Effects of Future Climate on Chaparral Fire Regimes

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Cooperative Extension

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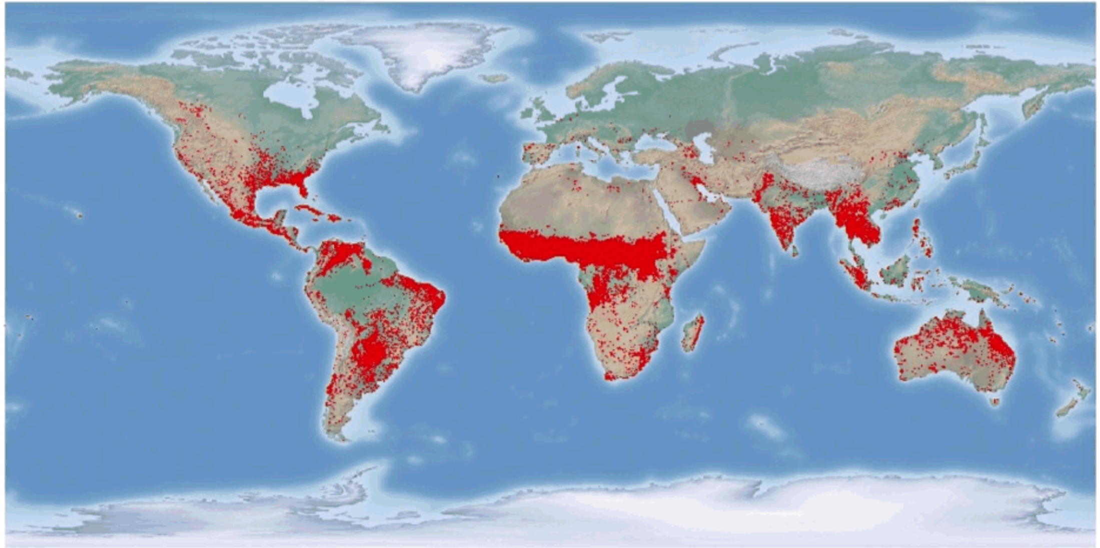
Why are questions related to climate change so challenging?

2012 MODIS Active Fire Detections from the Aqua and Terra Satellites



January February March April May June July August September October November December

Active fires, shown in red, are detected using MODIS data from the Aqua and Terra satellites
Source: NASA Fire Information for Resource Management System (FIRMS) https://earthdata.nasa.gov/firms

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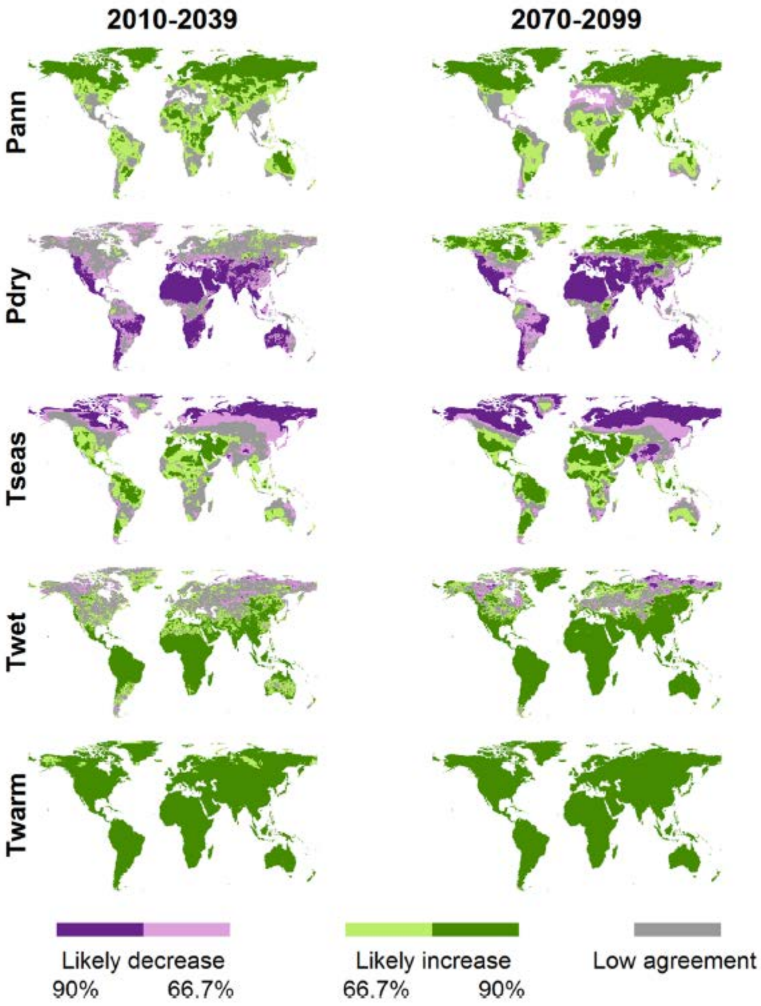
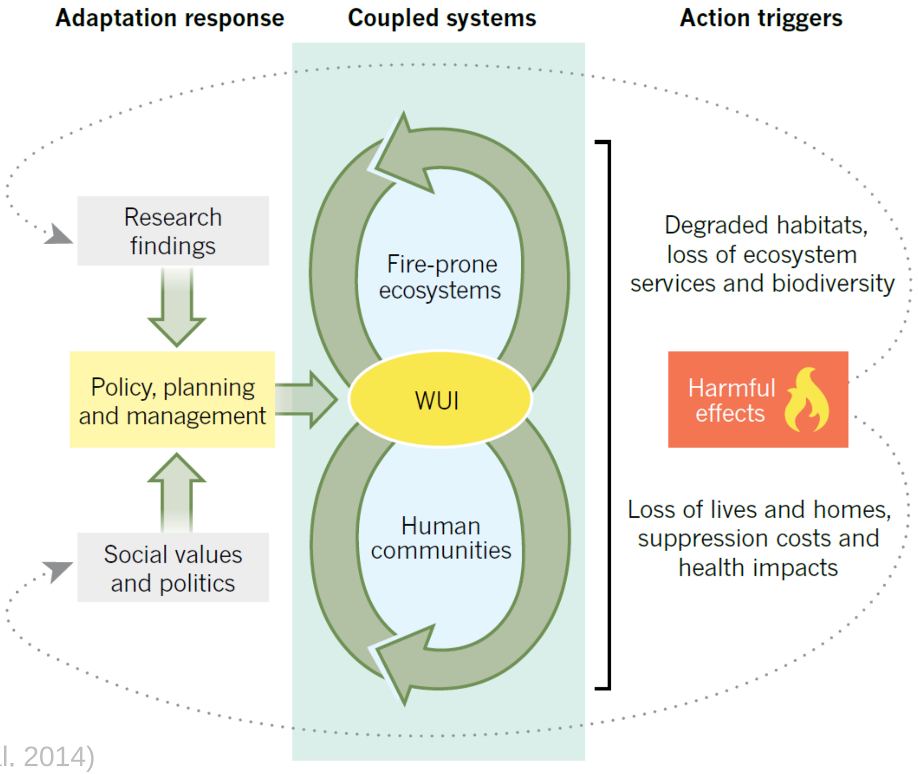
Why are questions related to climate change so challenging?



