Forests, Forestry and Climate Change

CEC PIER Technical Meeting
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Forests

- IPCC 2007 Report
  - About 20% of Global Emissions
  - Emissions Primarily from Tropical Forests
- Trees are Atmospheric Carbon Scrubbers
  - Age 50 Coast Redwood Tree ≈ 2.5 tonnes CO2e
  - Must Consider Water Flux, Albedo and Soil
- Forest Ecosystem Impacts
  - California Conifer and Hardwood Forests
  - Adaptation

Forests Globally

"…the amount of carbon dioxide in the atmosphere has increased by about 35% in the industrial era, and this increase is known to be due to human activities, primarily the combustion of fossil fuels and removal of forests. Thus, humankind has dramatically altered the chemical composition of the global atmosphere with substantial implications for climate."

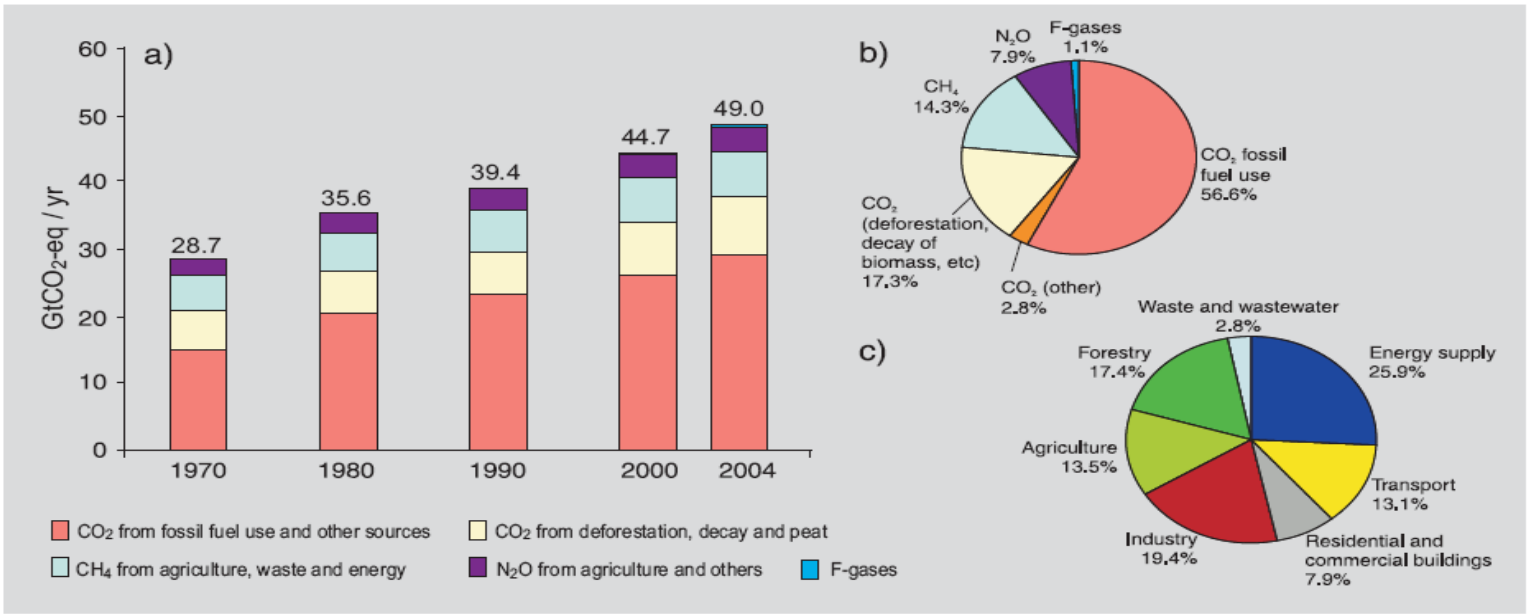


Figure 2.1. (a) Global annual emissions of anthropogenic GHGs from 1970 to 2004.[5] (b) Share of different anthropogenic GHGs in total emissions in 2004 in terms of CO_2-eq. (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO_2-eq. (Forestry includes deforestation.) {WGIII Figures TS.1a, TS.1b, TS.2b}

From IPCC 2007 Fourth Assessment Report, ch. 1 and Synthesis Report, ch. 2.

