2019 BOF CA Forest Ecosystem & HWP Carbon Inventory

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What's new from the last reports?

FIA post-stratification refinements

- Now grouping all private forest into 1 of 3 strata based on holding size class: small, medium and large.
- Newer NLCD forest cover map, additional vegetation layers, updated NFS boundary layers.
- Reduces potential bias from distinctly higher non-sampled rate for FIA plots on smaller acres of private forest, particularly woodland/hardwoods.
- Reduced overall sampling error for total carbon stock by ~4%.
- Now difficult to compare results from this report to previous reports.

Harvested wood products

- Whoops, there never was any missing carbon….but model revisions still make QA/QC easier
- New Monte Carlo Analysis for uncertainty to produce confidence intervals more in line with original Stockmann et al. 2012 publication

California Forest Carbon Stock: 2019 Reporting Period

Carbon pool	Stock (MMT C)
Forest Ecosystem	3,070.5
Harvested wood product	135.2
Total carbon stock	3,205.7

Report Table 7.3

California Forest Carbon Sequestration: 2019 Reporting Period

Forest land remaining forest land

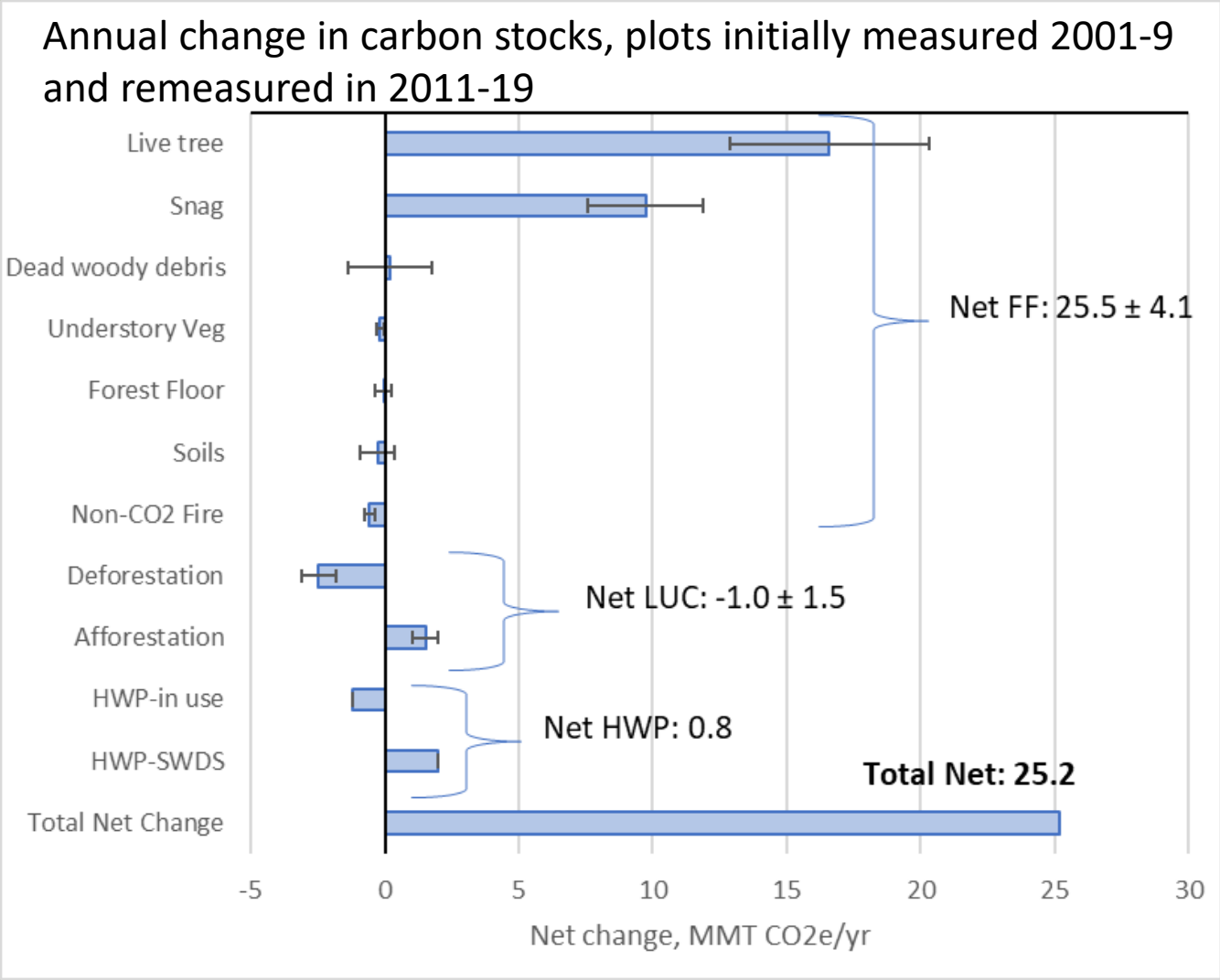
Report table 7.1

CARBON POOL	Net Change MMT CO_2 equivalent	
Forest land remaining forest land (FF)		
Forest ecosystem	**2019**	**2018***
Aboveground live[1]	13.6	16.5
FOREST ECOSYSTEM NET FLUX	26.0	27.5
Harvested Wood		
Products in use	-1.2	-1.3
Products at SWDS	2.0	2.0
HWP NET FLUX	0.8	0.7
TOTAL NET FLUX	26.8	28.2

[1]includes live trees, foliage, and understory veg

***re-calculated with new post-stratification**

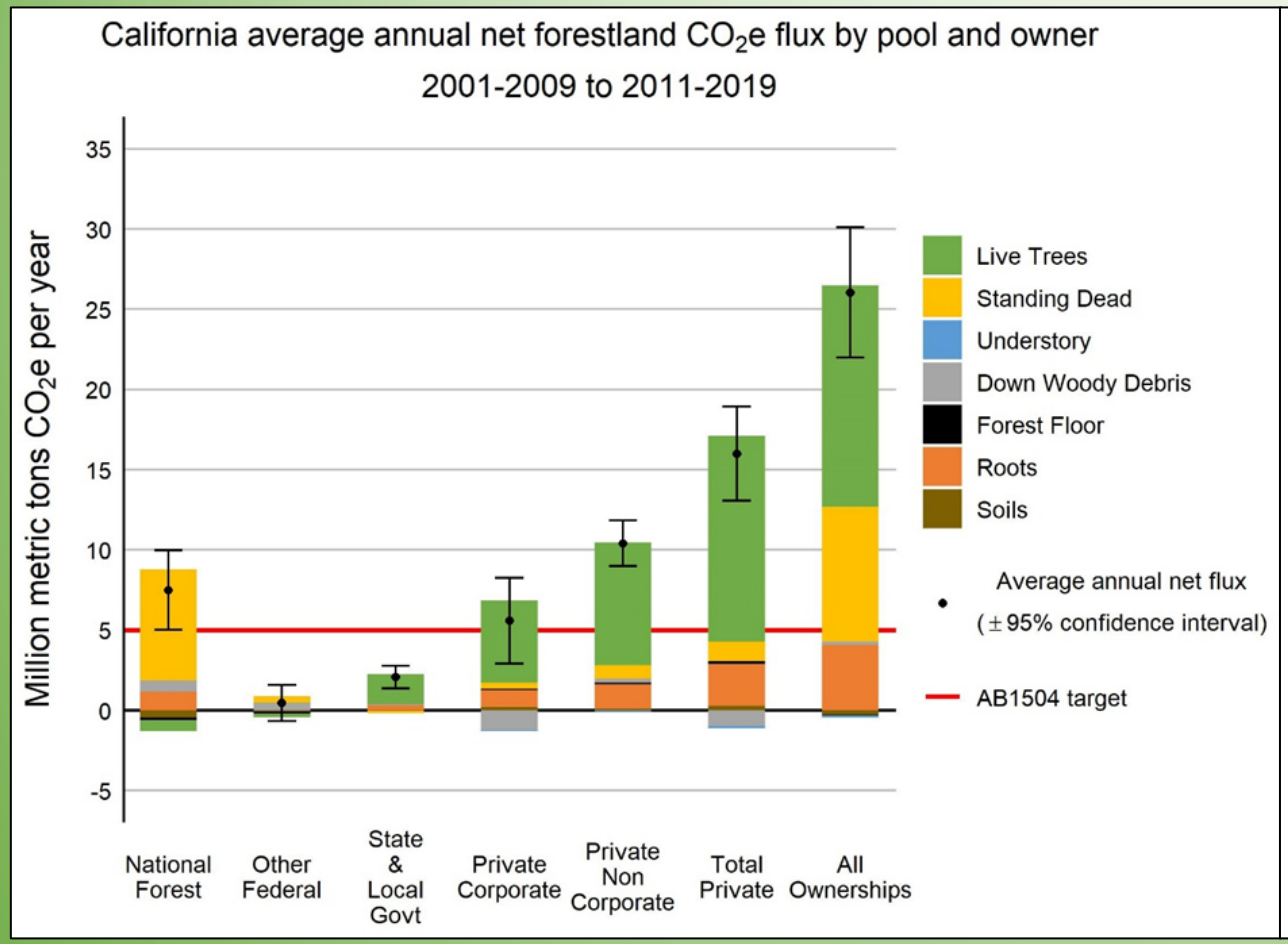
CA Forest Carbon Sequestration: Forest sector component



