CalEPA California Environmental Protection Agency

California Natural Resources Agency

cdfa California Department of Food & Agriculture

California Air Resources Board

California Strategic Growth Council

California Natural & Working Lands Climate Change Implementation Plan

NOVEMBER 2, 2018 PUBLIC WORKSHOP

Agenda

1. Context
2. Implementation goals
3. Update on scenarios, models, and outputs
4. 2030/2050 goals
5. Strategies for implementation
6. Final Plan timeline and next steps
7. Discussion/ Q&A

WEBINAR PARTICIPANTS: please email nwl@arb.ca.gov if you have questions during this presentation

1

CONTEXT

CLIMATE CHALLENGE & MANDATE FOR NATURAL AND WORKING LANDS

2017 Scoping Plan directive

maintain	achieve	minimize	reassess
lands as a **resilient long-term** carbon sink	net **zero** or **negative** greenhouse gas emissions	net greenhouse gas and black carbon **emissions,** where applicable	and **revise** the 15-20 MMT CO_2e preliminary 2030 goal for natural and working lands

Climate policy context

broader **climate policy** discussion

next **Scoping Plan** update

carbon neutrality executive order

Urgency of restoration & conservation

Tree mortality

Large and severe fire

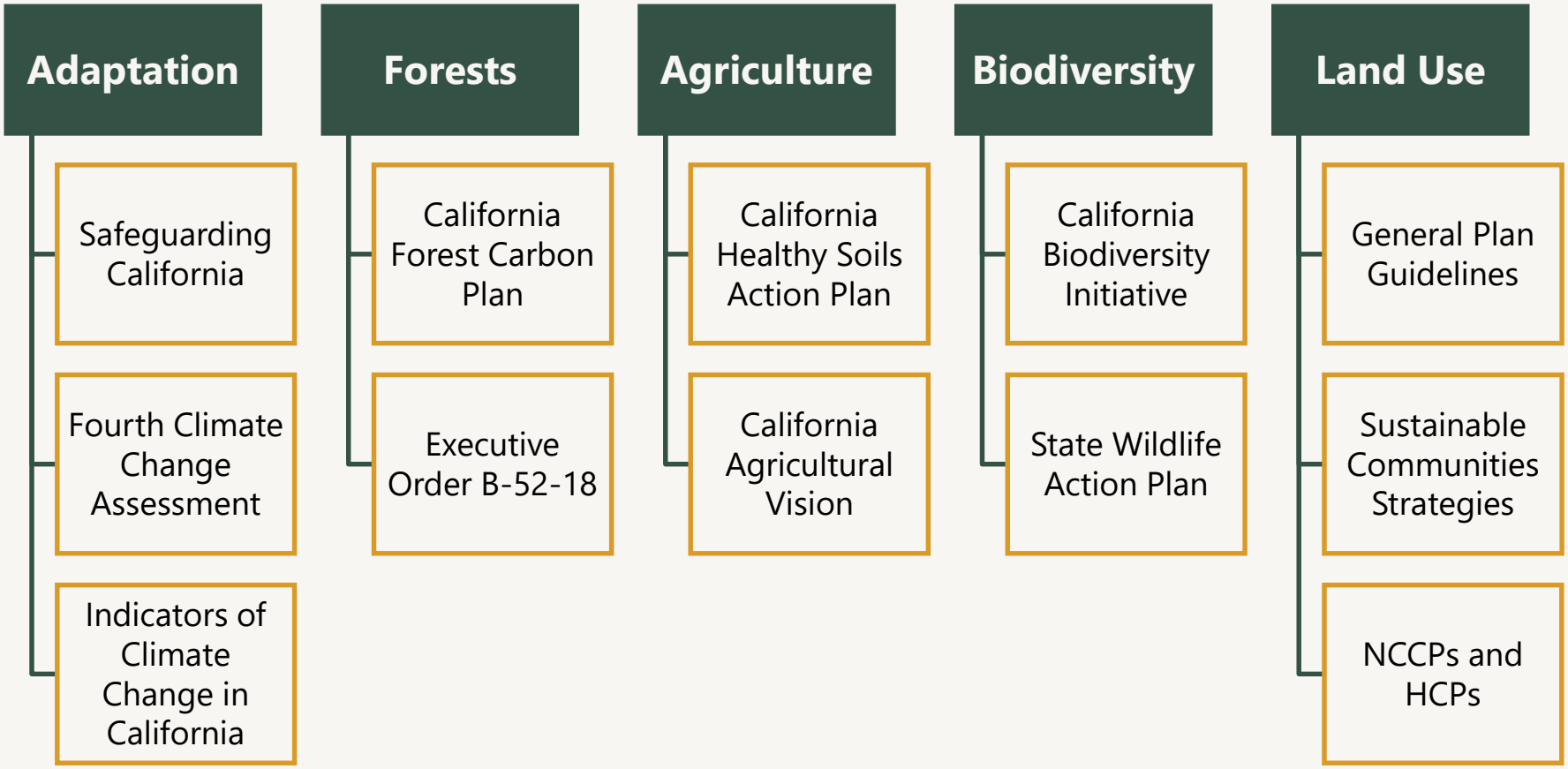
Urgency of restoration & conservation

Wetland degradation

Loss of native species


Urgency of restoration & conservation
40,000
acres/ year of farmland loss in California

Supporting land and resource plans, strategies, and assessments



Aligning climate adaptation & mitigation

PROTECTING:

source watersheds

food security

& creating jobs in our transition to a green economy

critical habitat

health & safety

Implementation to date

$30 billion

State bond funds invested in natural resource programs since 2000

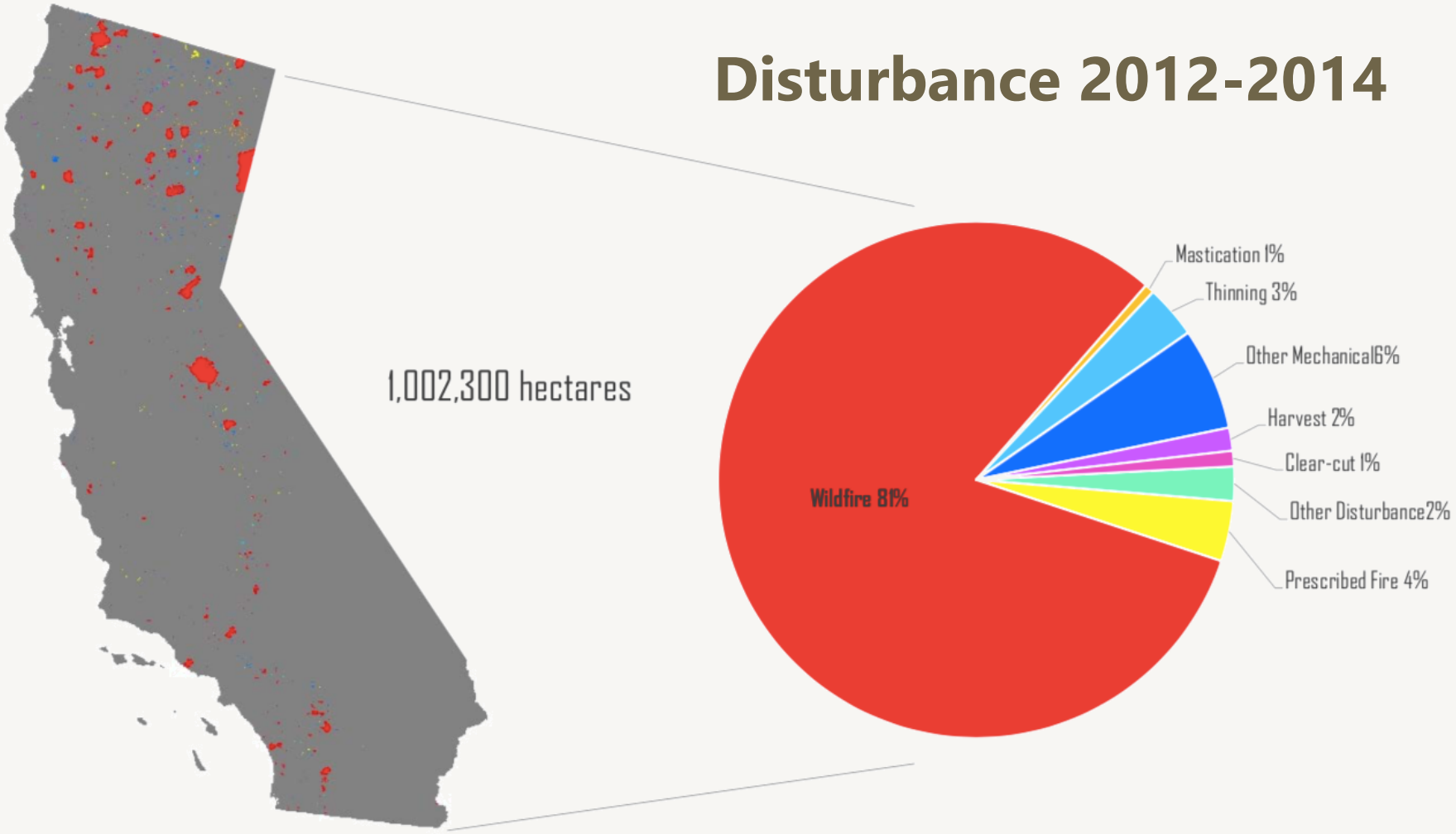
$800 million

California Climate Investments across 258,000 acres of natural and working lands to date

20 million metric tons

CO_2e sequestered by California forest offset projects alone, as of May 2018

Preliminary CARB inventory results



2 IMPLEMENTATION GOALS

To maintain our natural and working lands as a carbon sink,

California strives to double the pace and scale of land restoration activities by 2030 and beyond.

Cultivated & rangeland

5x

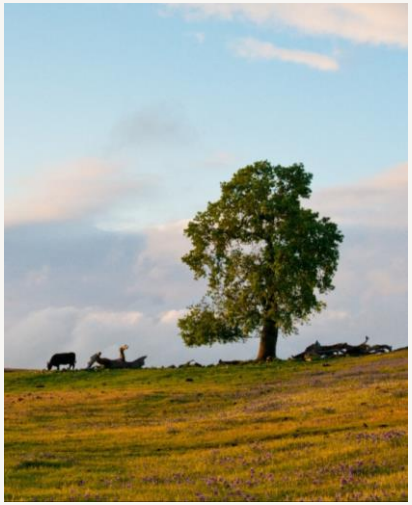
State-funded acres in soil conservation practices

Forested land

2x

Pace and scale of forests managed or restored

Savanna & woodland



3x

Pace of reforestation of oak savannas and riparian areas

Wetlands & seagrass

2x

Rate of wetland and seagrass restoration

Climate co-benefits

less intensive forest management

fuel reduction

wetland restoration

healthy soils

urban forestry

riparian restoration

Expected emission outcomes – forests

Pathway	Short-term Emissions (to 2030)	Long-term Emissions (to 2050/2100)
Less intensive forest management	↓	↓
Forest fuels reduction	↑	↓
Forest understory treatment	↓	↓
Increased biomass utilization	↓	↓
Post-fire reforestation	↓	↓

Expected emission outcomes – forests

Pathway	Short-term Emissions (to 2030)	Long-term Emissions (to 2050/2100)
Less intensive forest management	↓	↓
Forest fuels reduction	↑	↓
Forest understory treatment	↓	↓
Increased biomass utilization	↓	↓
Post-fire reforestation	↓	↓

Expected emission outcomes – other lands

Pathway	Short-term Emissions (to 2030)	Long-term Emissions (to 2050/2100)
Avoided urbanization	↓	↓
Coastal and Delta wetland restoration	↓	↓
Meadow Restoration	↓	↓
Riparian and oak woodland reforestation	↓	↓
Seagrass restoration	↓	↓
Soil conservation	↓	↓
Urban forest canopy expansion	↓	↓

3 UPDATE ON SCENARIOS, MODELS, & OUTPUTS

COMET, CALAND, RAPIDFIRE

Scenarios

ALTERNATIVE A: AMBITIOUS

Represent acceleration of historical levels of restoration and management

ALTERNATIVE B: AMBITIOUS PLUS

Represents large, landscape-scale plans for future ambition

Where possible, shows full potential implementation of restoration and management

Scenarios

Unconstrained by current availability of:

- Markets
- Permitting
- Landowner interest
- Funding
- Equipment
- Labor
- Technical assistance