California Forests

- 12.4 million hectares
- Nearly 1/3 of California Land Base
- Water, Wood Products, Recreation, Ecosystem
- Urban Forests (5% of Land Base)
- Store 8.5 Billion Tonnes of CO_2e

"In 2003, growing vegetation in North America removed approximately 500 million tons of carbon per year (± 50%) from the atmosphere and stored it as plant material and soil organic matter. This land sink is equivalent to approximately 30% of the fossil-fuel emissions from North America." Source: The First State of the Carbon Cycle Report (2007)

Carbon Stored in California Forests

Table 4—Estimated total carbon on forest land by ownership and carbon pool in California

Ownership	Forest area	Aboveground live tree biomass[a]	Below-ground biomass	Under-story vegetation	Dead wood	Soil organic	Litter	Total
	Million acres	*Teragrams carbon*						
National forest:								
Timberland	9.275	354.73	88.99	13.91	89.52	155.81	96.59	799.55
Other unreserved	2.265	20.61	5.48	30.69	3.18	16.95	12.38	89.28
Other reserved	3.366	115.29	29.88	11.06	30.46	53.01	36.34	276.04
Other public:								
Timberland[b]	0.428	15.92	3.39	0.58	3.32	7.18	4.99	35.39
Other unreserved	1.795	12.48	2.73	10.17	1.58	13.02	8.55	48.53
Other reserved	2.485	113.17	24.37	25.43	22.25	37.93	28.58	251.73
Private:								
Timberland[b]	7.542	280.55	59.79	10.18	58.54	126.54	88.01	623.60
Other unreserved	5.660	68.53	17.04	11.55	10.32	57.30	39.98	204.72
Subtotals								
Timberland	17.245	651.20	152.17	24.67	151.39	289.53	189.59	1,458.54
Other unreserved	9.720	101.62	25.25	52.41	15.07	87.27	60.91	342.52
Other reserved	5.851	228.45	54.25	36.49	52.72	90.94	64.92	527.77
Total	32.816	981.28	231.66	113.56	219.17	467.74	315.42	2,328.83
Total CO_2 equivalent[c]		3,601.28	850.21	416.78	804.37	1,716.59	1,157.58	8,546.82

[a] The live tree aboveground biomass is calculated based on the equations developed by Pacific Northwest Research Station Forest Inventory and Analysis Program (PNW-FIA).