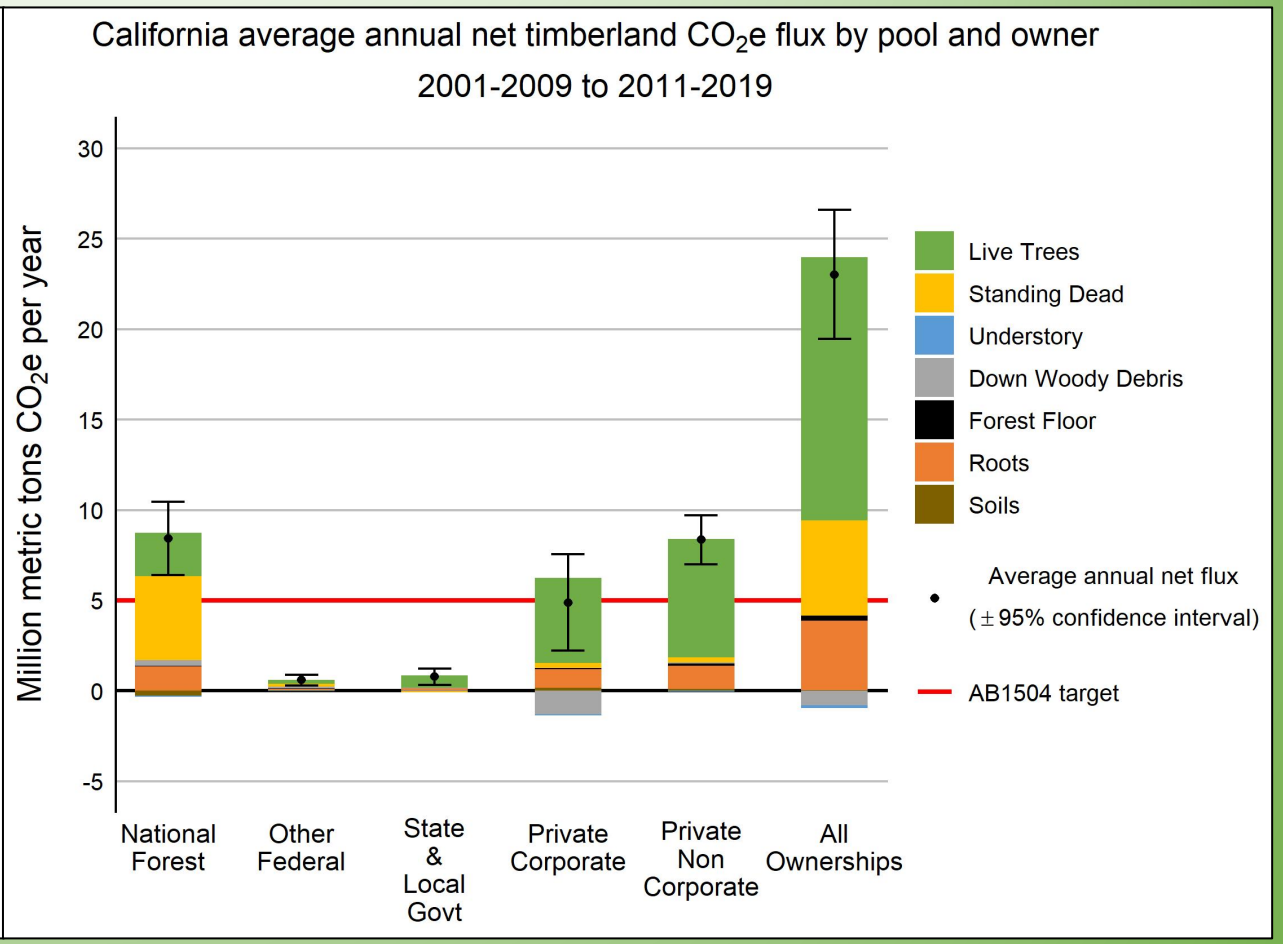
- C stores increasing in live trees and snags
- Annual flux as percent of stocks:
  - 25.2 MMT Co2e/yr ~ 6.9 MMT C/yr
  - 6.9 ÷ 3,070 = 0.22% / yr
- CA greenhouse gas emissions, all other sectors:
  - 425.3 MMT CO2e/yr (CA ARB - 2018)
  - 25.2 ÷ 425.3 = 5.9% offset