Acreage target development process

- **10** regional meetings/ webinars
- **350** in-person and remote attendees
- **22** written comments and letters
- **20+** programs, departments, boards, & conservancies engaged
- **20+** resource management plans consulted

CUMULATIVE IMPLEMENTATION BY 2030: CNRA & CDFA

Practice	*Alt. A Acres*	*Alt. B Acres*	*Ecoregions*
Forest thinning, prescribed burn, & understory treatment	1,275,000	★ 2,059,000	All except Deserts and Delta
Less intensive forest management	597,000	705,000	North Coast, Klamath, Central Coast, Sierra, Eastside, South Coast
Oak woodland restoration	37,000	★ 111,000	All except Eastside, Deserts, Delta
Meadow restoration	97,000	97,000	Klamath, Sierra, Eastside
Delta fresh marsh	30,000	33,500	Delta
Tidal marsh	61,000	66,000	Delta and Coastal regions
Soil conservation practices	530,000	★ 1,030,000	All regions
Riparian restoration	109,000	★ 235,000	All regions
Seagrass restoration	6,000	7,500	Coastal regions
Urban forest expansion	20% increase in canopy cover		All urban areas
TOTAL	2,742,000	4,306,000	All regions

COMET-Planner

Scenarios and Results

Outline

1. Practices Selected for Inclusion
2. Comet-Planner Introduction & Demonstration
3. Comet-Planner Specifications
4. Overview of Scenarios for the NWL Implementation Plan
5. Methods
6. Outputs

Practices for Inclusion in the NWL Implementation Plan

Cropland Management	Grazing Land Management	Woody Planting	Herbaceous Planting	Compost Applications
• Cover Crop • Mulching • No Till • Reduced Till	• Prescribed Grazing • Silvopasture	• Hedgerows • Windbreak Establishment • Riparian Forest Buffer	• Riparian Herbaceous Cover	• Compost on Annual Cropland (C:N<11) • Compost on Annual Cropland (C:N>11) • Compost on Perennial Cropland (C:N<11) • Compost on Perennial Cropland (C:N>11) • Compost on non-irrigated rangeland • Compost on irrigated pasture

These practices have been incorporated into CDFA's Healthy Soils Program as practices recognized to sequester carbon, reduce atmospheric GHGs, and improve soil health.

Comet – Planner Background and Demo

- Online tool originally developed by USDA and Colorado State University in 2015 to quantify the GHG benefits of USDA NRCS Conservation Practice Standards.
- Fine-tuned to support the Healthy Soils Program through collaboration with CDFA, CARB, USDA, and Colorado State.
- Revisions have improved quantification methods and spatial resolution.

http://comet-planner-cdfahsp.com

Comet-Planner Specifications

- Output Units: flux in carbon dioxide equivalent are annual average values over a 10-year duration
- Emission reduction coefficients are based on runs of Comet-Farm, a whole farm GHG auditing tool, which utilizes USDA Entity-scale GHG Inventory methods (biogeochemical models, weather, and soil data)
- Included carbon pools are soil and biomass carbon
- GHG emissions included are CO_2, N_2O and CH_4
- Field level emissions only – does not include off-field emissions such as transportation

Scenario Summary

Healthy Soils Program Requirements

In both scenarios most practices are annually implemented for three years, meaning that the farmer or rancher will repeat or maintain the practice for three years. Four practices (hedgerow, riparian forest buffer, windbreak establishment, and silvopasture) are maintained for 10 years, after which time the carbon accrual benefits are maxed out - no additional carbon accrues in years 11 and 12. The benefits that have accrued to that point will remain stored for the full 12 year period (2019-2030). All practices may be continued longer by the farmer, but in these scenarios, only benefits from state investments are counted.

Total practice acreage is phased in evenly over the implementation period.S

Scenario A

500,000 acres

by 2030

Scenario B

1 million acres

by 2030

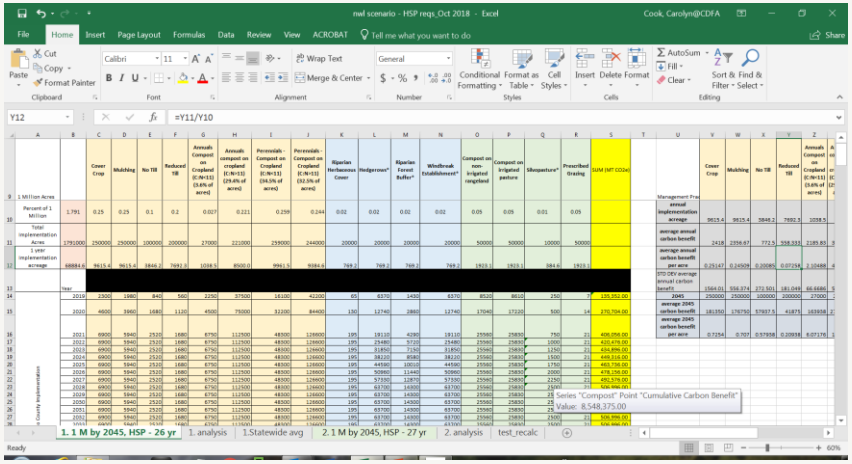
Acreage Targets

Category	Practice	Percent of Target Acreage		A: ½ Million Acres	B: 1 Million Acres
Cropland Management	Cover Cropping	.25		125,000	250,000
	Mulching	.25		125,000	250,000
	No Till	.1		50,000	100,000
	Reduced Till	.2		100,000	200,000
Grazing Land Management	Prescribed Grazing	.05		25,000	50,000
	Silvopasture	.01		5,000	10,000
Woody Cover	Hedgerows	.02		10,000	20,000
	Windbreak Establishment	.02		10,000	20,000
	Riparian Forest Buffer	.02		10,000	20,000
Herbaceous Cover	Riparian Herbaceous Cover	.02		10,000	20,000
Compost Application	Compost on Annual Cropland (C:N<11)	.75	.027	13,500	27,000
	Compost on Annual Cropland (C:N>11)		.221	110,500	221,000
	Compost on Perennial Cropland (C:N<11)		.259	129,500	259,000
	Compost on Perennial Cropland (C:N>11)		.244	122,000	244,000
	Compost on non-irrigated rangeland	.05		25,000	50,000
	Compost on irrigated pasture	.05		25,000	50,000
				895,5000	1,791,000

When identifying practices for inclusion in the NWL Implementation Plan, CDFA consulted with stakeholders and considered Healthy Soils Program practice uptake for the first year of funding. Agricultural management practices can be implemented alone or in combinations.

