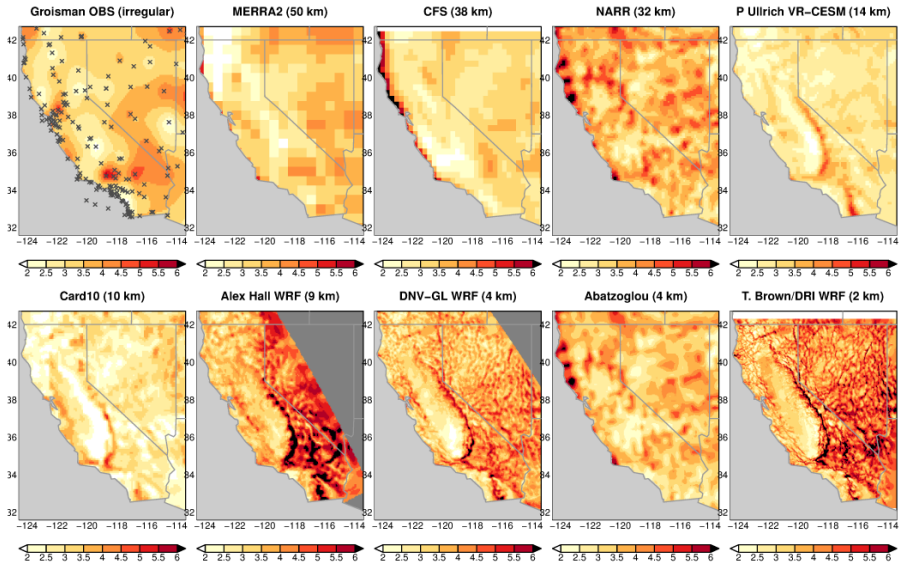
Source: Westerling, 2018

Main findings from the climate science part of the July 25th Staff Workshop

- Wildfire models have different driving factors that can lead to different results.
- Vegetation changes with climate are not well-known but will affect fire regimes.
- The large number of dead trees has no historical precedent.
- There are only hypotheses on how tree mortality would affect wildfires but no hard data for California because we lack historical data.
- There is a *potential* for mass fires that burn extremely hot but slowly.
- Relative humidity will change with a warming planet, and is important for wildfires.
- Historical wind data sets do not agree with each other. It is extremely difficult to simulate wind. The future of extreme wind events is a major uncertainty.



Conceptual diagram of fuel load and fire hazard over time (Stephens et al. 2018). Provided by John Battles (UC Berkeley)



Cayan and Pierce, 2018

The Future

- The Energy Commission is supporting the development of the next generation of regional climate models, which will be more tailored for wildfire simulations and the energy system. They will be used to downscale the results of the new global climate models being run by different centers around the world for the next IPCC Assessment. This new modeling system will have improved representation of wind regimes, changes in relative humidity, and other factors affecting wildfires.
- An EPIC solicitation to address climate science needs on wildfire and the electricity system will be released in 2019.
- This would be foundational work for the next California Climate Change Assessment.

Questions

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