Adapted from report table 7.2

CA Forest Carbon Sequestration: Owner and pool

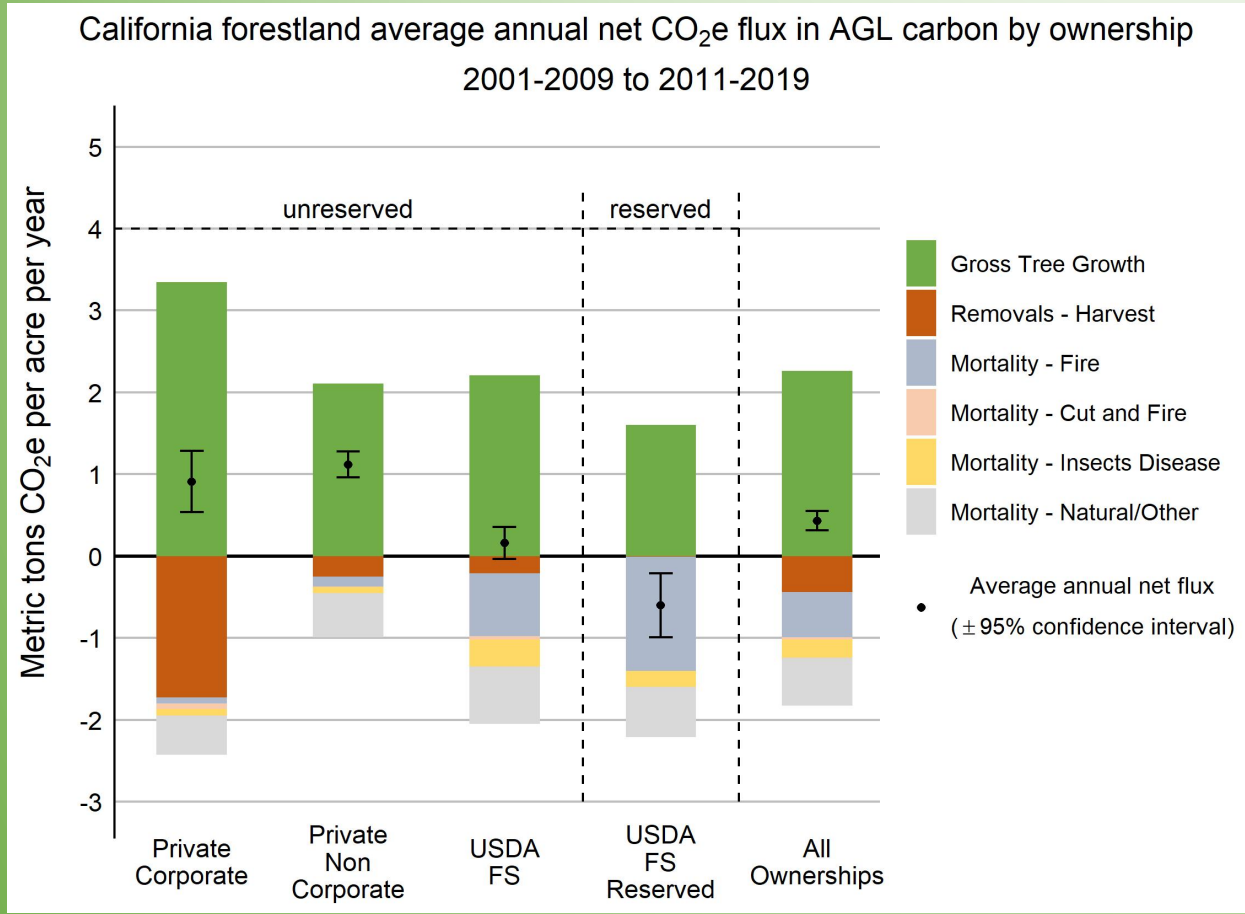


Report figure 4.2

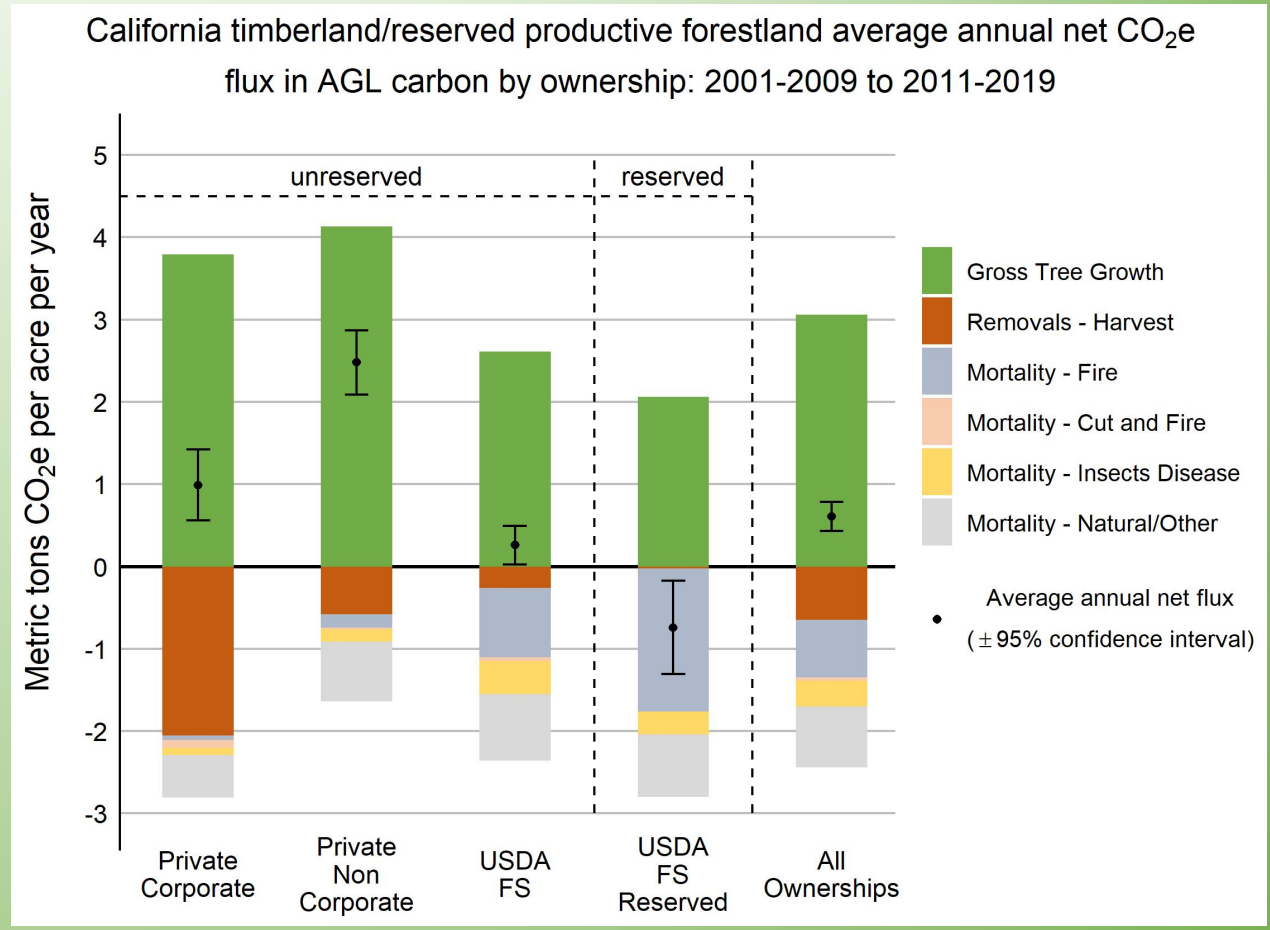


Report figure 4.3

CA Forest Carbon Sequestration:
Growth, Removals and Mortality

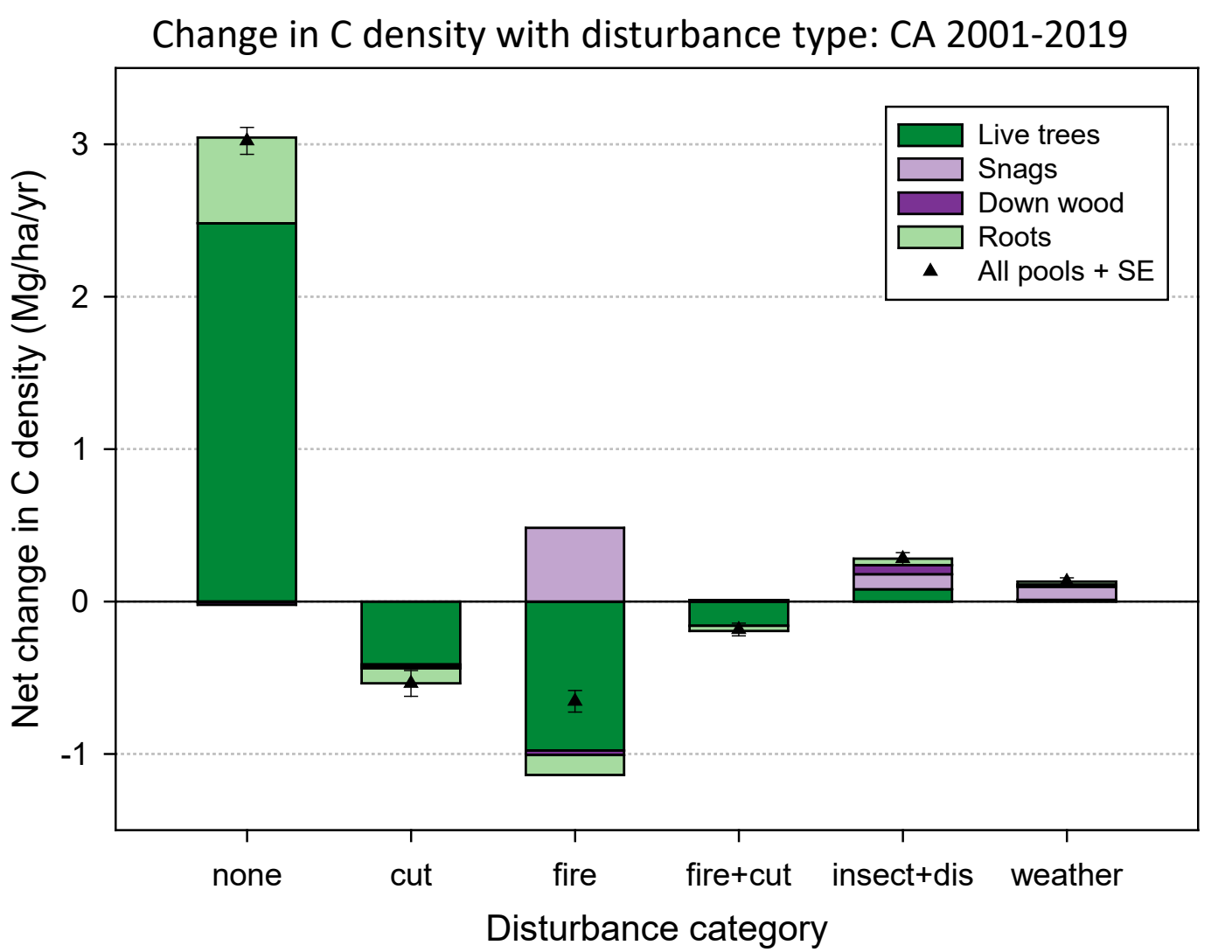


Report figure 4.4a



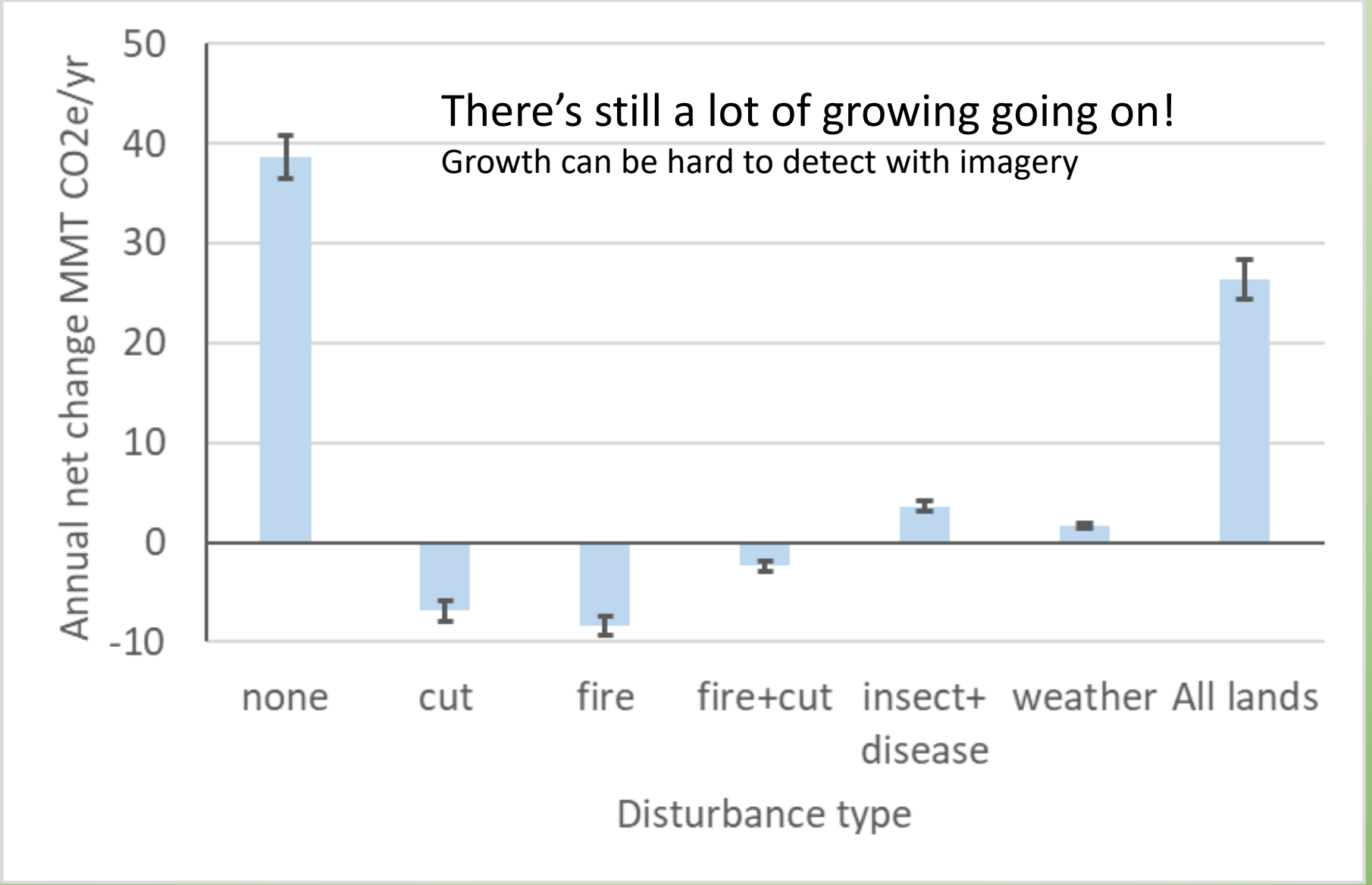
Report figure 4.4b

CA Forest Carbon Sequestration: Disturbance

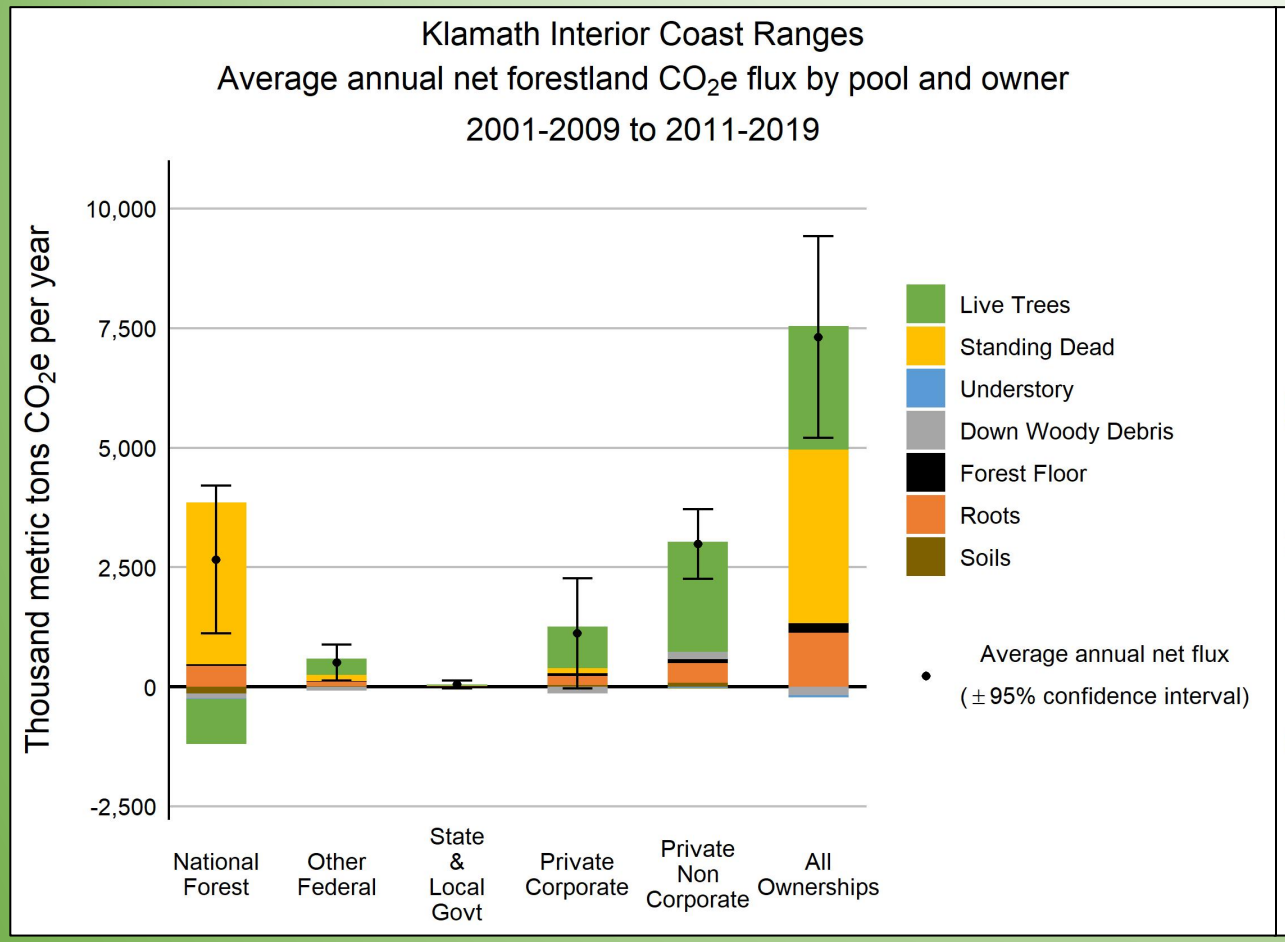


- Substantial above- and below-ground increase in undisturbed