(Moritz et al. 2012)

Why are questions related to climate change so challenging?



(Moritz et al. 2014)

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High Variation & Uncertainty!

- Natural fire regimes are complex & have multiple drivers.
- There are great differences in how humans have impacted various fire-prone landscapes.
- Future projections from global climate models (GCMs) often disagree on key variables.

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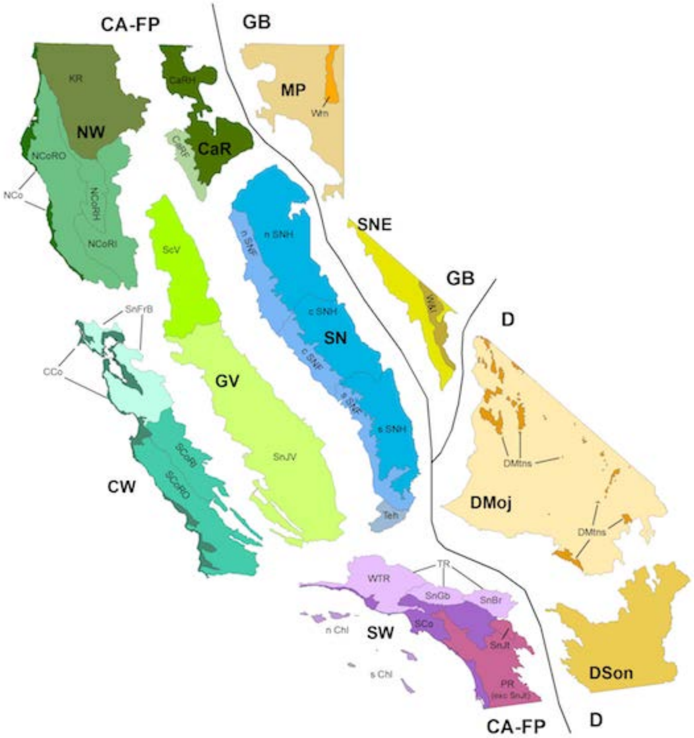
One More Challenge: California is Complex!



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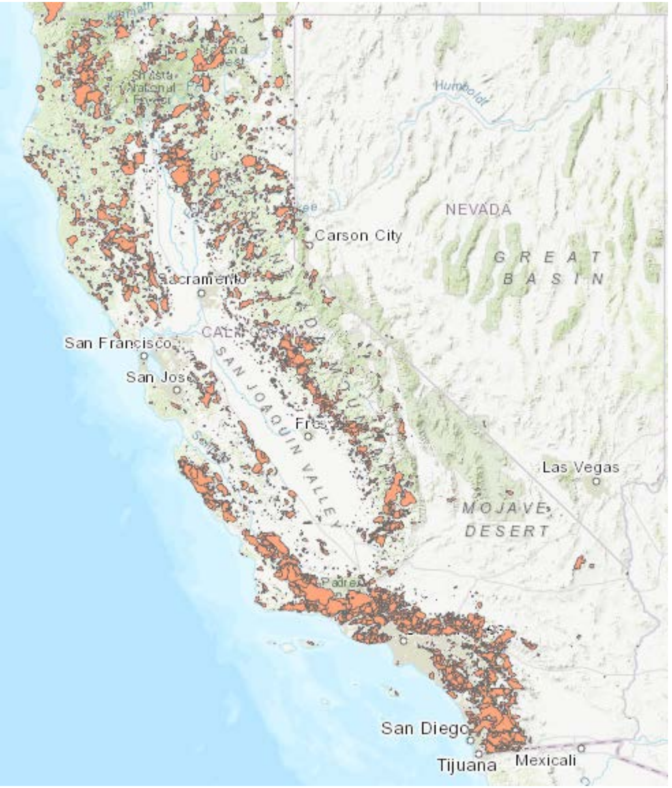
One More Challenge: California is Complex!



