Analytical approaches to align climate mitigation with social and ecological co-benefits in California

Low Emissions Solutions Conference
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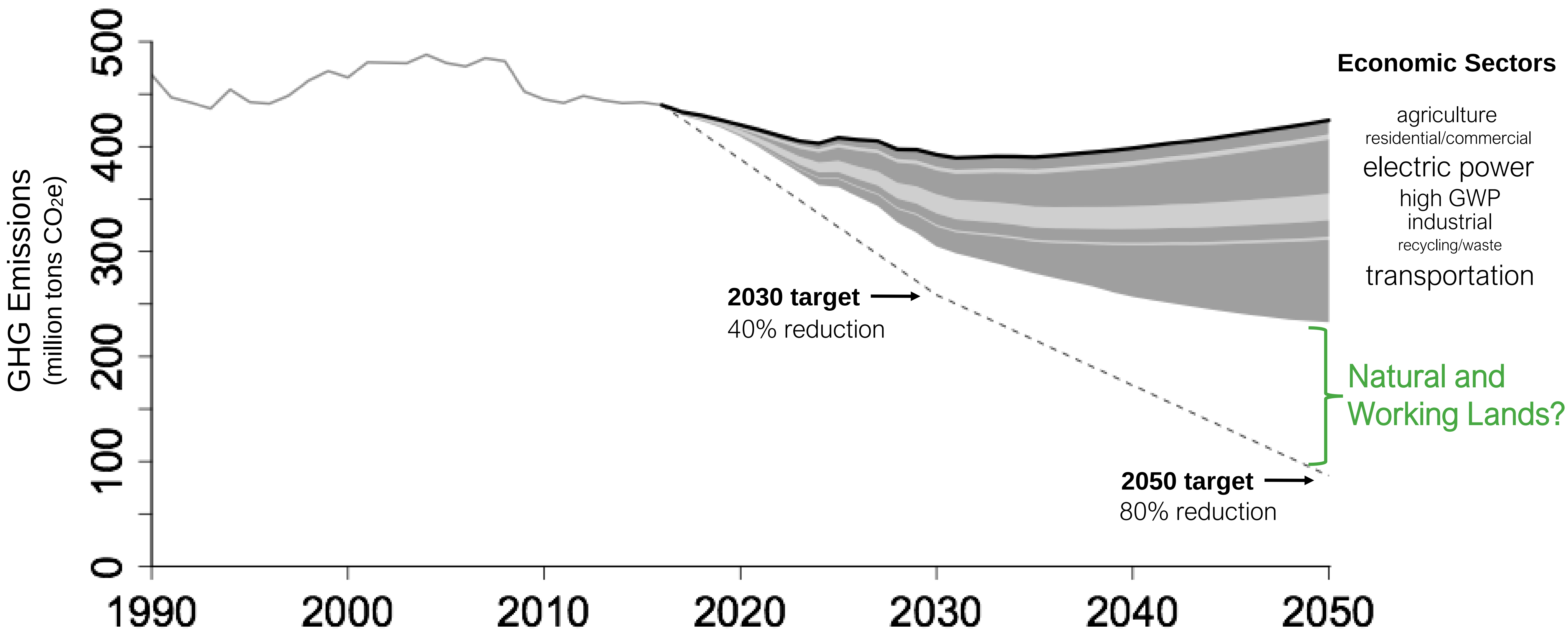
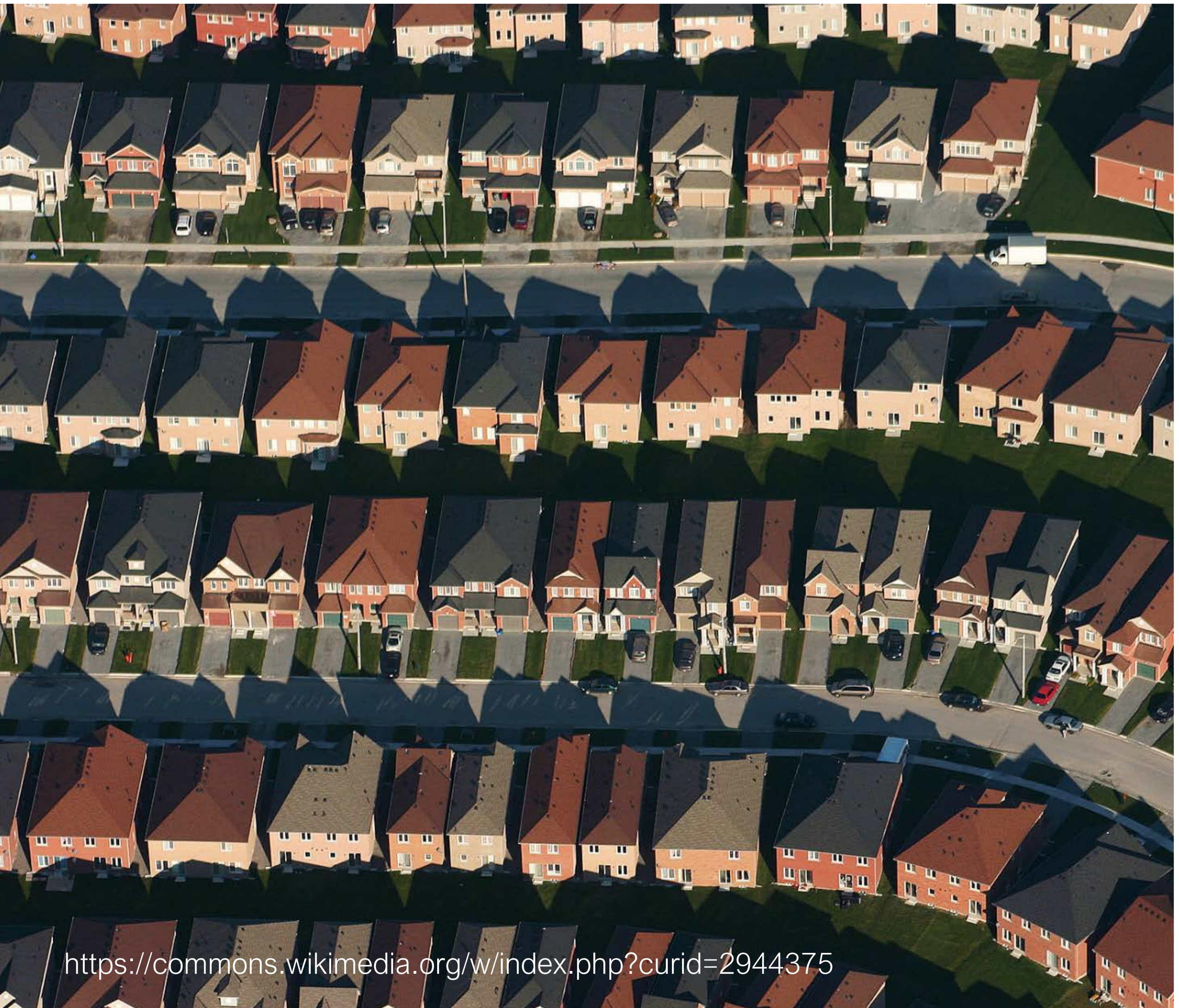
How can ecosystem reductions contribute?