- Fire loss of live trees is partially compensated by increase in snags, which are hard to see with satellites or lidar
- C still increases on average in insect, disease, and weather disturbance

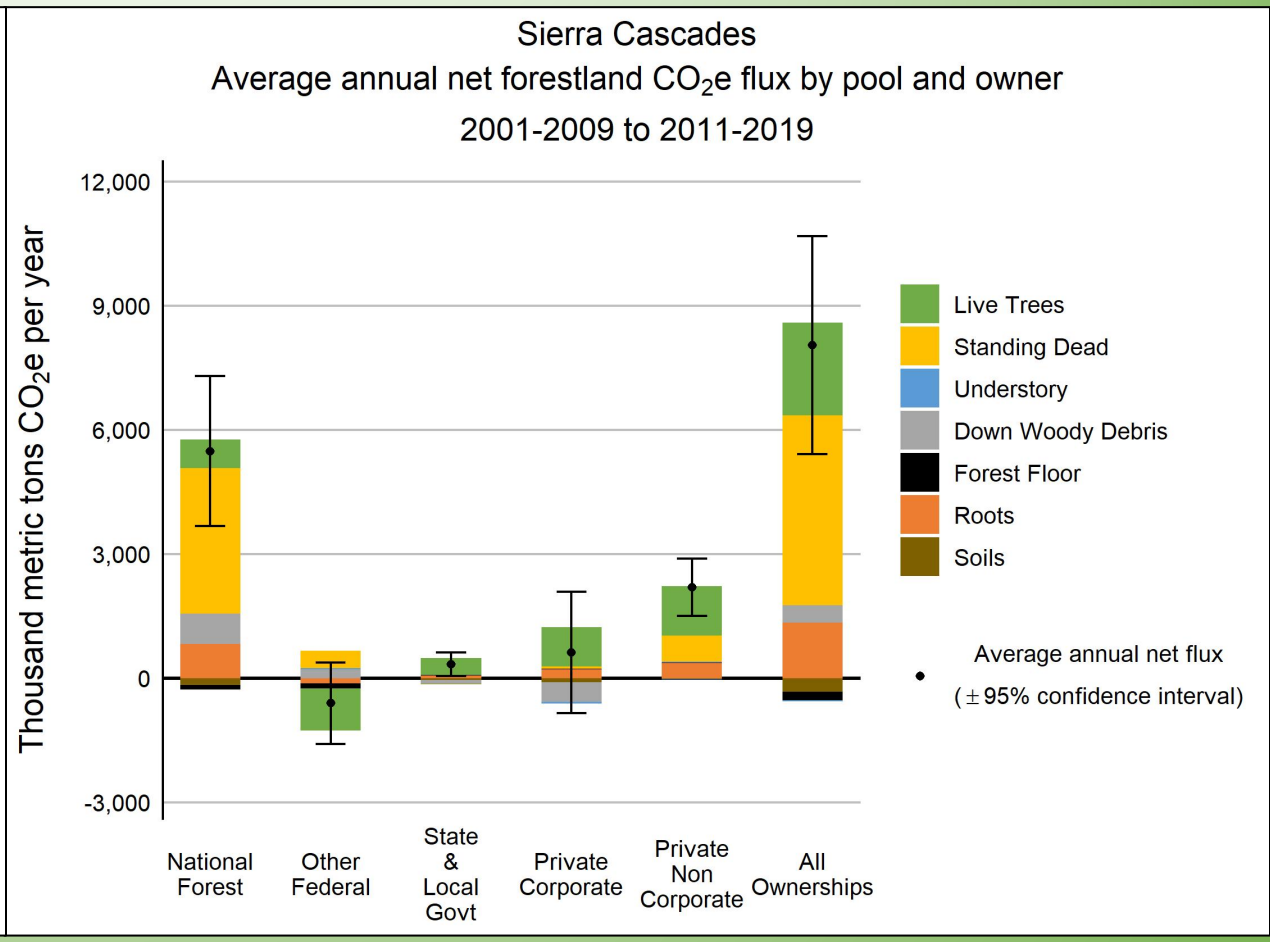
CA Forest Carbon Sequestration: Disturbance



CA Forest Carbon Sequestration: Ecoregions



Report figure A.4.3



Report figure A.7.3

CA Forest Carbon Sequestration: Ecoregions

Report figure 4.6b

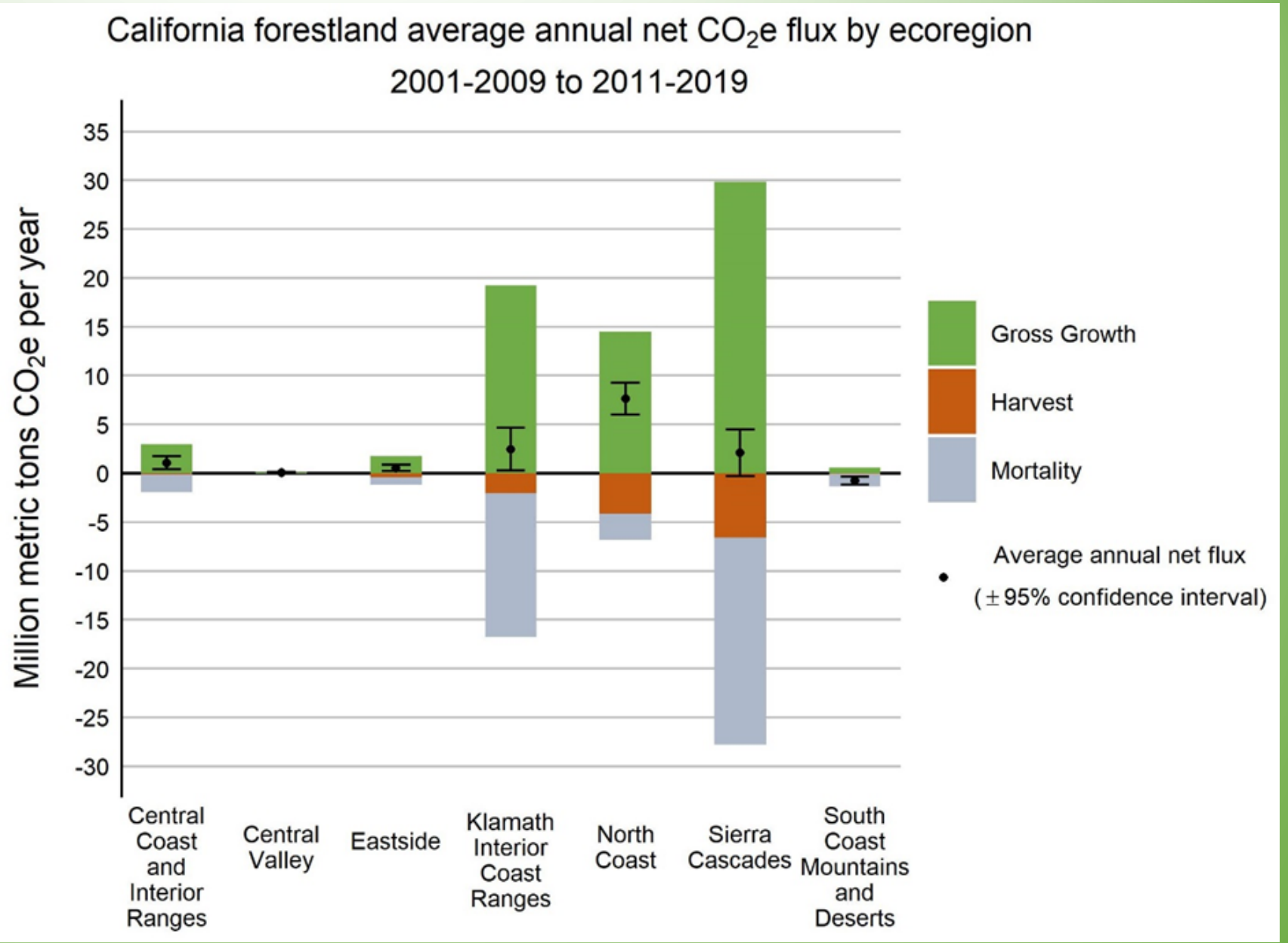
Tree mortality rate (MMT CO2e)