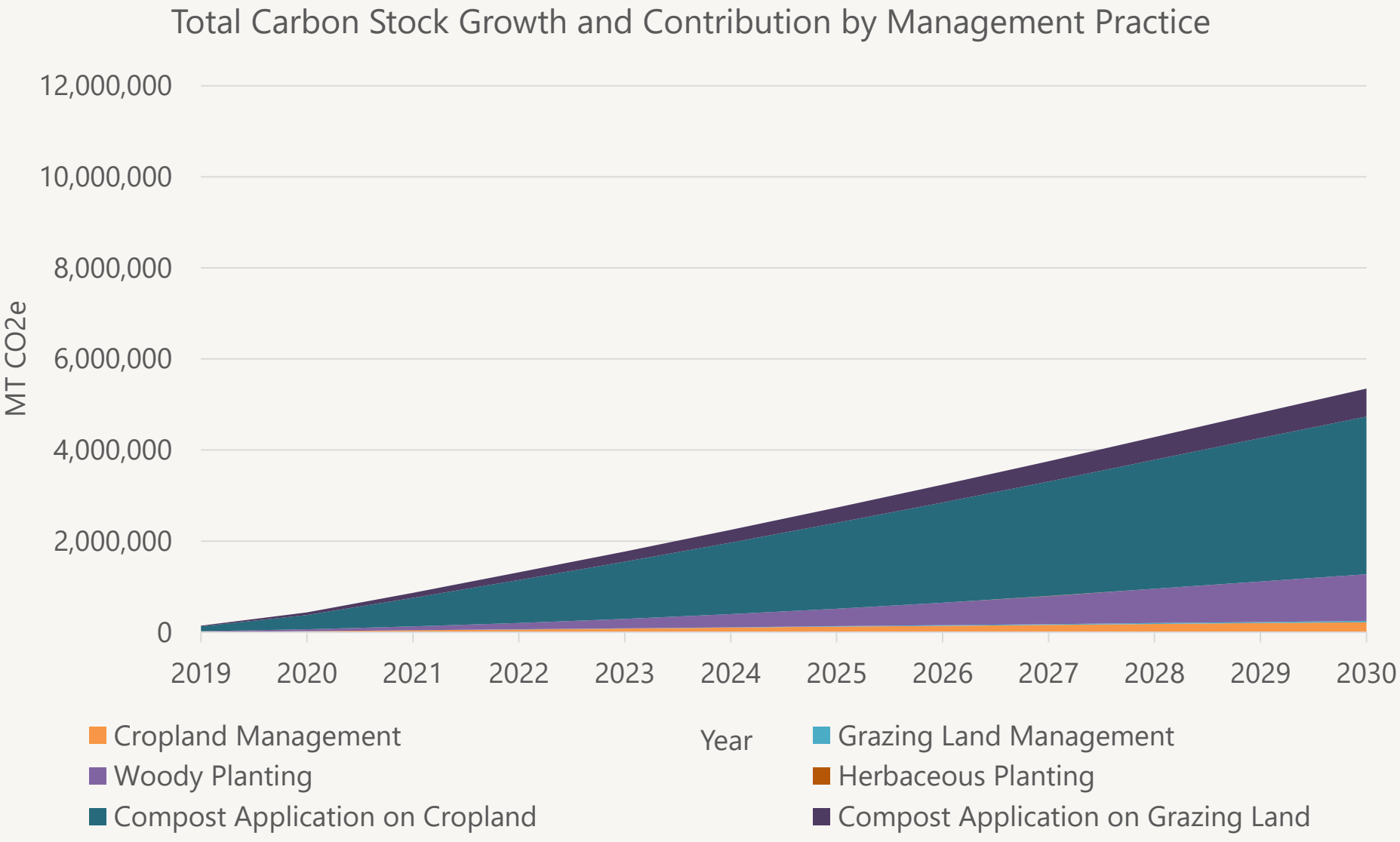
Methods

- Twelve county sample used to determine a statewide average*
- Calculated the average GHG benefit for each practice
- 5% variance in annual total GHG benefit among the counties.