Source: 2030 Scoping plan


Scott Warren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Andrew Peacock

Ecosystem management and land conservation can substantially contribute to California's climate mitigation goals

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Modeling efforts focused on future greenhouse gas (GHG) emissions from energy and other sectors in California have shown varying capacities to meet the emissions reduction targets established by the state. These efforts have not included potential reductions from changes in ecosystem management, restoration, and conservation. We examine the scale of contributions from selected activities in natural and agricultural lands and assess the degree to which these actions could help the state achieve its 2030 and 2050 climate mitigation goals under alternative implementation scenarios. By 2030, an Ambitious implementation scenario could contribute as much as 147 $MMTCO_2e$ or 17.4% of the cumulative reductions needed to meet the state's 2030 goal, greater than the individual projected contributions of four other economic sectors, including those from the industrial and agricultural sectors. On an annual basis, the Ambitious scenario could result in reductions as high as 17.9 $MMTCO_2e \cdot y^{-1}$ or 13.4% of the state's 2030 reduction goal. Most reductions come from changes in forest management (61% of 2050 projected cumulative reductions under the Ambitious scenario), followed by reforestation (14%), avoided conversion (11%), compost amendments to grasslands (9%), and wetland and grassland restoration (5%). Implementation of a range of land-based emissions reduction activities can materially contribute to one of the most ambitious mitigation targets globally. This study provides a flexible, dynamic framework for estimating the reductions achievable through land conservation, ecological restoration, and changes in management regimes.

land use change | avoided conversion | carbon sequestration | natural lands | agriculture