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Take-home Messages:

- Future fire activity is predictable to a certain degree.
- The future depends on BOTH: 1) which climate scenario & 2) which land use scenario actually occur.
- We need to know time horizon & question of interest!

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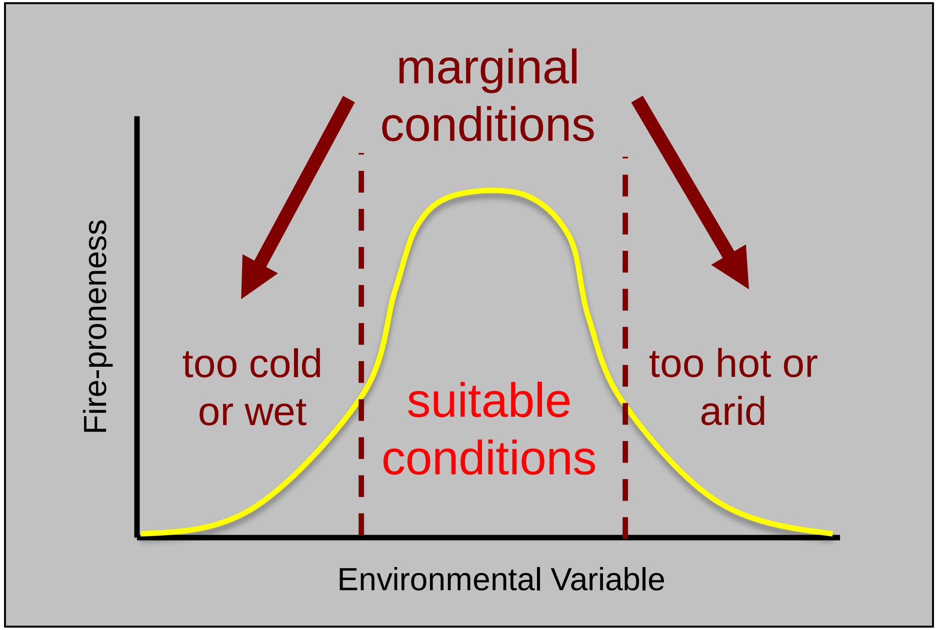
Fire Probabilities & Environmental Gradients



Species Distribution Modeling

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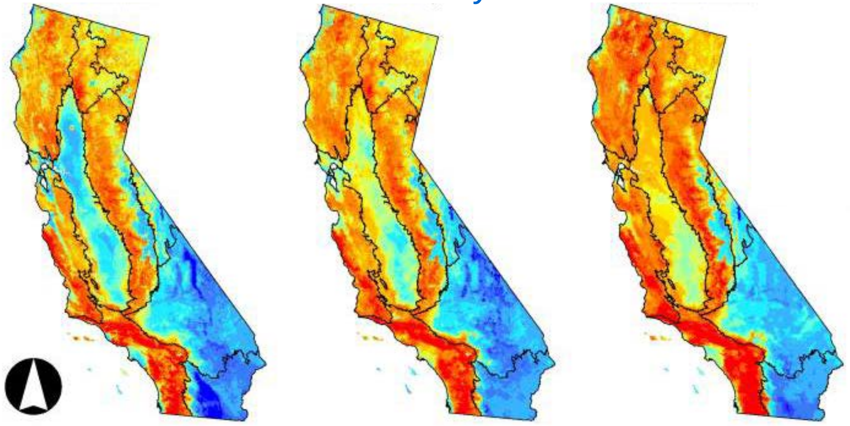
Developed for California…

Predictions:

	Full model	Climate-only	Derived climate
			
AUC	0.884	0.871	0.853
Top variables	Pot. vegetation Nonfuel July max. temp.	July max. temp. March tot. precip. January precip. freq.	Max. monthly tot. precip. Max. monthly precip. freq. Max. monthly temp.