	Sierra	Klamath
2016	-17.8	-12.6
2017	-19.6	-13.4
2018*	-21.2	-13.7
2019*	-21.0	-14.8

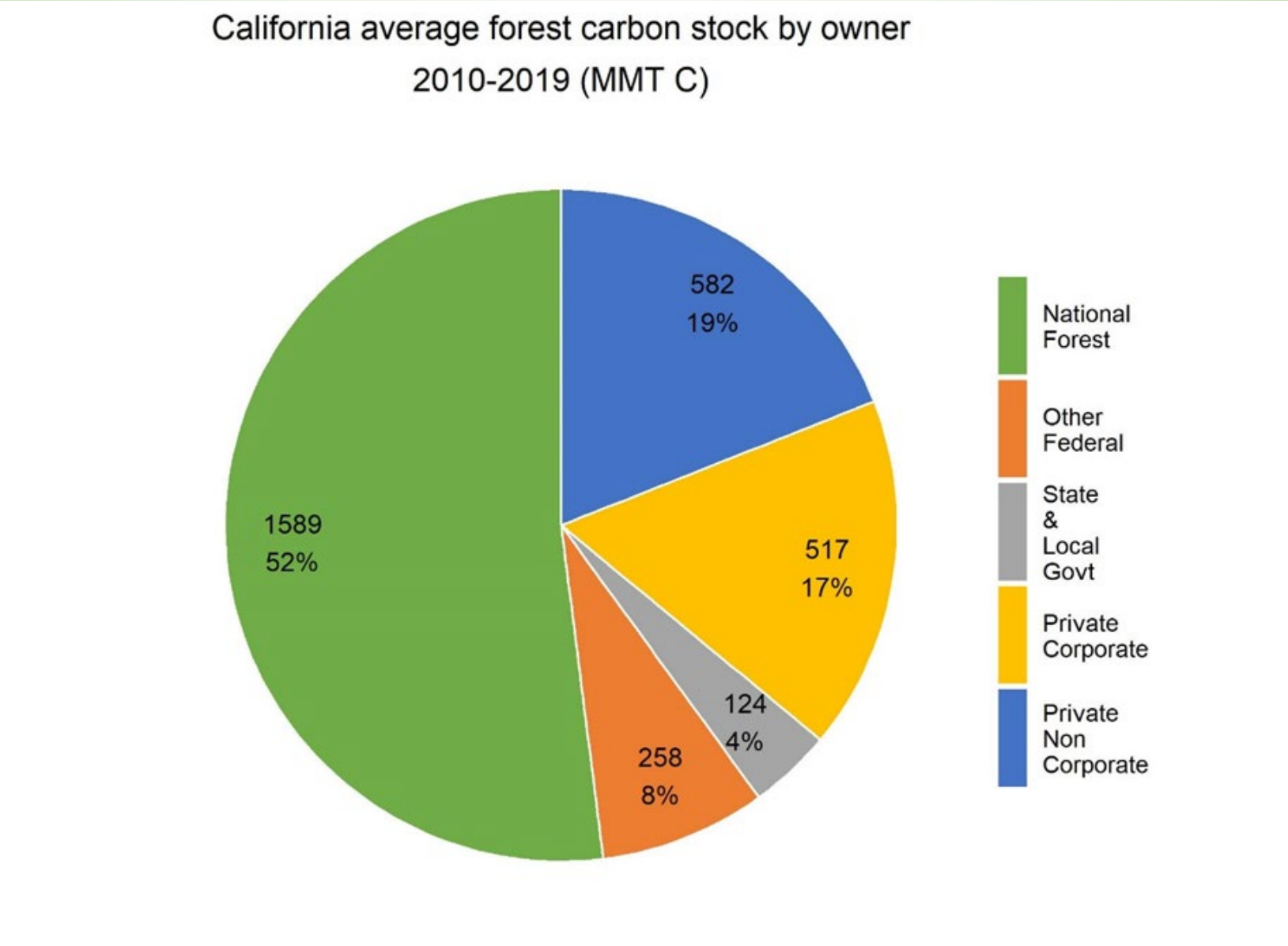
Gross growth rate (MMT CO2e)