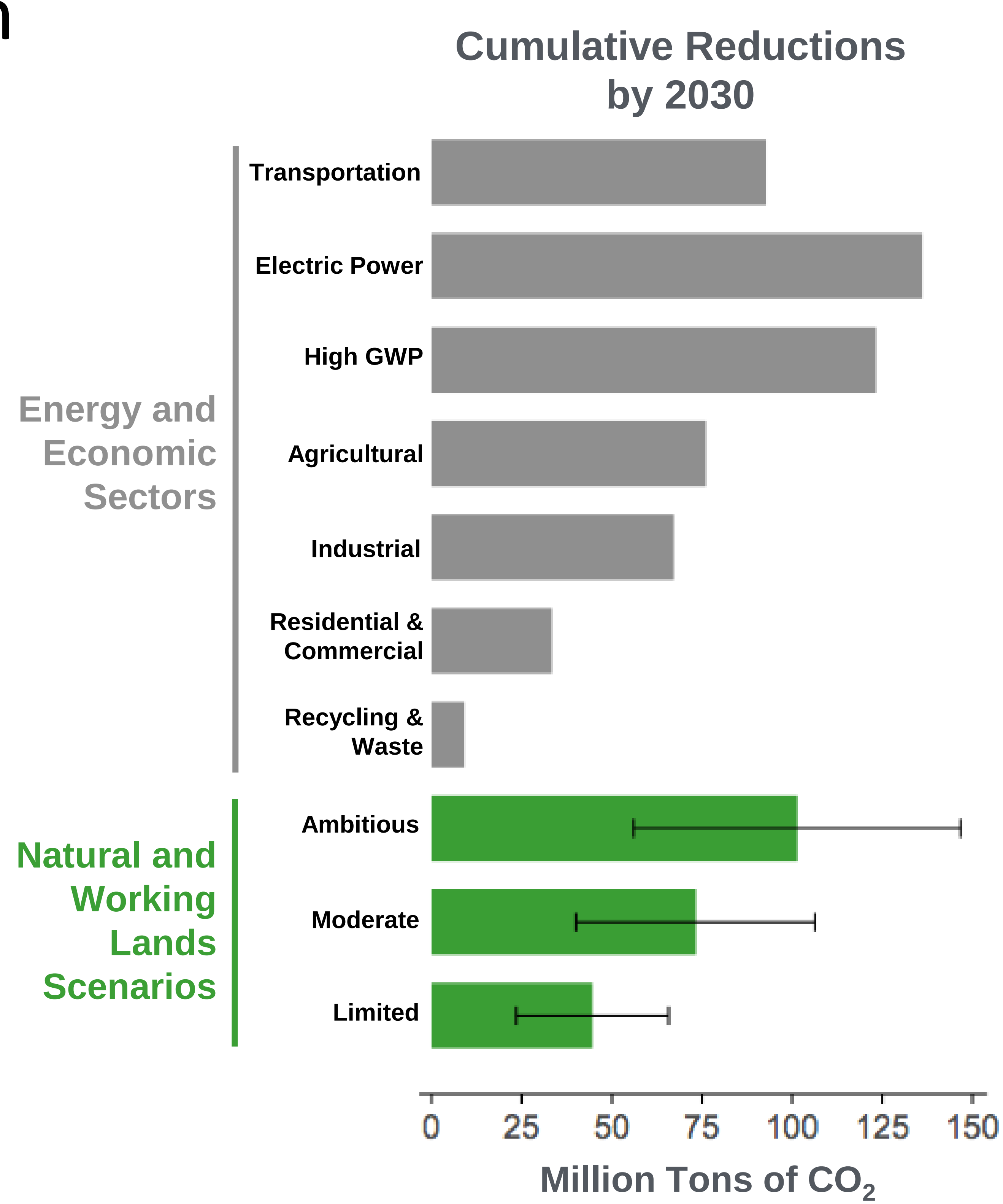
Significance

Combatting climate change will require using all available tools, especially those that contribute to other societal and economic goals, such as natural resource protection and energy security. Conserving and managing natural and agricultural lands to retain and absorb greenhouse gasses (GHGs) are tools that have not been widely integrated into climate policy. Our analysis provides a quantification of potential climate benefits from multiple land-based activities for a jurisdiction with an emissions reduction target (up to 13.3% of the cumulative reductions needed to meet the 2050 target, or nearly three-fourths of a billion metric tons of GHGs). This approach provides a model that other jurisdictions can use to evaluate emissions reductions that might be achieved from conserving and restoring natural lands.

- 14 activities under 3 policy scenarios, focused on natural ecosystems
- 2030 and 2050 cumulative and annual mitigation

Sectoral comparison

Max of **17.4% of cumulative reductions to meet the 2030 goal (147 MMTCO2e)**



What about……

"Baseline" trends under plausible futures?

Climate effect on reduction potential?

Cost to achieve mitigation?

Land Use Carbon Scenario Simulator (LUCAS)

Environmental Research Letters

LETTER • OPEN ACCESS

Effects of contemporary land-use and land-cover change on the carbon balance of terrestrial ecosystems in the United States

Benjamin M Sleeter[1,8], Jinxun Liu[2], Colin Daniel[3,4], Bronwyn Rayfield[3], Jason Sherba[2], Todd J Hawbaker[5], Zhiliang Zhu[6], Paul C Selmants[2] and Thomas R Loveland[7]

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Focus on Carbon Monitoring Systems Research and Applications