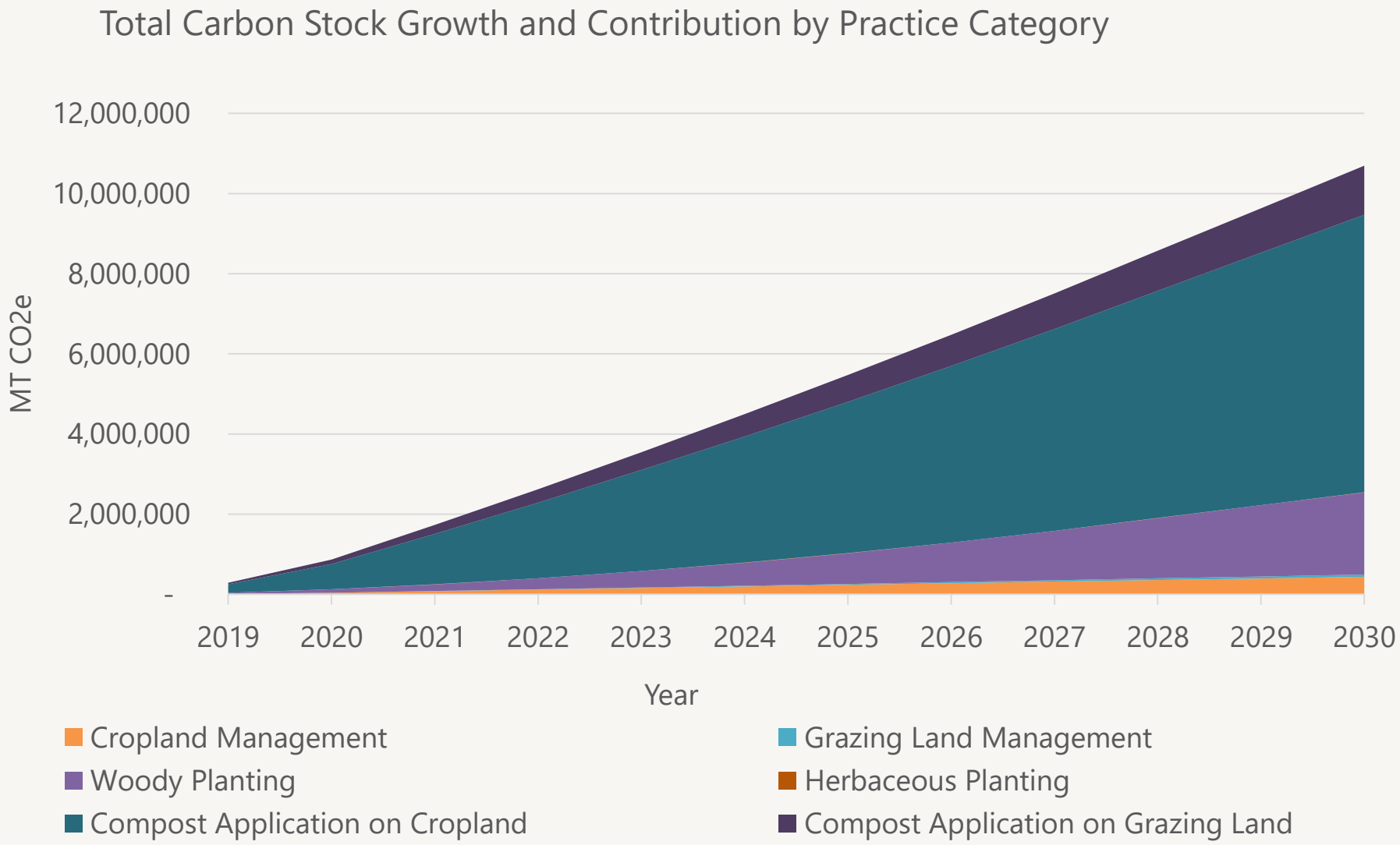


*Unweighted sample of Fresno, Imperial, Sonoma, Ventura, Stanislaus, Yolo, Kern, Butte, Tuolumne, Humboldt, Monterey, Alameda.

Scenario A: 500,000 Acres



Scenario B: 1 Million Acres



Summary of Scenario Outputs

Scenario	Annual Acres	Cumulative GHG Benefit	Estimated Annual Program Costs*
A: 500,000 acres	41,667	5.3 MMT CO2e	$18.2M
B: 1 million acres	83,333	10.7 MMT CO2e	$36.3M
*Based on $436 per acre award			

GHG benefit per acre is the same in both scenarios at 10.7 MT of CO2e over the 12 year period (.89 MT/year/acre).

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California Natural and Working Lands Carbon Model (CALAND)

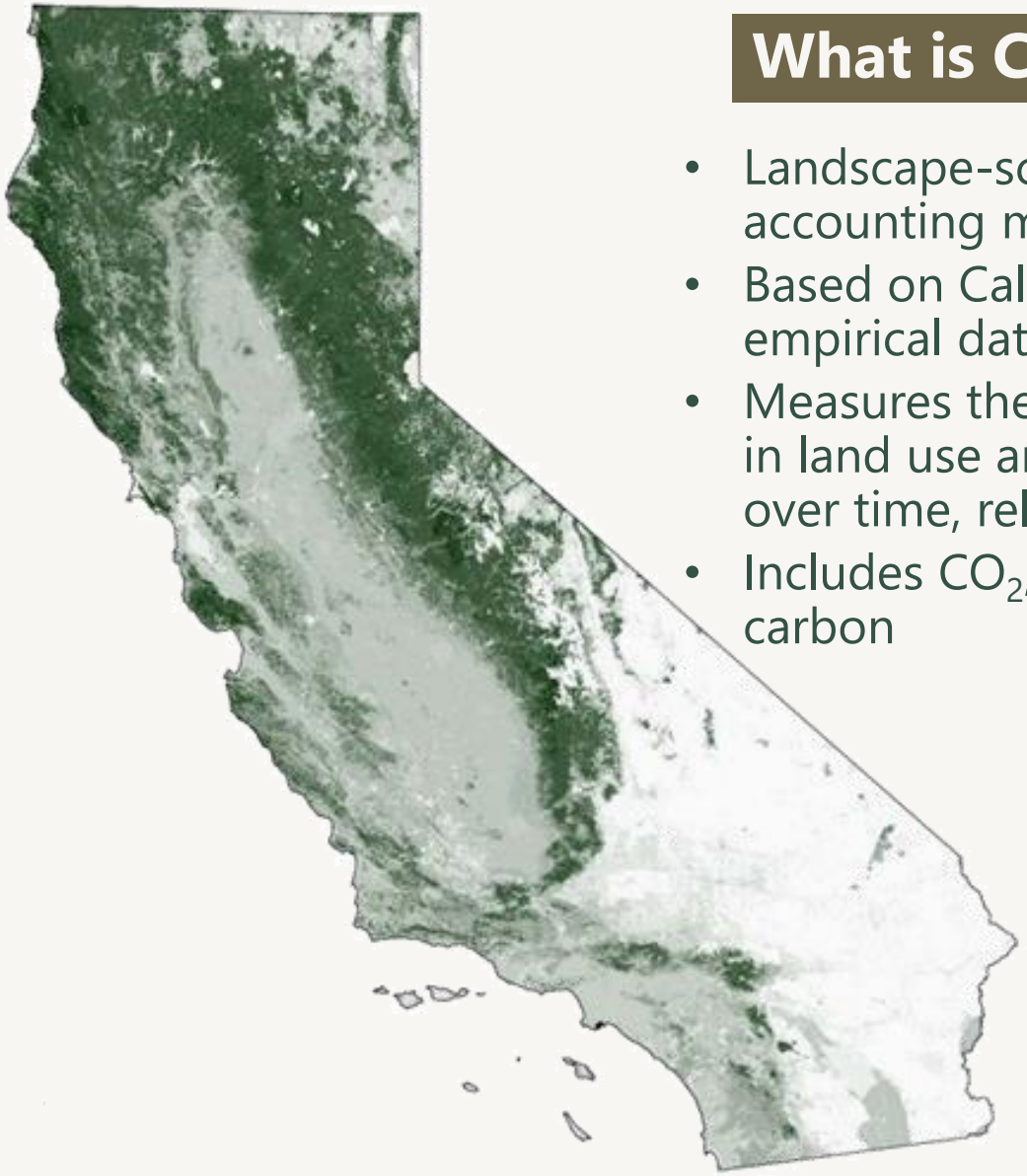
Scenarios and Results

Overview

1. Description of CALAND
   - Model summary
   - Feedback and Version 3 Updates
2. NWL Implementation Scenarios for CALAND
   - Statewide summary
   - Regional highlights
3. Results
   - Interpretation primer
   - Results