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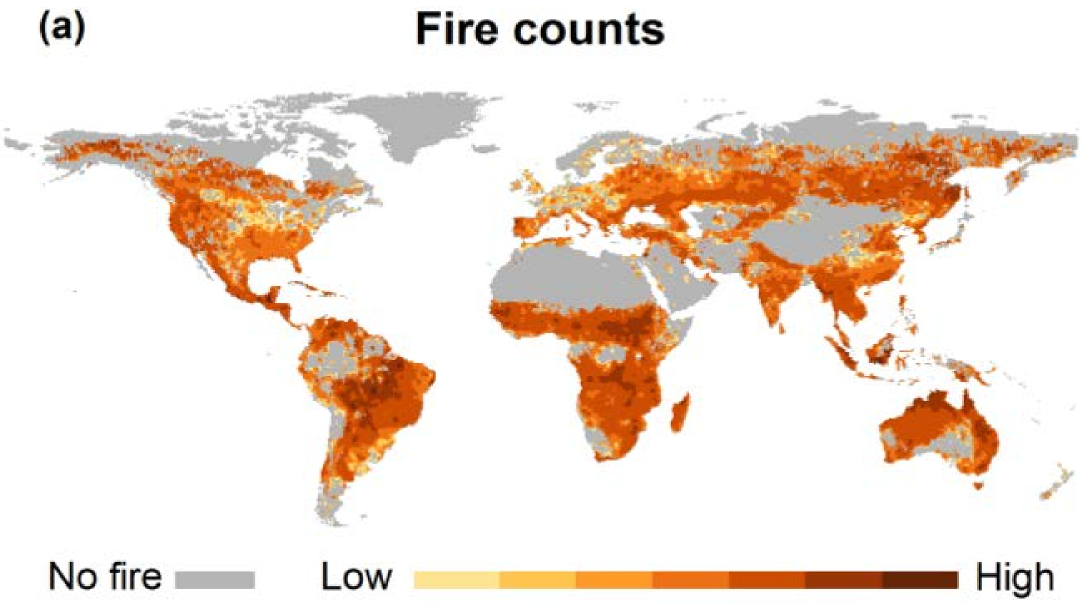
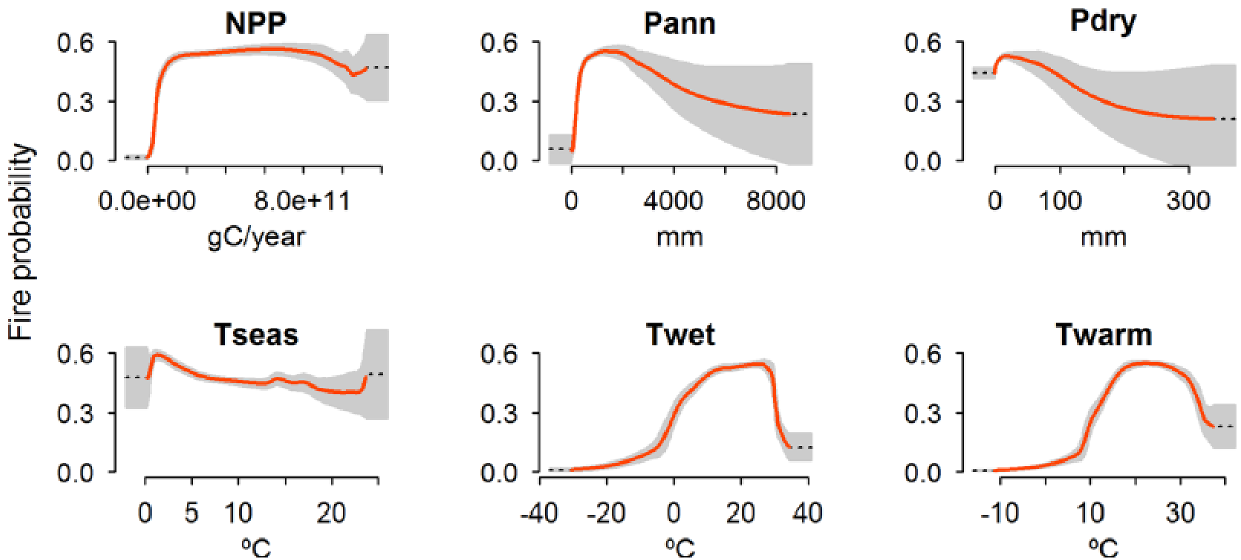
Global Ensemble Model Projections

Training data:



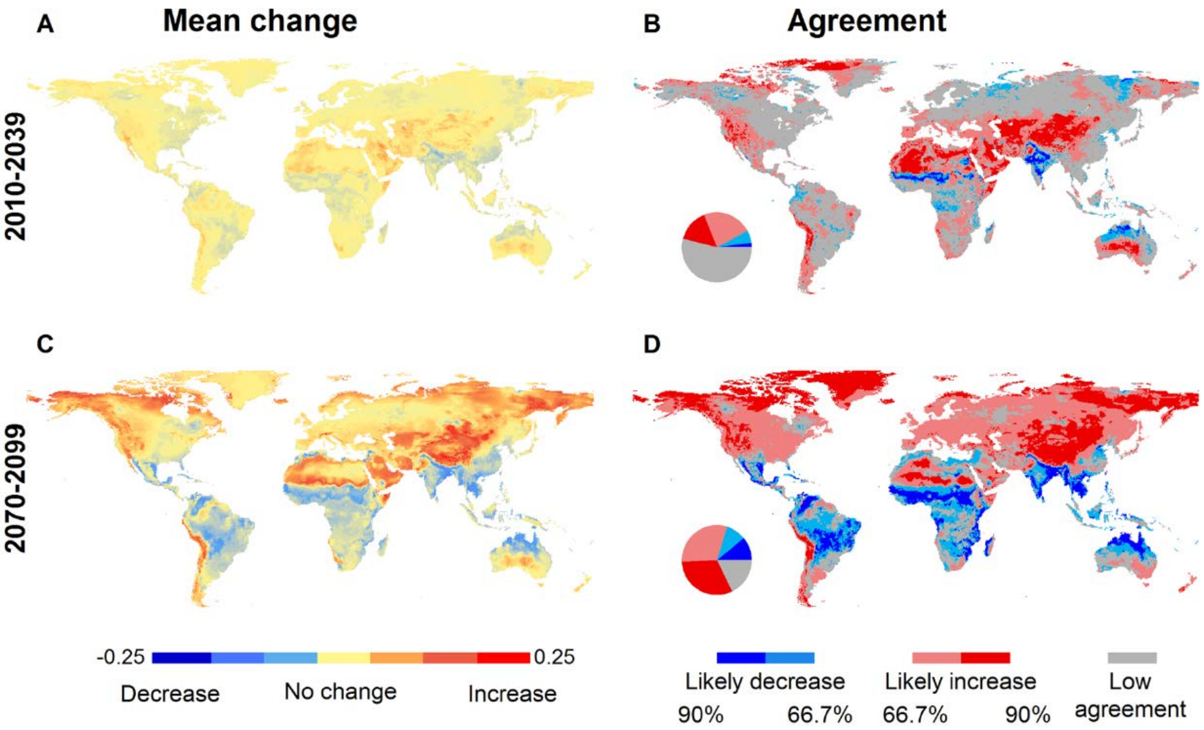
(Moritz et al. 2012)