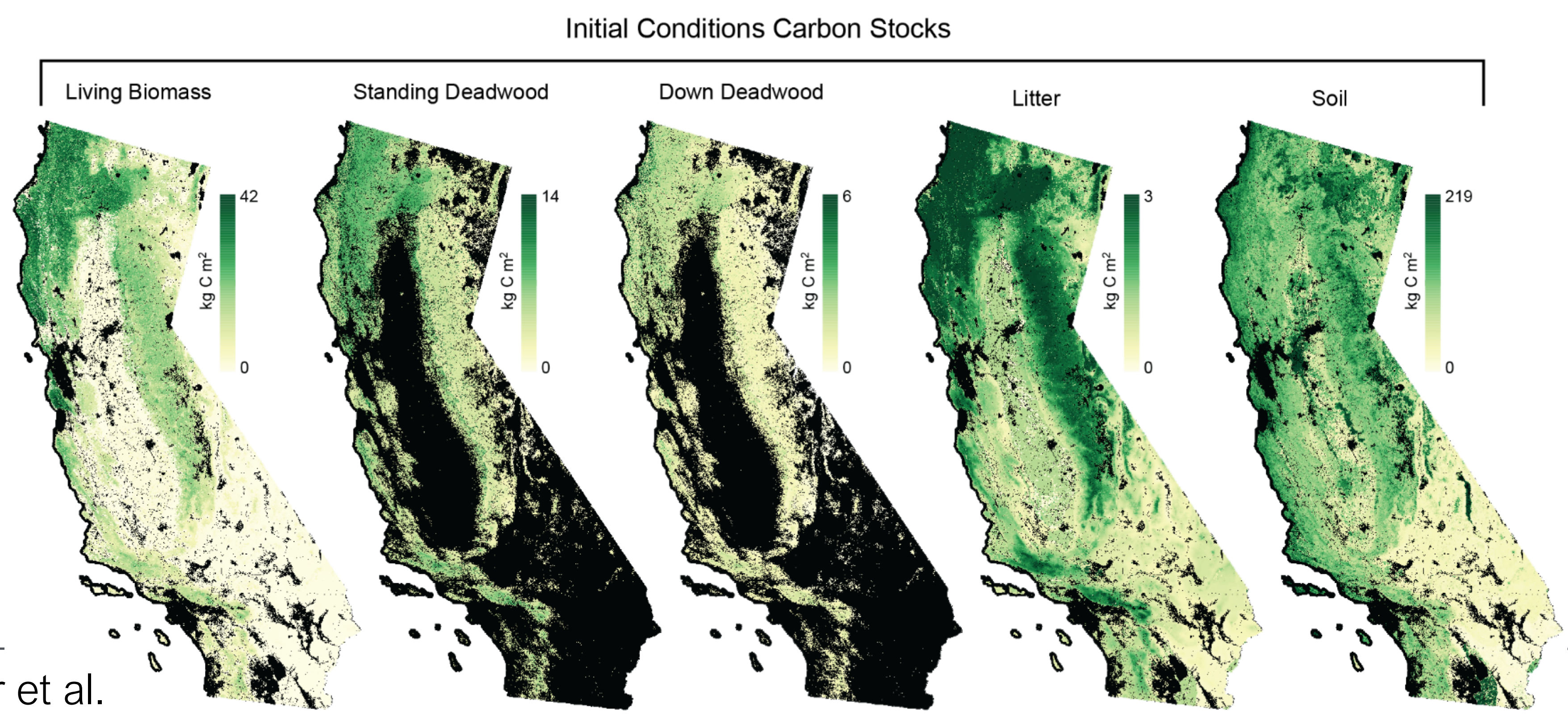