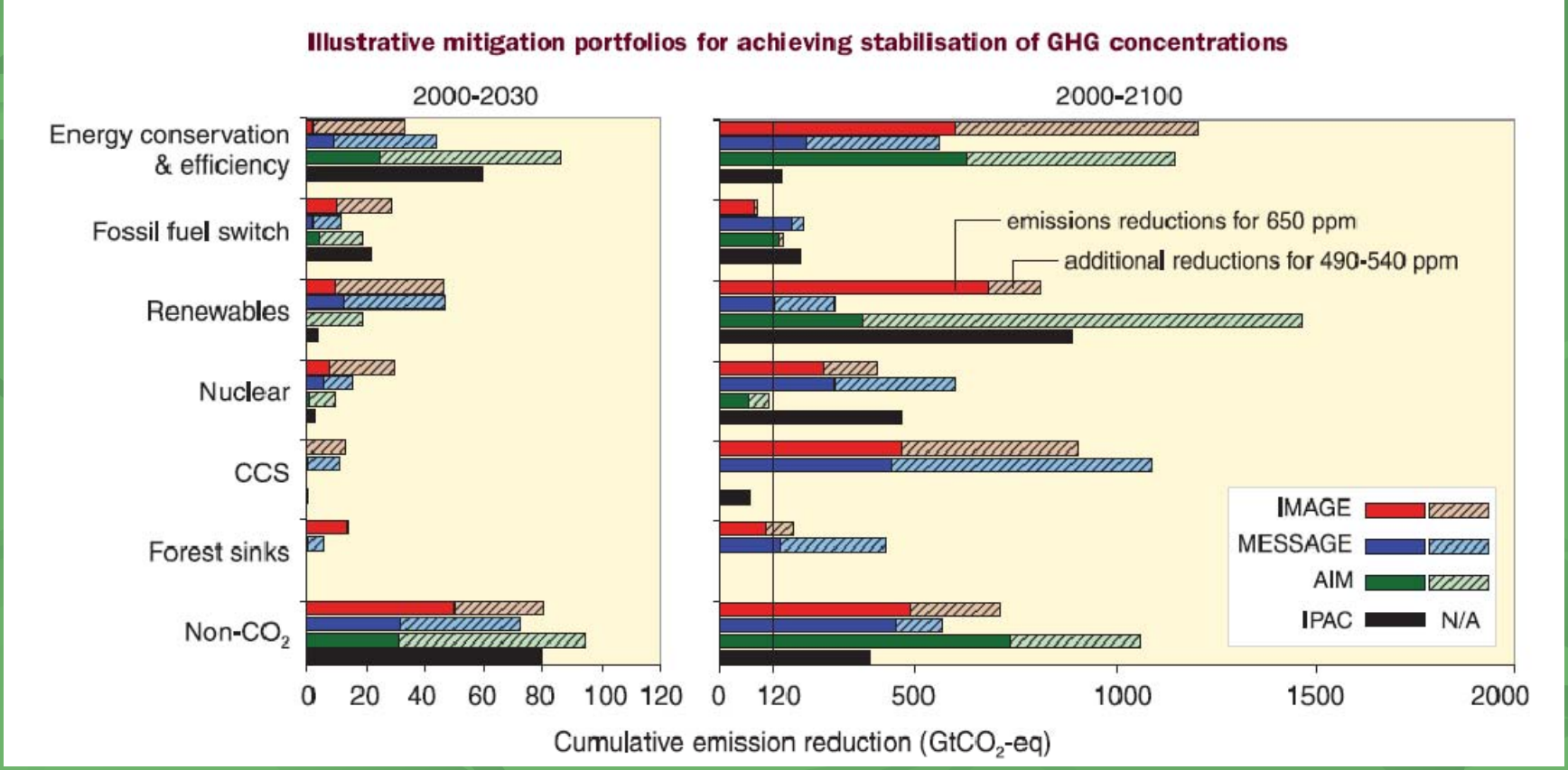
[b] Timberland area and carbon density for other public and private (outside national forest) use 1994 change database data from PNW-FIA.

[c] Total carbon dioxide (CO_2) equivalent is calculated, in terragrams, as 3.67 times Tg carbon.

Source: Fried and Zhou (2008)

Mitigation

"Regional studies have confirmed the plausibility of strong mid-latitude sinks due to forest regrowth."



From IPCC 2007 Fourth Assessment Report, ch. 7 and Synthesis Report, ch. 5.

Adaptation

- Risks
  - Fire
  - Insects and Disease
  - Conversion (“Natural” and Development)
- Planning
  - Selecting for Resilience
  - Sustainable Practices
- Monitoring

Forests & Climate Change: What

- California Climate Action Registry (CCAR)
  - Urban Forestry Protocol
  - Advisory Committee
    - Conservation, Forest Mgmt, Reforestation
- AB32 and Scoping Plan
  - 5 MMt per Year for 2020 Target
  - ARB and Board of Forestry
- CEC Research
  - PIER
  - Westcarb

Knowledge Gaps

- Forest Condition and Flux
  - Biomass Estimation
  - FIA, Remote Sensing, Models
- Urban Forests
  - Heat Islands, Energy Conservation, Storm water…
- Fire Emissions
- Wood Products
  - Storage Lifetime, Landfills, Imports, Substitution

Knowledge Gaps, cont.

- Bioenergy and Biofuels
  - GHG Profiles
- Forest Management Strategies
  - GHG Impacts
- Impacts to Species
  - Particular to California
  - Community Response
- Invasive Species