Model summary

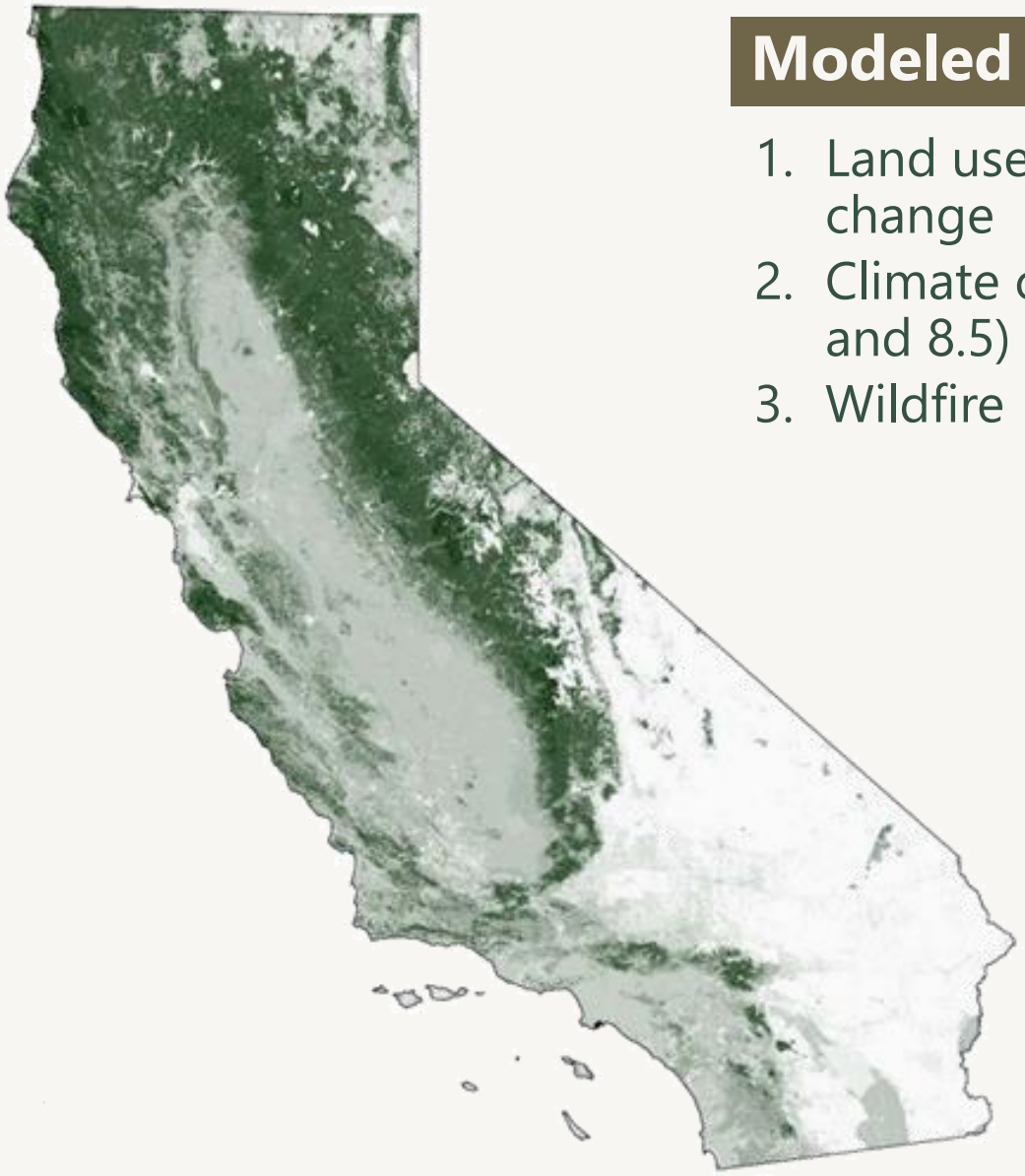
Model summary



What is CALAND?

- Landscape-scale carbon accounting model
- Based on California-specific empirical data
- Measures the effects of change in land use and management, over time, relative to a baseline
- Includes CO_2, CH_4, and black carbon