Functional Response Curves…



(Moritz et al. 2012)

Global Ensemble Model Projections



(Moritz et al. 2012)

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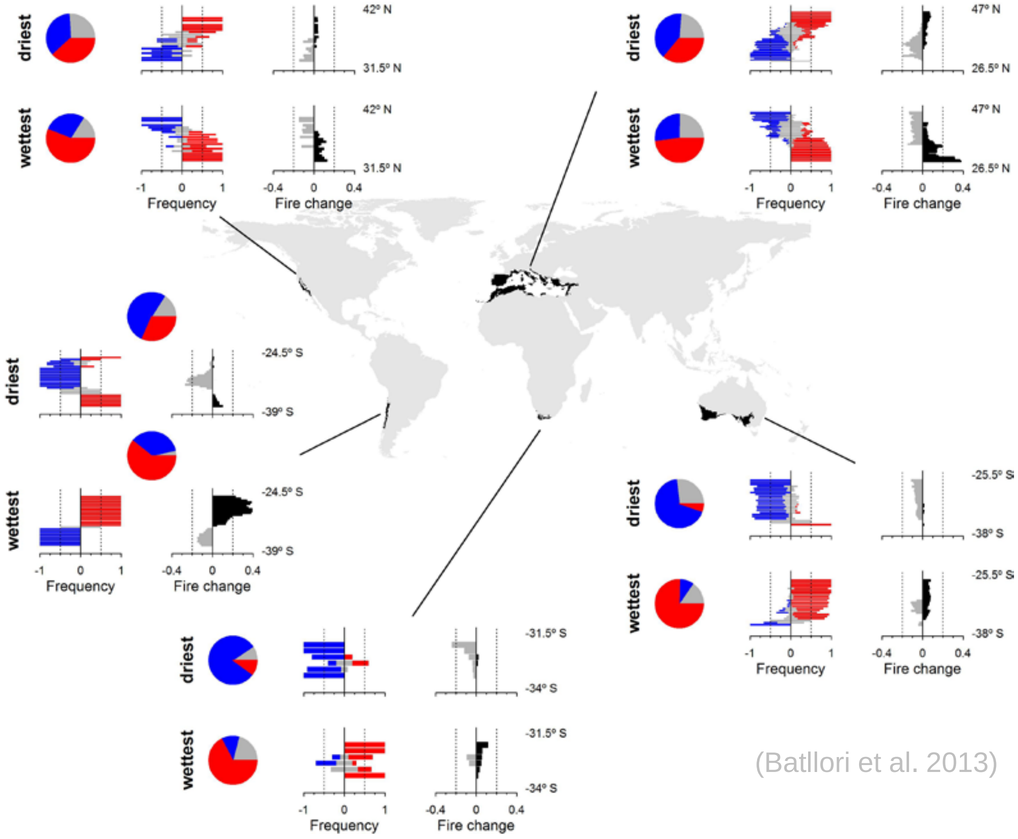
Which Future to Accommodate?



(Batllori et al. 2013)

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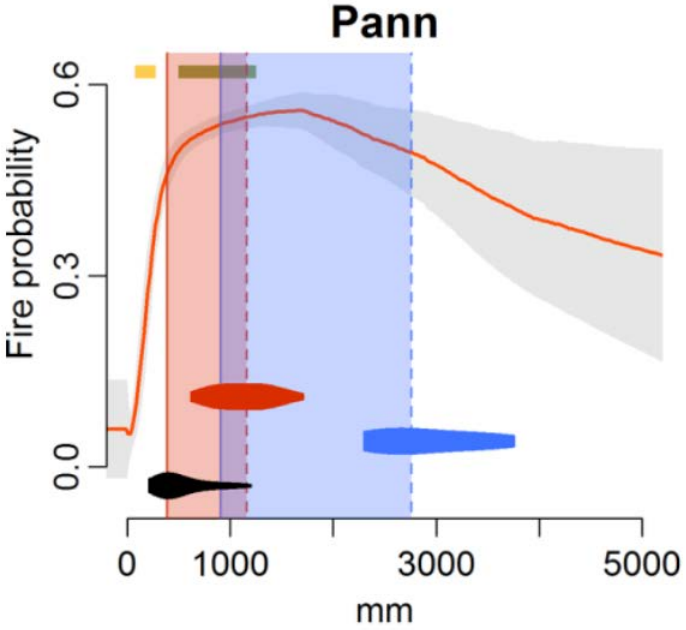
Which Future to Accommodate?