	Sierra	Klamath
2016	32.3	20.8
2017	31.9	20.1
2018*	30.1	19.7
2019*	29.9	19.3

*new post-stratification

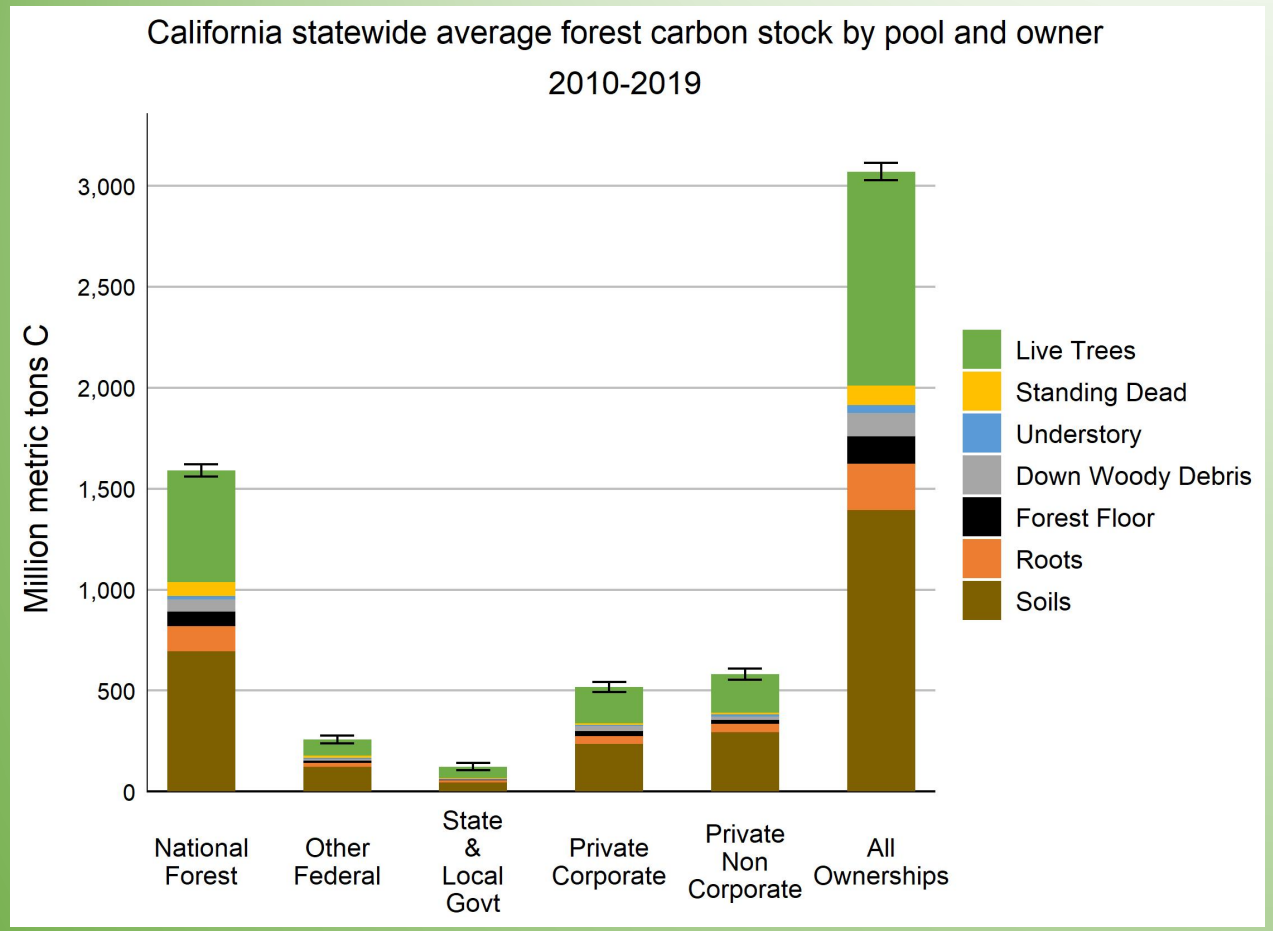


California Forest Ecosystem Carbon Stock
3.1 Billion Metric Tons C

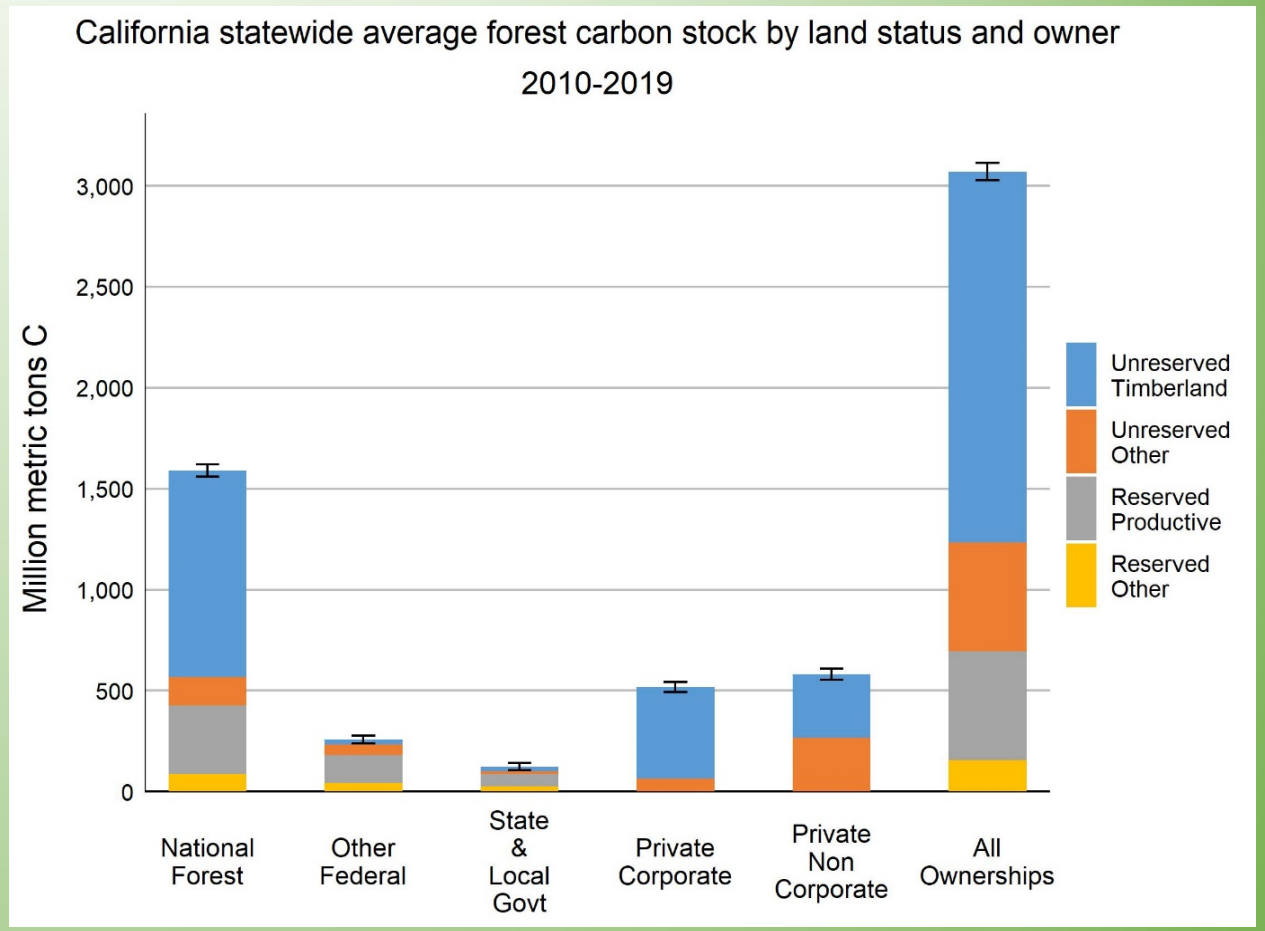


Report Figure 4.8

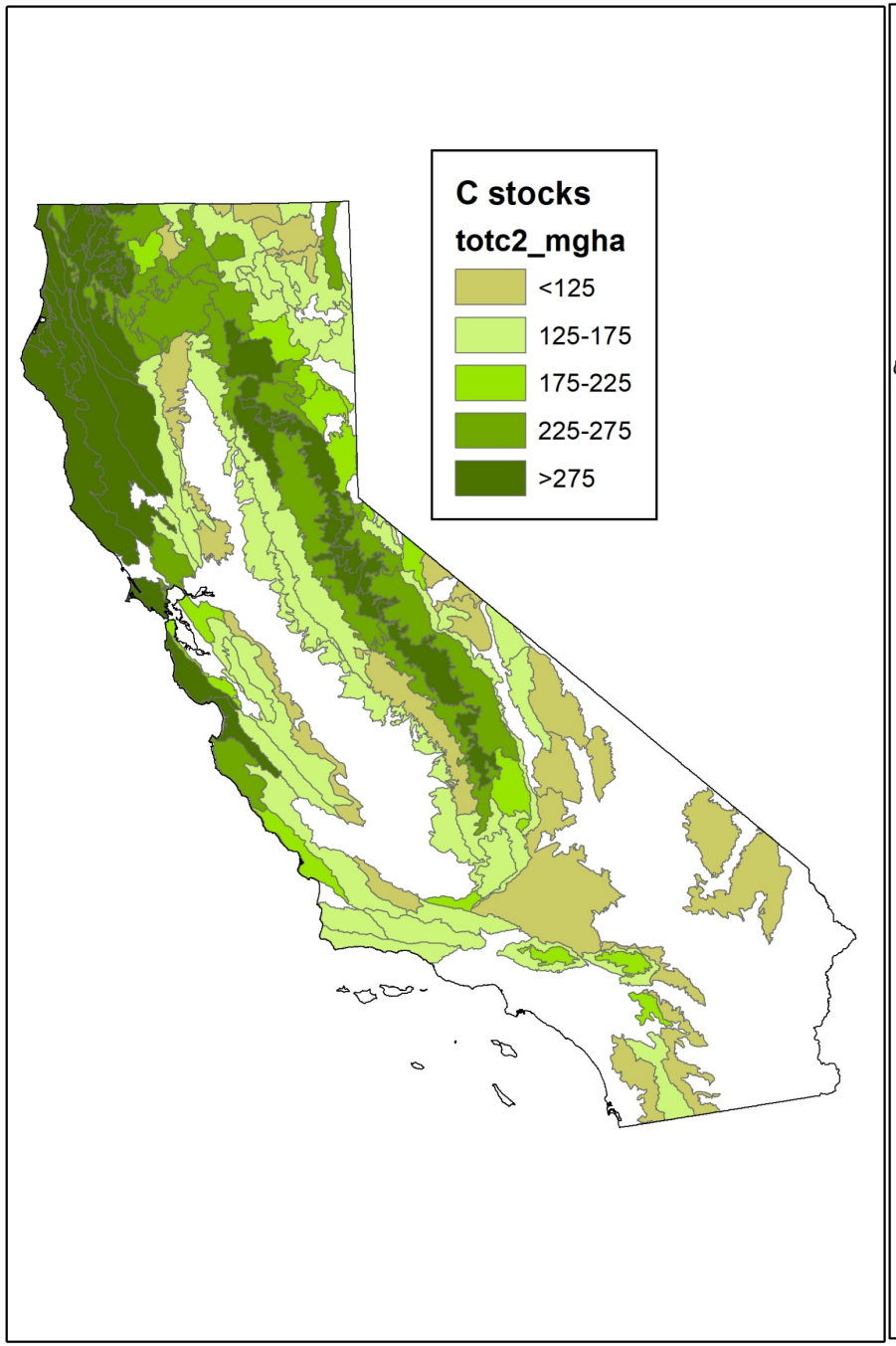
California Forest Ecosystem Carbon Stock
3.1 Billion Metric Tons C