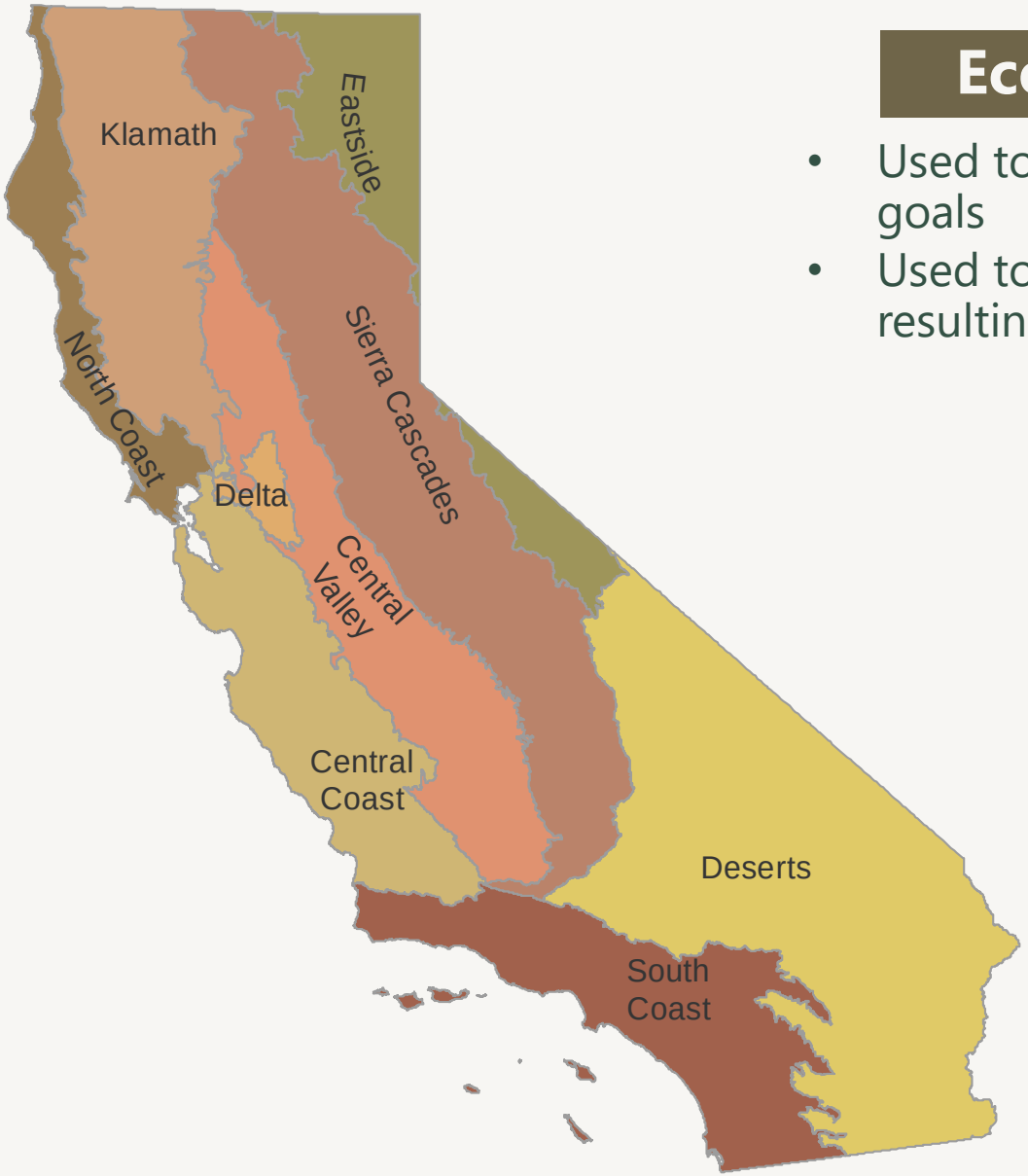
Model summary



Modeled trends:

1. Land use and land cover change
2. Climate change (RCP 4.5 and 8.5)
3. Wildfire

Model summary



Ecoregional scale

- Used to scope implementation goals
- Used to model these goals and resulting land type changes

Feedback and Version 3 updates

Resolved for CALAND Version 3:

- Permanence of restoration and changes in management
- Maintenance of fuel reduction treatments
- Wildfire impact and regeneration
- Biomass utilization
- Agricultural practices and emissions

Feedback and Version 3 updates

Unresolved in Version 3 – selected next steps:

- Carbon dynamics of restoration of additional ecosystems and management regimes: shrubland, chaparral, grasslands, etc.
- Carbon dynamics of wildfire severity risk reduction on non-forest lands and the wildland matrix
- More granular land use modeling
- Incorporating non-state management goals and actions

CALAND Scenarios

A – Ambitious

Acceleration of historical levels of restoration and management

Models 50% decrease in rate of urbanization

B – Ambitious Plus

Large, landscape-scale plans for future ambition

Where possible, full targets from resource management plans

Models 75% decrease in rate of urbanization

CALAND MODEL INPUTS: CUMULATIVE ACRES TO 2030

Practice	*Alt. A Acres*	*Alt. B Acres*	*Ecoregions*
Forest thinning, prescribed burn, & understory treatment	1,275,000	2,059,000	All except Deserts, Delta
Less intensive forest management	597,000	705,000	North Coast, Klamath, Central Coast, Sierra, South Coast
Oak woodland restoration	37,000	73,000	All except Eastside, Deserts, Delta
Meadow restoration	97,000	97,000	Klamath, Sierra, Eastside
Delta fresh marsh	30,000	33,500	Delta
Tidal marsh	61,000	66,000	North, Central, & South Coast; Delta
Soil conservation practices	30,000	30,000	North, Central, & South Coast; Sierra, Central Valley, Deserts
Riparian restoration	109,000	235,000	All regions
Seagrass restoration	6,000	7,500	North, Central, & South Coast
Urban forest expansion	20% increase in canopy cover		All urban areas
TOTAL	2,242,000	3,306,000	Statewide

Regional Highlights

Sierra & Eastside regional highlights

75,000-141,000

acres/ year forest restoration

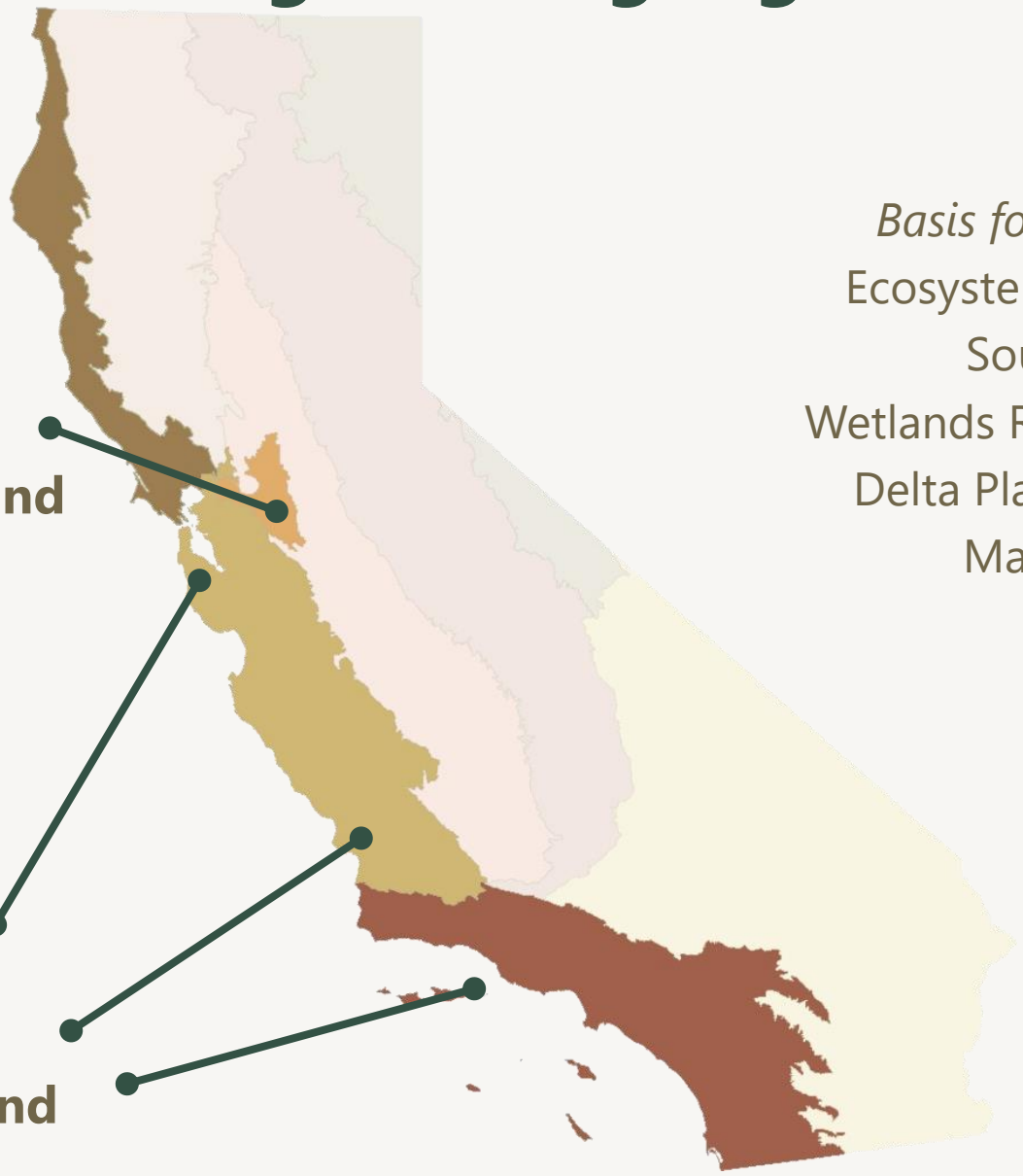
Basis for rates: Sierra Nevada Watershed Improvement Plan; Sierra Meadows Strategy