For example:
Warmer-wetter
Mediterranean CA:



(Batllori et al. 2013)

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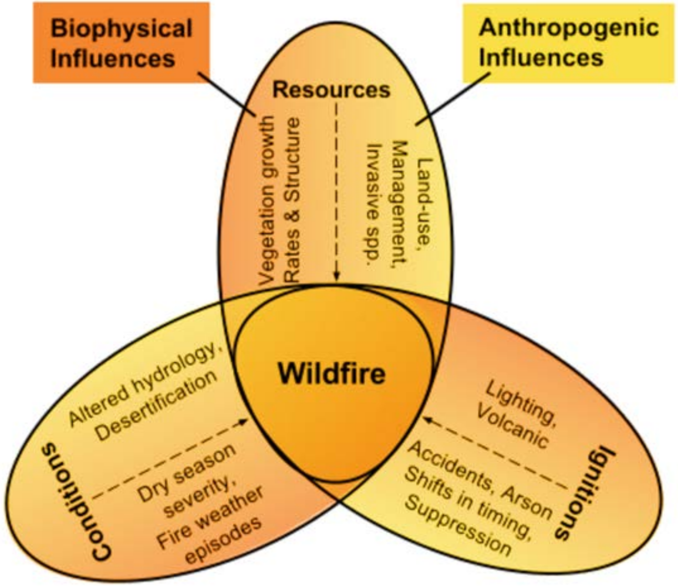
Human Influences at Finer Scales!



(Mann et al. 2016)

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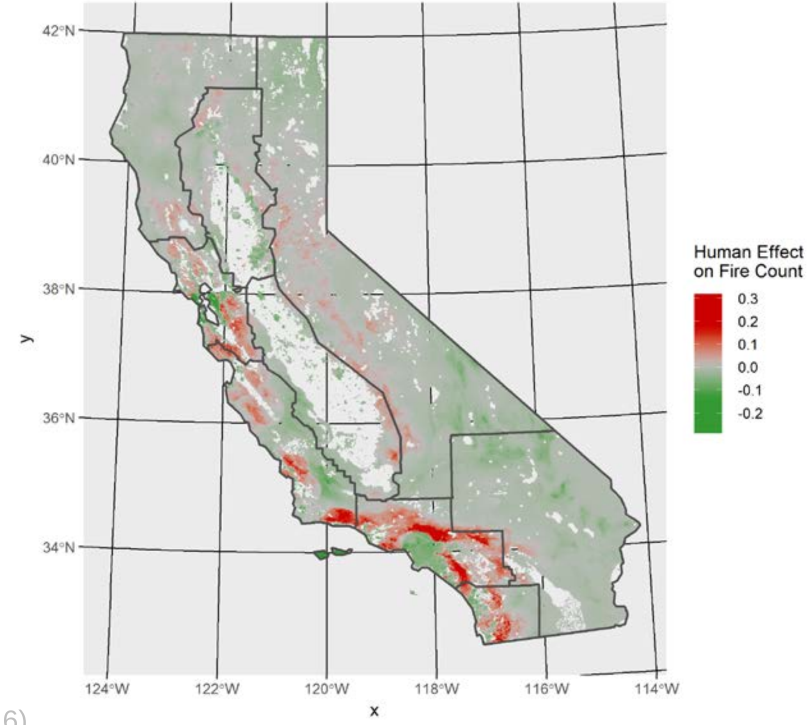
Human Influences at Finer Scales!



(Mann et al. 2016)

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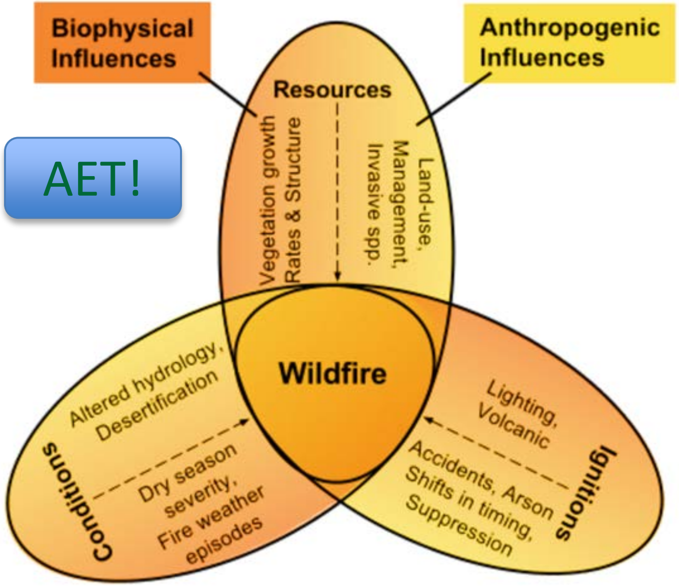
Including Human Dimensions

(Mann et al. 2016)

More Mechanistic Variables…

AET!



CWD!

(Mann et al. 2016)

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Wildcards?

Precipitation

Winds

Grass-fire Cycle

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Take-home Messages:

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- The future depends on BOTH: 1) which climate scenario & 2) which land use scenario actually occur.
- We need to know time horizon & question of interest!