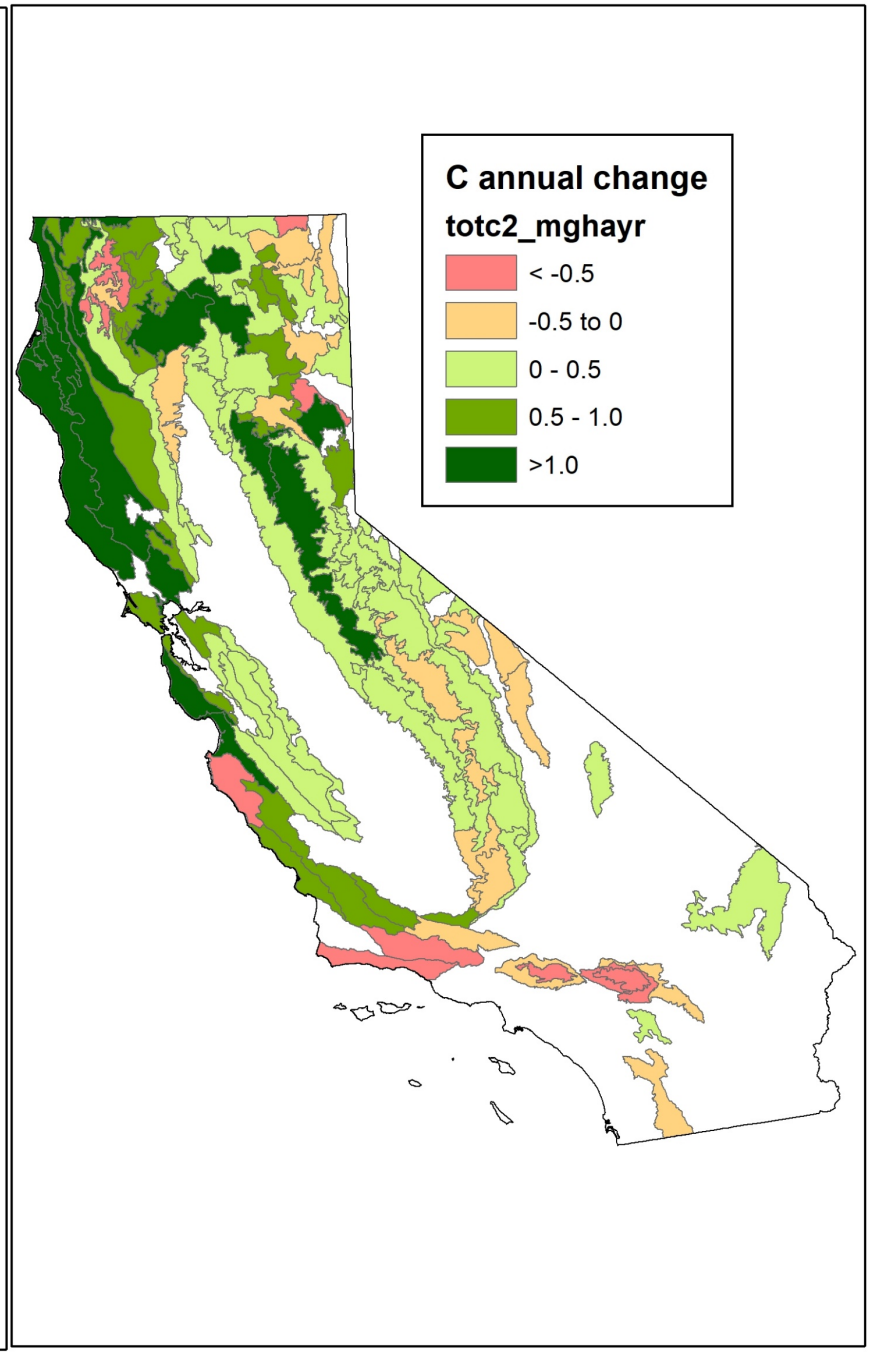


Report Figure 4.9



Report Figure 4.10



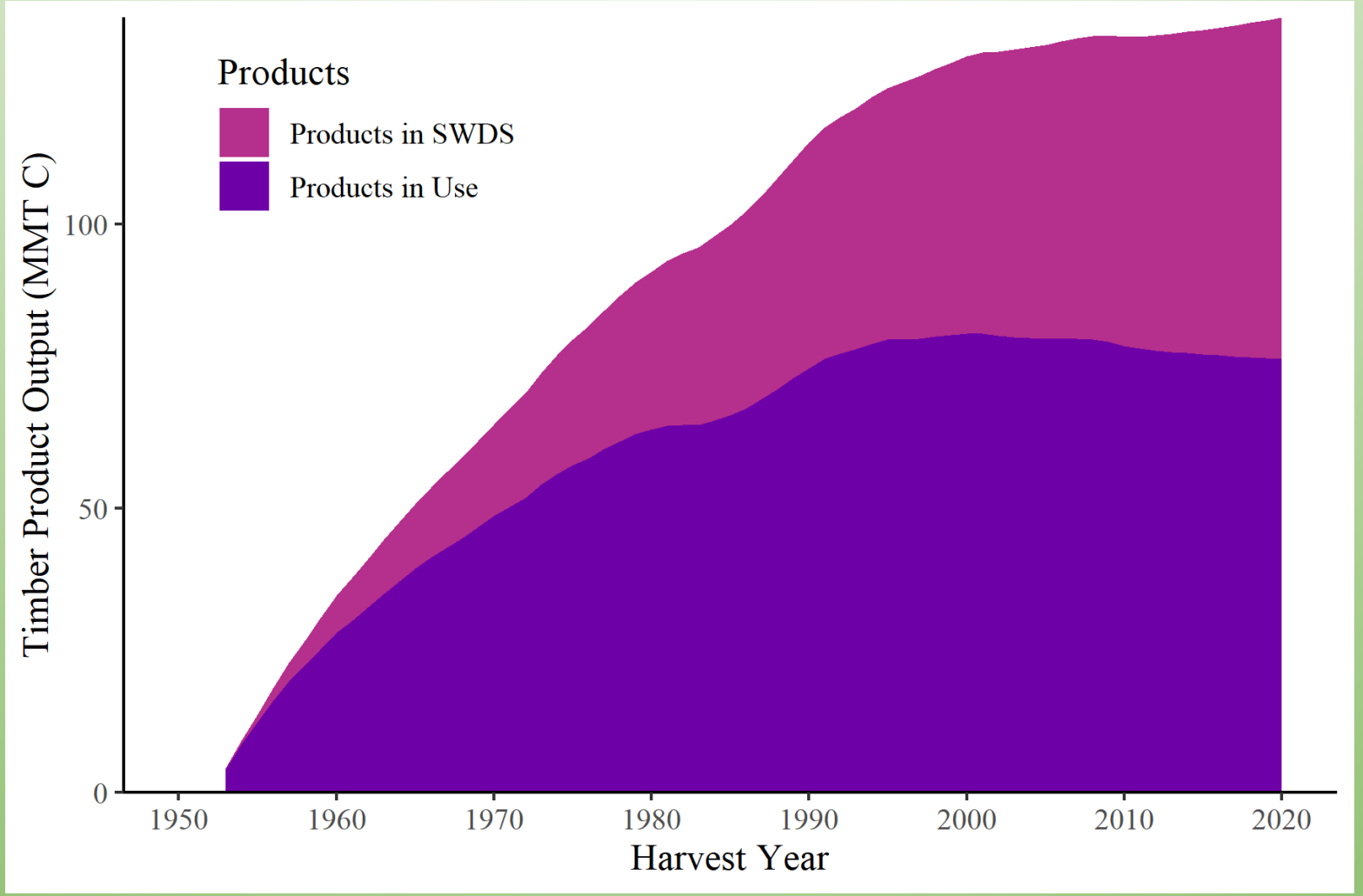


Carbon density (left)

Net change (right)