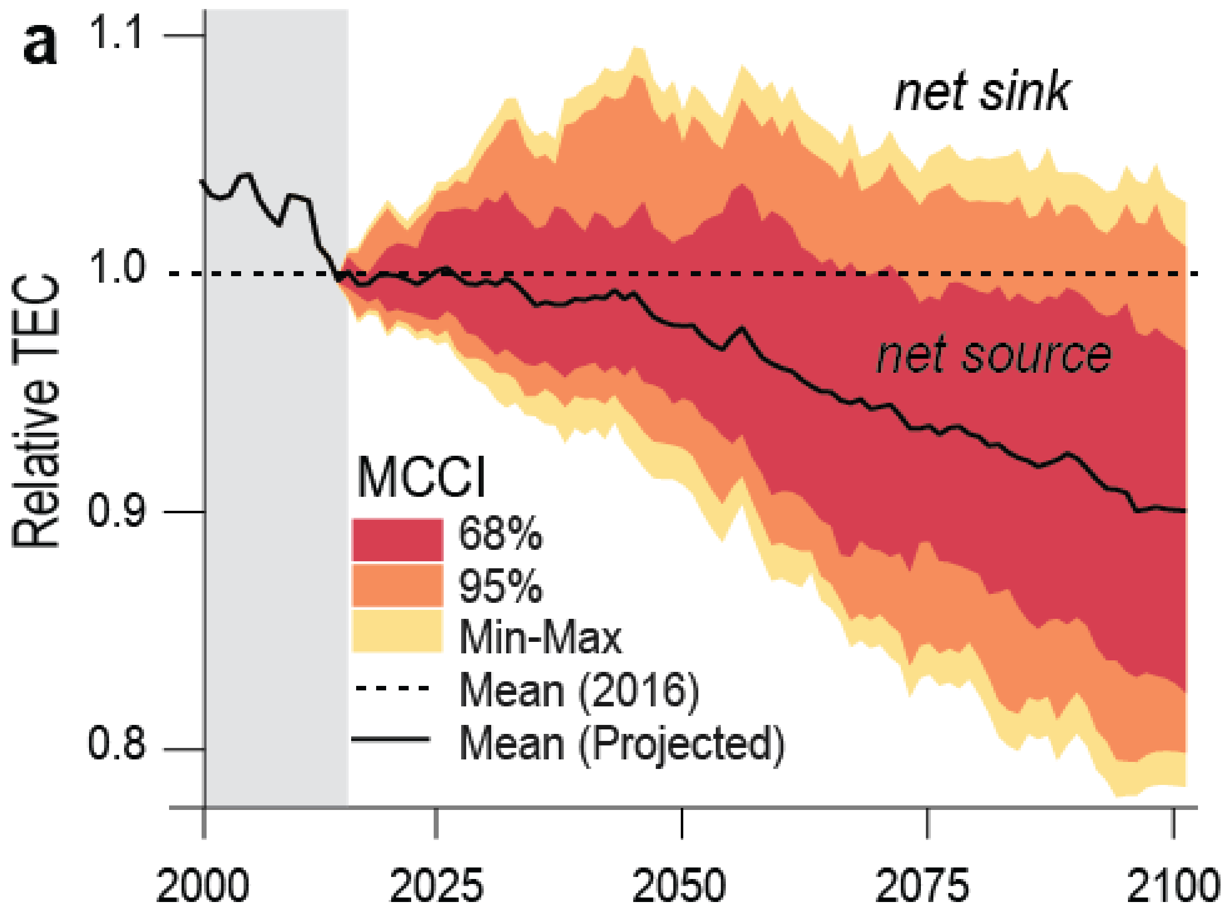
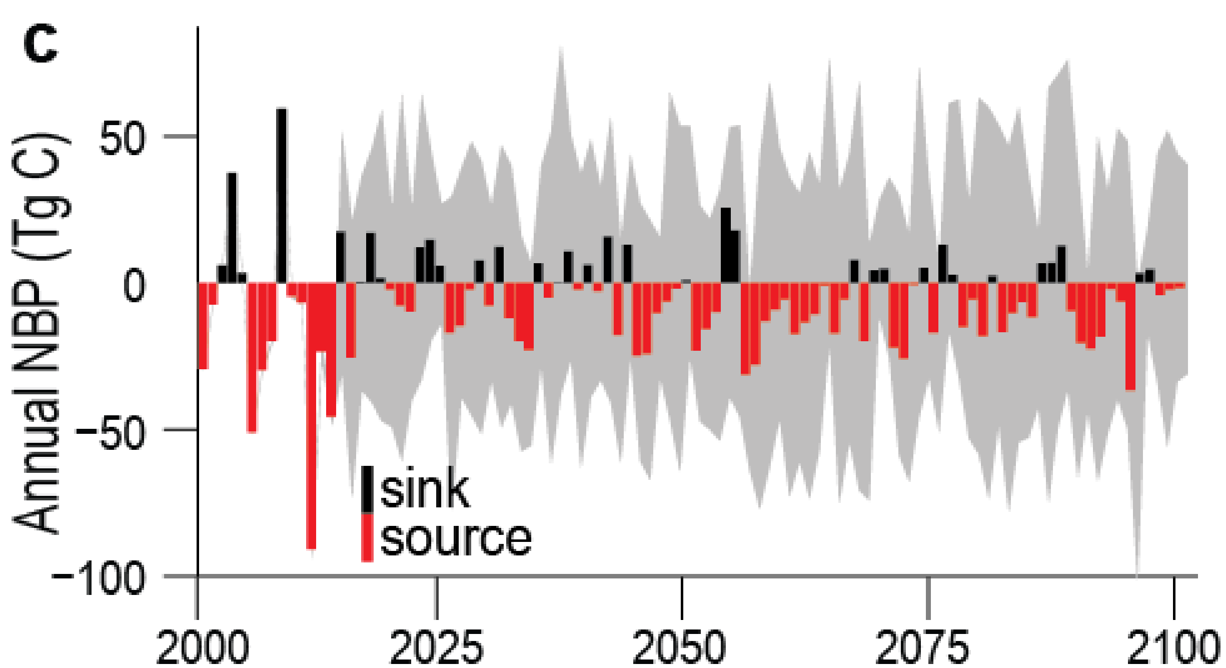