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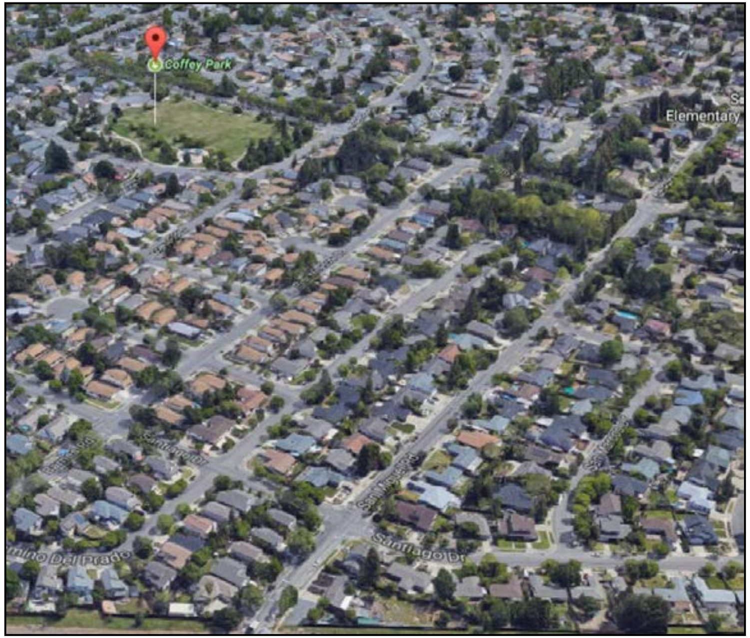
This scale?

Or this?

What could better planning achieve?



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How to Apply?

Mitigation: CAL FIRE

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FRAP Projects

Fire Probability for Carbon Accounting

The Fire and Resource Assessment Program (FRAP) at CAL FIRE is investigating methods for estimating the likelihood of fire occurrence across the State of California in the coming decades. As part of this effort, FRAP has created a map of annual fire probability for the period 2026-2050, derived from a statistical model of fire occurrence created at the University of California, Berkeley. This map is intended for use in the quantification of GHG benefits of fuel reduction activities funded under the 2016-17 Greenhouse Gas Reduction Fund (GGRF) Forest Health Program.

Data Access Web Tool

This web-based tool will allow you to select, draw, or upload a project area polygon and summarize the fire probability information from this dataset.

Click here to open the tool in a web browser.

Data Download

- PDF statewide map
- Zipped geodatabase with metadata

Data Information

Title: California Annual Fire Probability 2026-2050 (Percent)

Summary: This data represents projected probability of fire occurrence (%) for California, 2026-2050. It was derived by CAL FIRE from work performed by Mann et al. (2016), and is intended for use in greenhouse gas accounting in the CAL FIRE Forest Health Program.

Description: Annual probability of fire occurrence (%), derived from Mann et al. (2016) projections for 2026-2050. Source data represents projected mean fire return intervals (MFRI), derived under A2 emissions scenario in both GFDL and PCM climate models. MFRI projections for two models were combined by taking minimum MFRI for each cell, inverted to get annual probability, then multiplied by 100 to get percent value. Derivation was performed by the Fire and Resource Assessment Program (FRAP), California Department of Forestry and Fire protection (CAL FIRE).

Source Data Reference: Mann, M.L., Batllori, E., Moritz, M.A., Waller, E.K., Berck, P., Flint, A.L., Flint, L.E. and Dolfi, E., 2016. Incorporating anthropogenic influences into fire probability models: effects of human activity and climate change on fire activity in California. PloS one, 11(4), p.e0153589. Available at:

Download the Data

- PDF statewide map
- Zipped geodatabase with metadata

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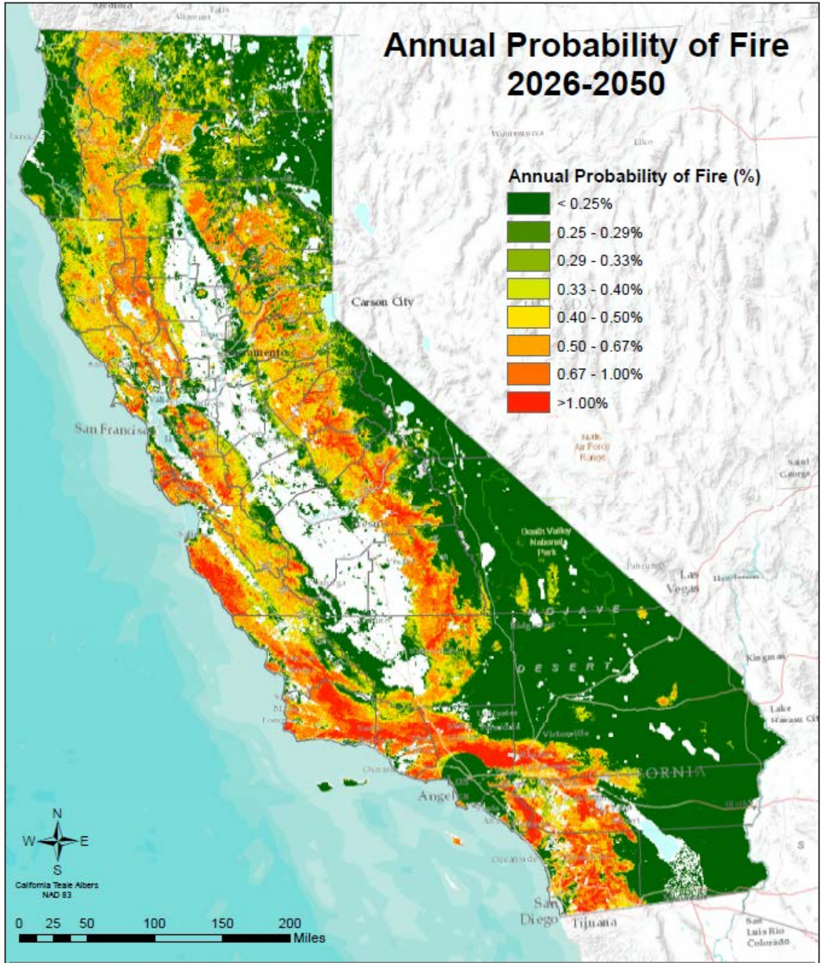