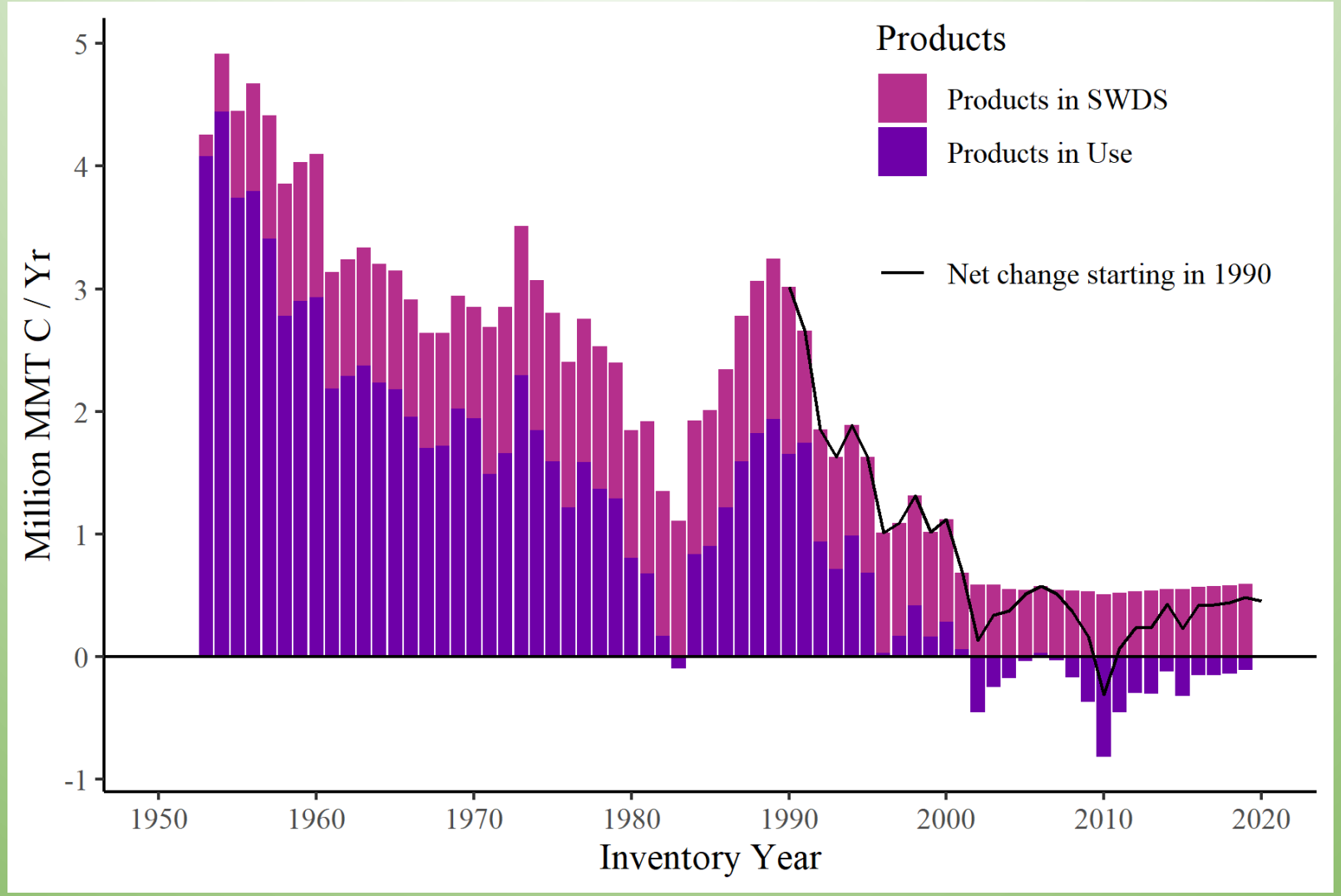
2019 reporting period

California HWP Carbon Stock
135.2 MMT C



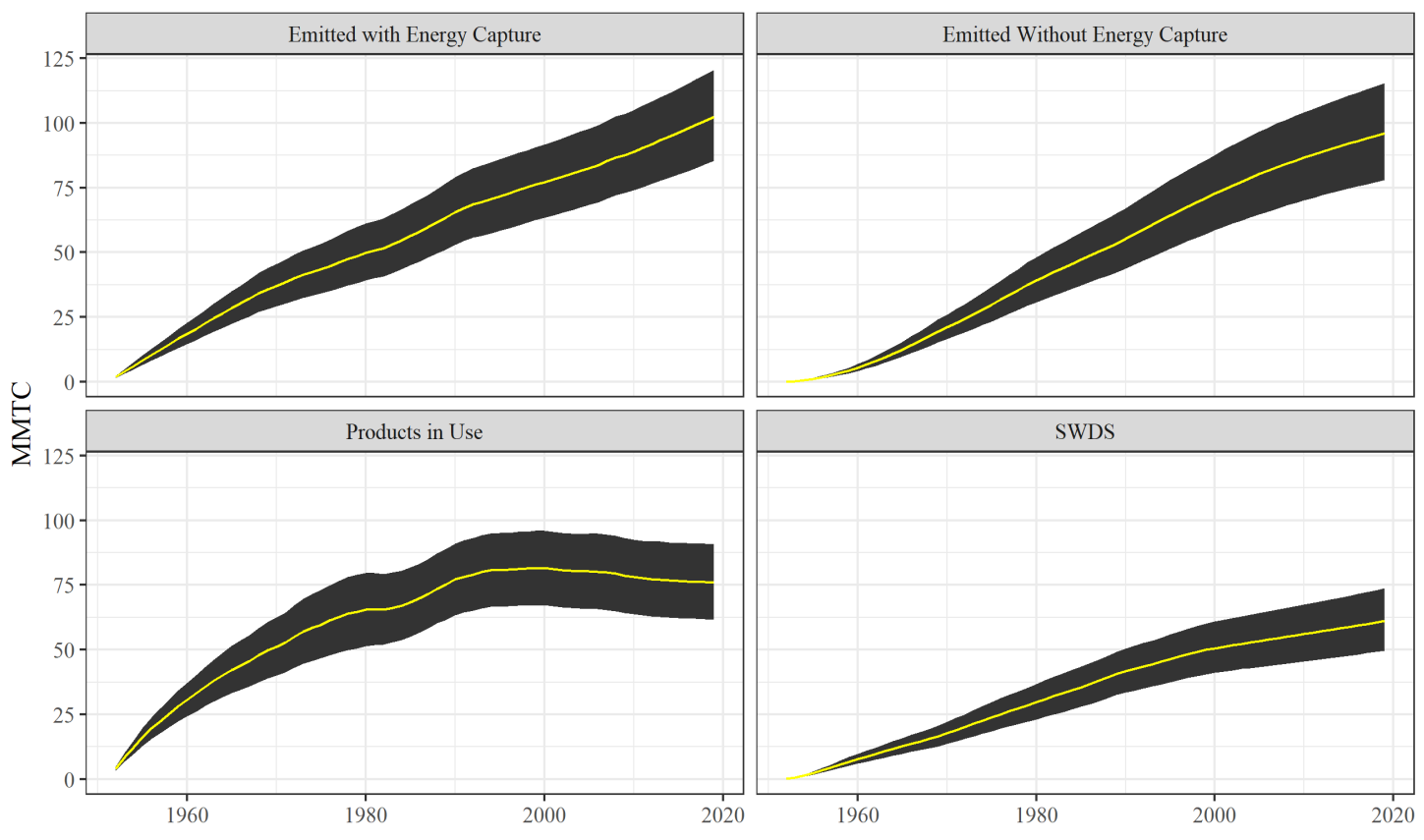
Report figure 6.2

California HWP Carbon Flux
0.8 MMT CO2e/yr



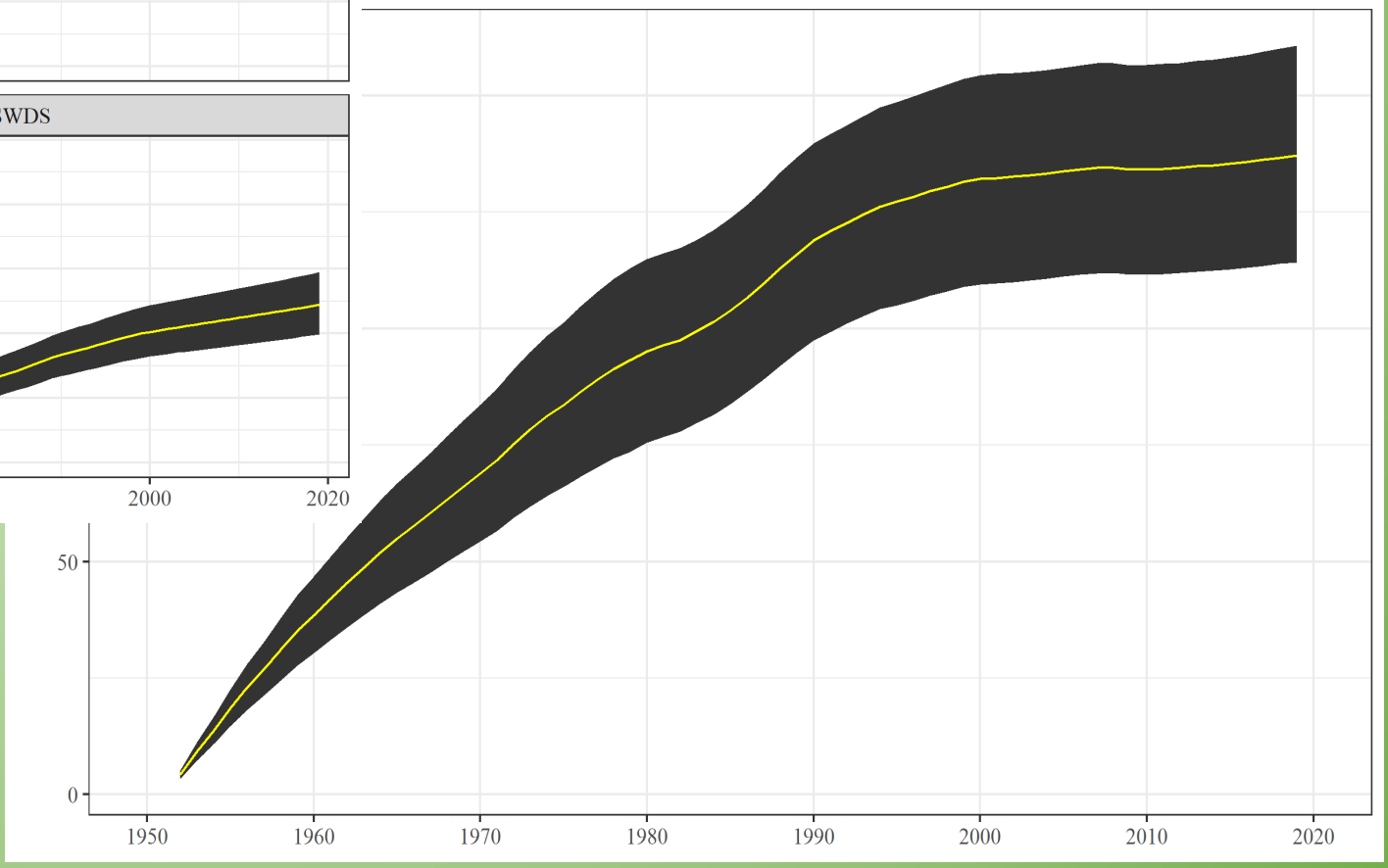
Report figure 6.3

California HWP C Monte Carlo Analysis



New! Report figure 6.7

New! Report figure 6.6



Next steps

2021

- Complete 1st 10-yr re-measurement cycle [Covid-19, fire delays in 2020]
- Start 2nd re-measurement, 1st 5-year cycle – Integrated Resource Inventories, Inc., ~630 plots
- Make HWP C model publicly available in web app

2022+

- 2020 FULL REPORT – 1 year delayed (early-2023)
- Pacific Coast Temperate Forest and Harvested Wood Product Carbon Regional Report (mid-2022)
- 2022-2025 contracts for FIA intensification

Effects of forest management and wood utilization scenarios on carbon sequestration and storage in California, Pacific Coast

- Carbon Budget Model of the Canadian Forest Sector (CBM-CFS3)
- MD, PA, MN, WI, MI, OR also working with American Forests and using CBM to inform climate mitigation strategies
- Stakeholder input on scenario building

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CALIFORNIA DEPARTMENT OF FORESTRY & FIRE PROTECTION CAL FIRE SINCE 1885

BOARD OF FORESTRY STATE OF CALIFORNIA AND FIRE PROTECTION

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Examples of scenarios

Forest Management

- Afforestation
- Reforestation
- Fuels / forest resilience treatments
- Even / uneven aged silvicultural systems
- Prescribed fire / managed wildfire
- Harvest less area / extend rotations
- Increased salvage (possibly coupled with increased disturbance)
- Higher recovery of stemwood / slash
- Reduced forest LUC / no net loss

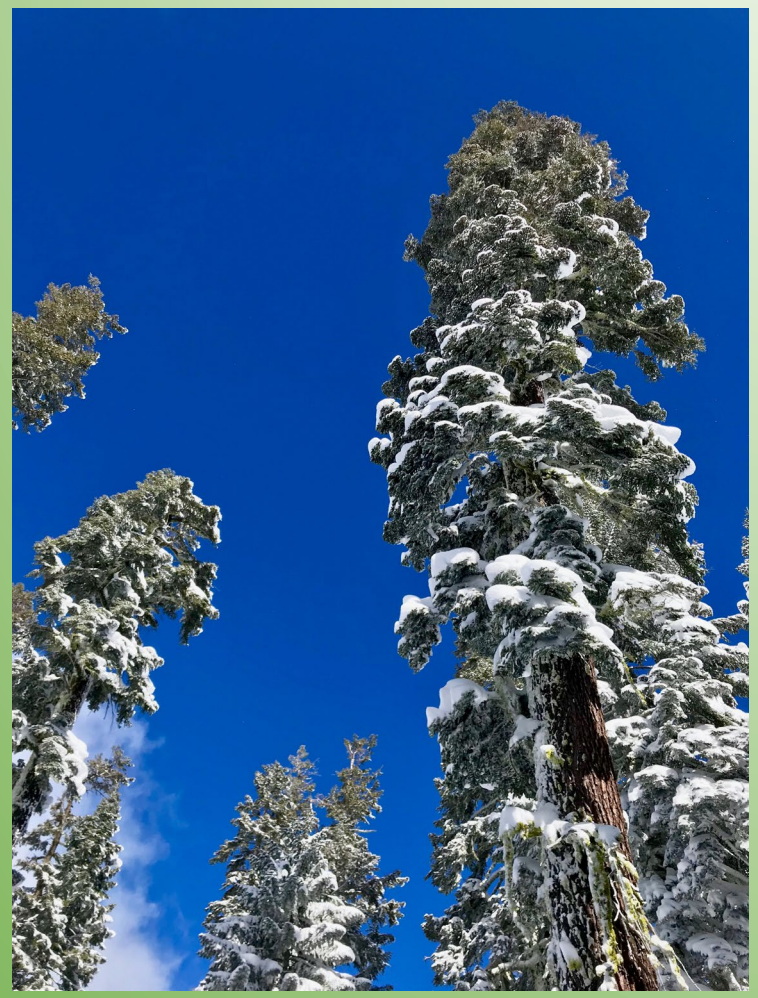
Wood Utilization

- Logging residues for bioenergy, transportation fuels
- Divert wood to longer-lived products / emerging products
- Cascaded utilization of products
- Increased recycling

Elements to try and address through modeling

- Future global emission and climate scenarios
- Future drought effects on tree growth rates, mortality
- Future disturbance regimes, mortality
- Climate-induced veg type conversion
- Tradeoffs with other ecosystem services
- Future timber supply
- Portfolios of scenarios that represent different objectives:
  - Maximizing forest carbon mitigation
  - Minimizing mitigation costs
  - Prioritizing forest health and resilience

Synergy with other modeling efforts



- Evaluate results in Pacific Coast Regional context
- In California:
  - Run similar scenarios through different models, especially BAU?
  - Utilize similar model input parameters (climate, emissions, temp / precip)?
  - Use outputs from one model as inputs for another?
  - Utilize similar time steps or metrics for analysis?

Questions?

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