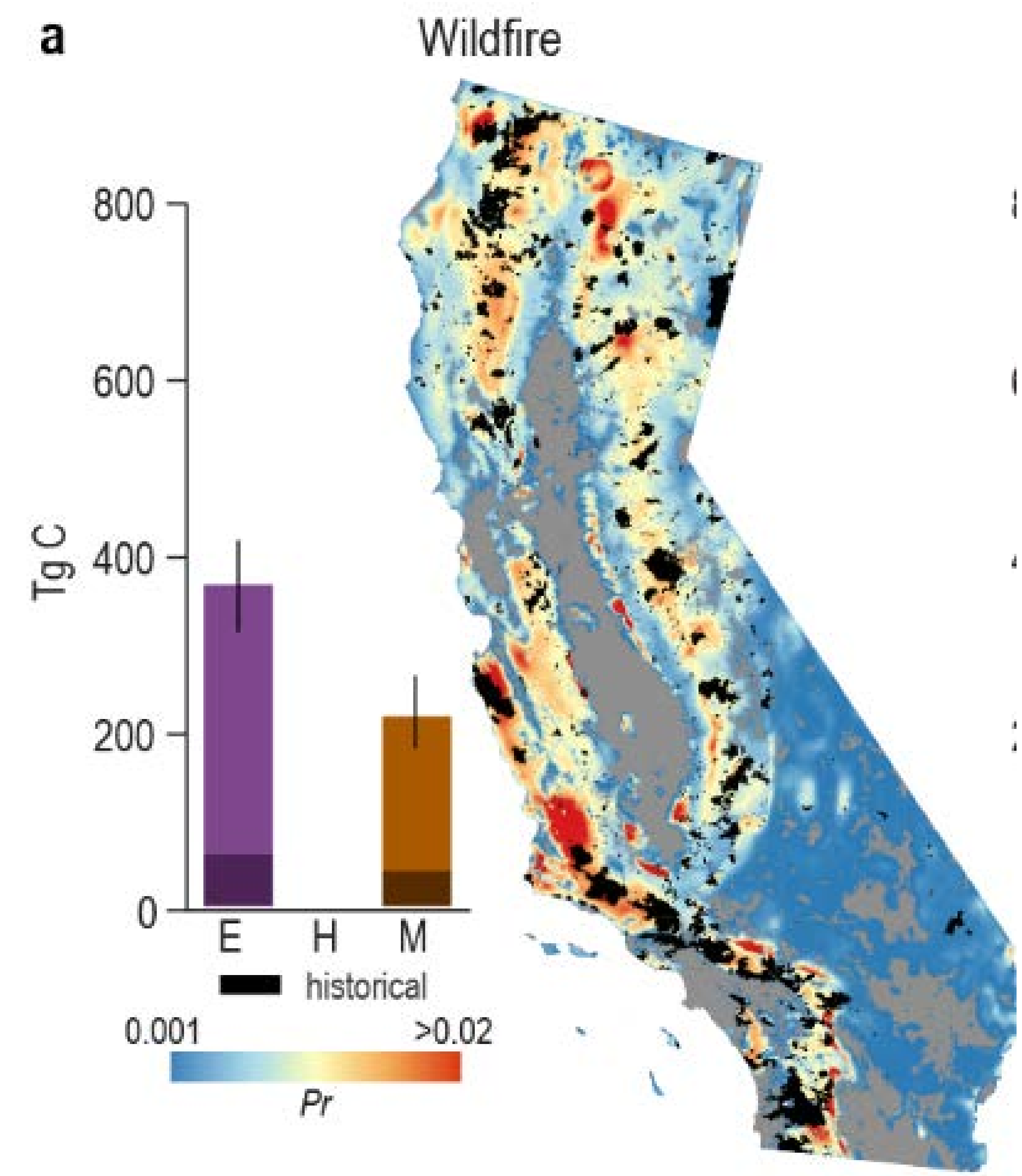