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CAL FIRE FRAP

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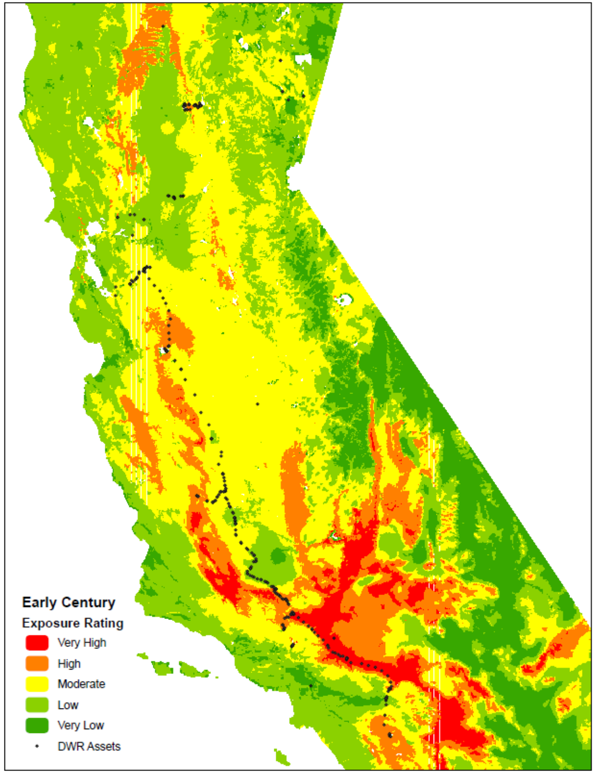
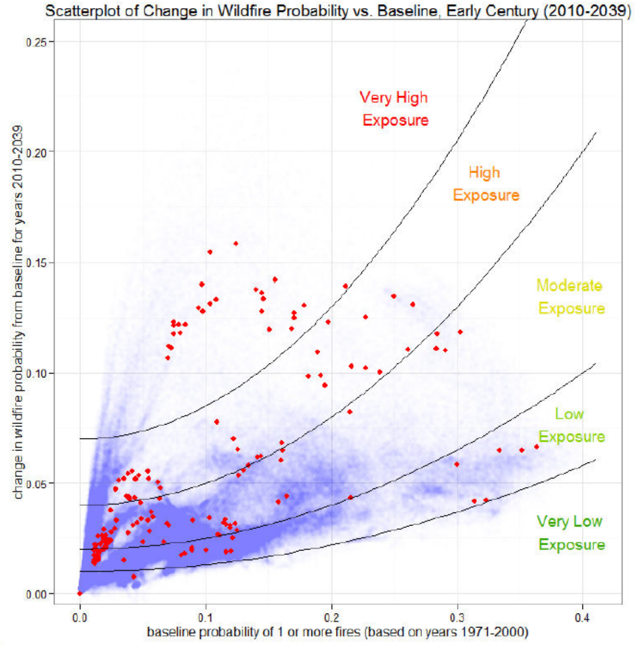
How to Apply?

Adaptation: CA Department of Water Resources





Change in Wildfire Exposure Due to Climate Change Early Century (2010-2039)

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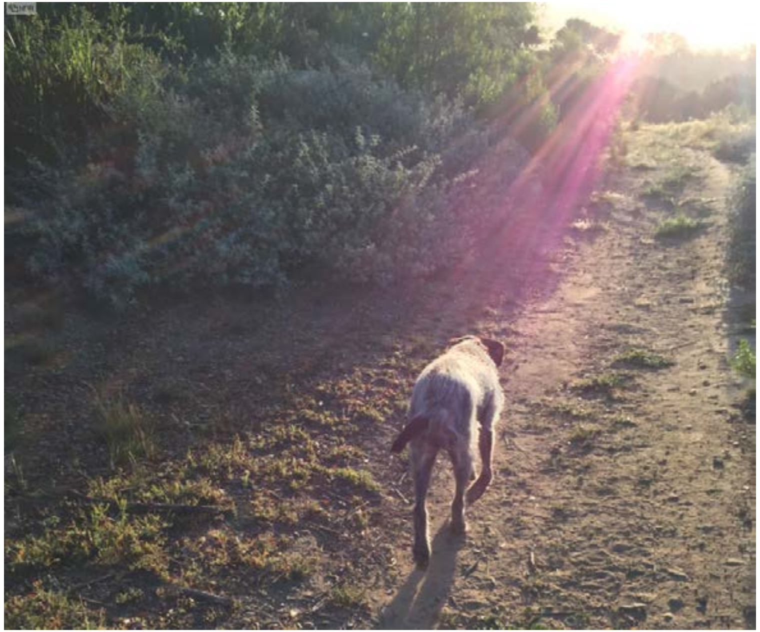
Thanks...



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