Forest Sector Priorities

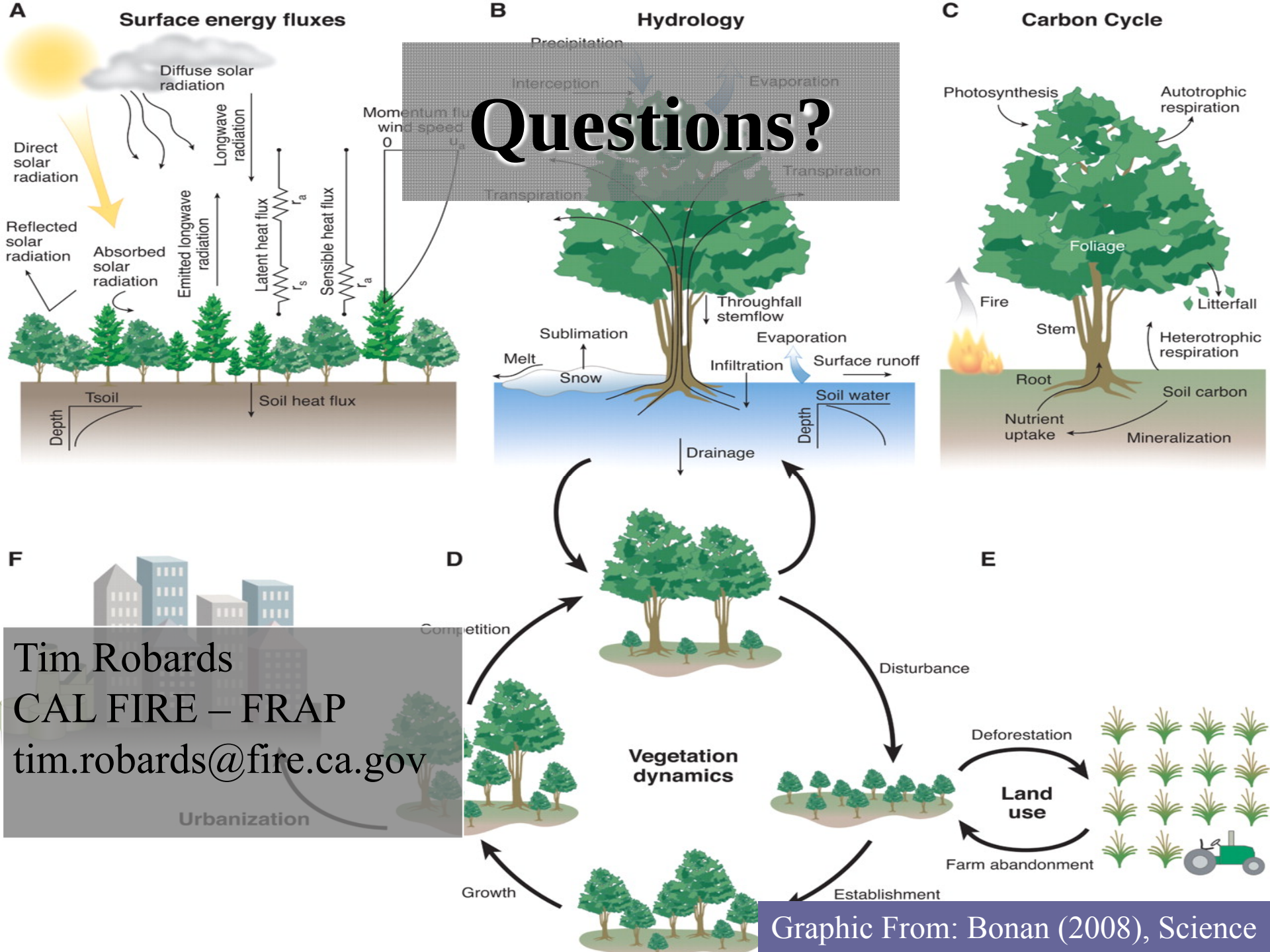
1) Statewide Forest Carbon Inventory and Change Tracking for 2020 Target Progress Monitoring
2) ***Urban Forests Comprehensive Cost and Benefit Analysis***
3) Predictive Tree Biomass Model Evaluation and Improvement
4) Wildfire GHG Emission Analysis: Standardized Estimation Methodologies

Priorities, Continued

5) ***Life-Cycle Characterization of Forest Carbon Pools and Wood Products in California***
6) Forest Landowner Profile Development: Current and Projected Forest Conditions and Landowner Participation in Programs and Markets
7) ***Improved Forest Research and Management Tools: Climate-Smart Forest Projections and Risk Assessments for Pests and Fire***

Priorities, Continued

8) ***Forest Bioenergy and Biofuel GHG Profile Characterization***
9) Comprehensive Monitoring and Adaptive Management Program
10) Tradeoff Analysis of Managed Versus Wild Fire
11) Risk and Prevention Analysis of Catastrophic Tree Mortality in California Forests from Exotic Insects and Disease



Questions?

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Graphic From: Bonan (2008), Science