Figure from Sleeter et al.
In prep., Figures are Draft

Carbon dynamics of California's lands







32 futures (GCM/RCP/LUC)

TEC: Total Ecosystem Carbon
NBP: Net Biome Productivity

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Sleeter et al.
In prep., Figures are Draft

Direct and opportunity costs of intervention

Costs

Social cost of carbon/nitrogen
Avoided fire suppression costs
Avoided conversion benefits to cropland
Avoided flood damages
Avoided fire damages?

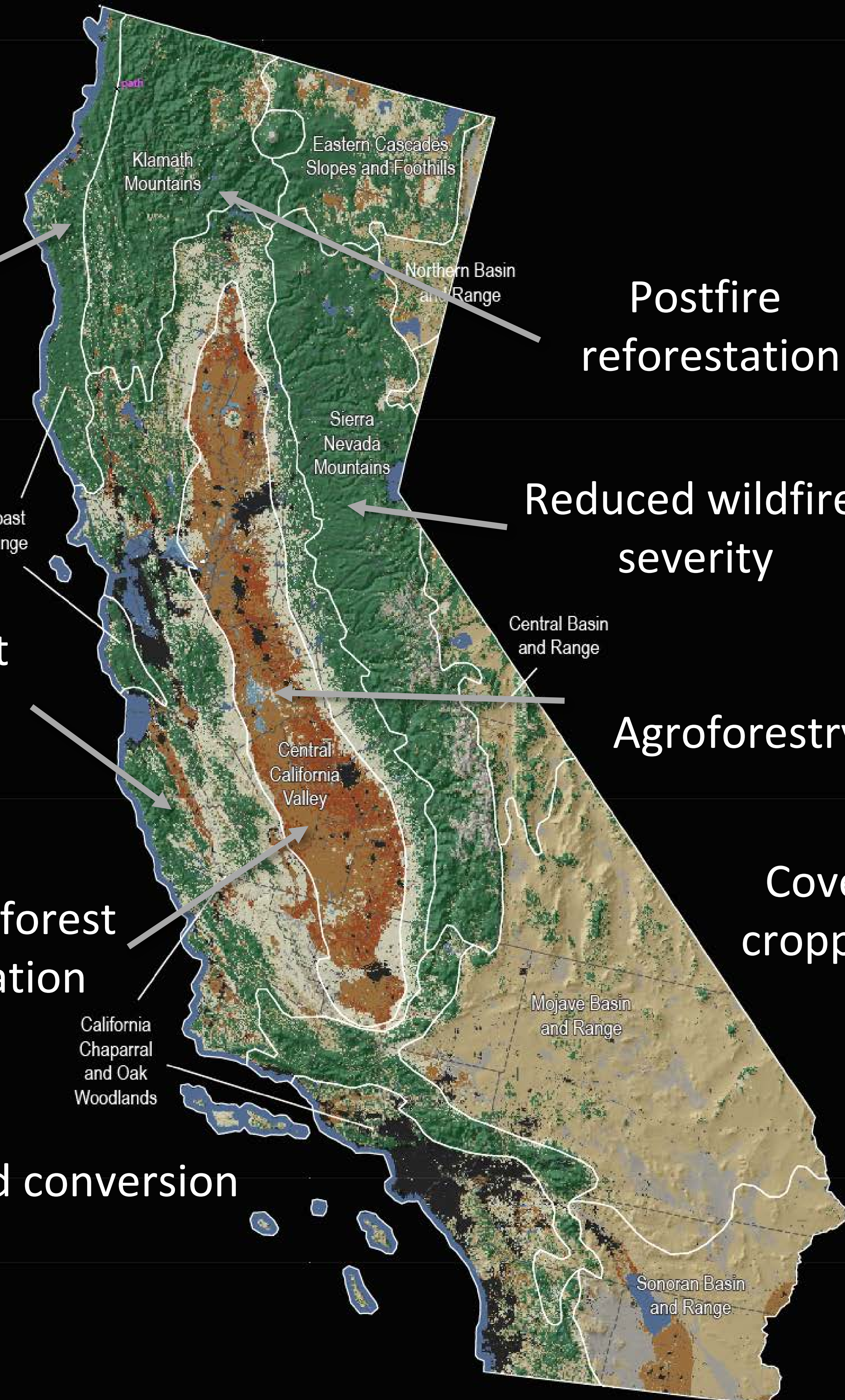
Benefits

Changes to forest management

Hardwood forest restoration

Riparian forest restoration

Avoided conversion



Postfire reforestation

Reduced wildfire severity

Agroforestry

Cover cropping

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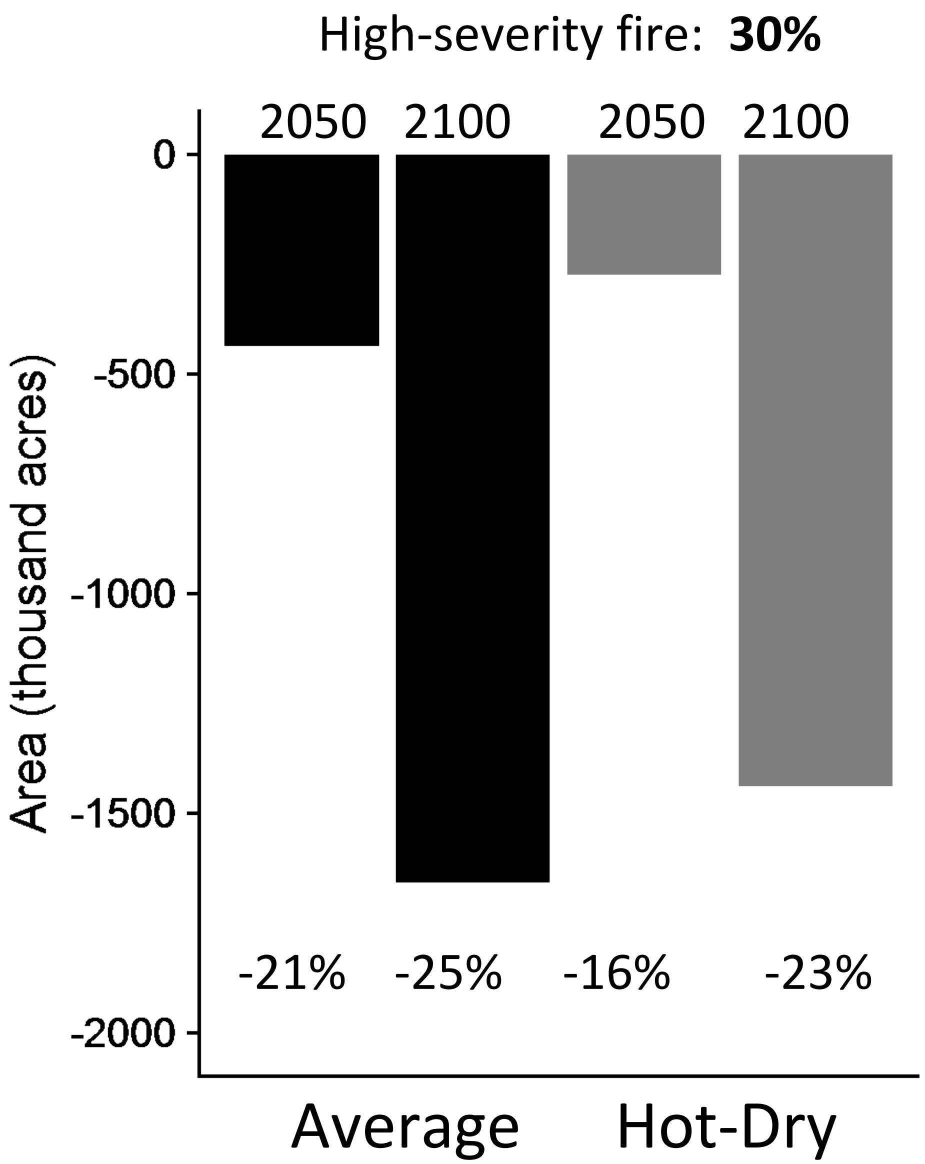
UNIVERSITY OF CALIFORNIA, SANTA BARBARA

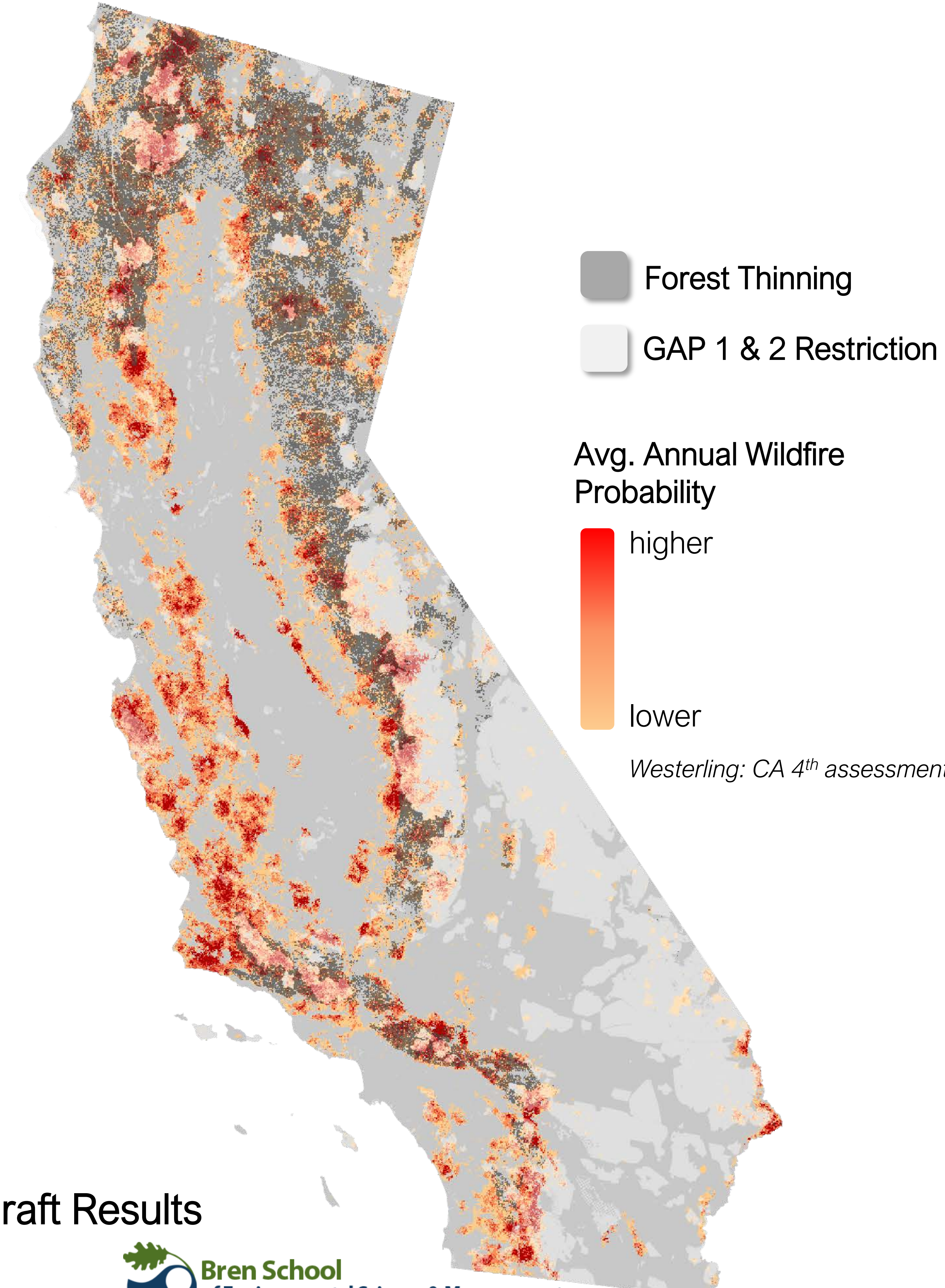
USGS
science for a changing world

Reduced Wildfire Severity

310,000 ac thinning/yr

120,000 ac Rx burning/yr





Draft Results

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Summary

- Evidence of strategies to achieve material GHG reductions and generate co-benefits is emerging
- Analytical approaches exist at multiple levels of complexity
- Taking a scenario-based approach to explore trade-offs will support more robust policies

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