North Coast & Klamath regional highlights

43,500-50,500

acres/ year changes in forest management

Delta & Coast regional highlights



2,500
acres/year
Delta wetland restoration

5,500
acres/year
coastal wetland restoration

Basis for rates: Baylands Ecosystem Habitat Goals, Southern California Wetlands Recovery Project, Delta Plan, Suisun Marsh Management Plan, & others

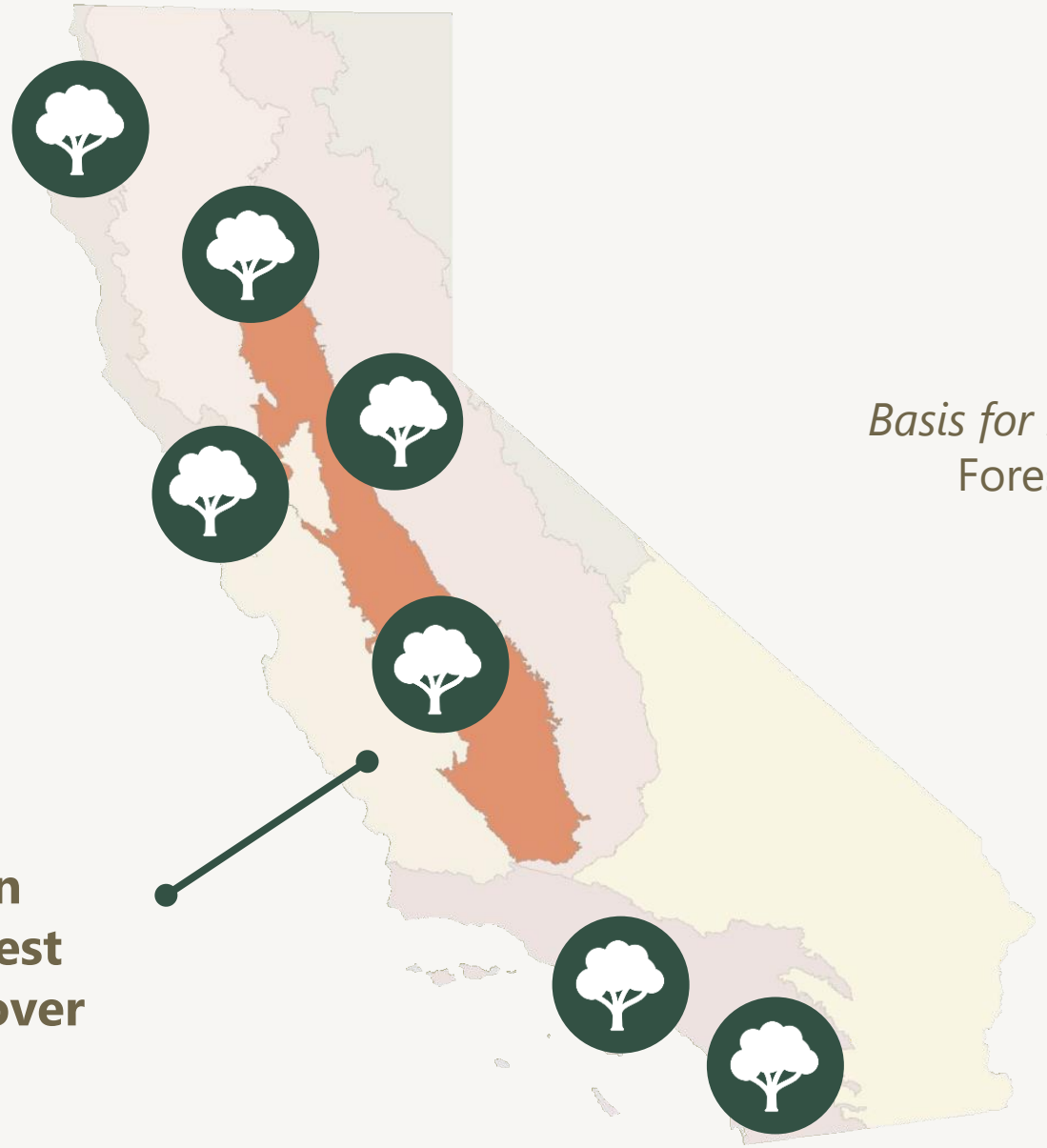
Central Valley regional highlights

800-2,500
acres/year oak woodland restoration

6,000-9,500
acres/year riparian restoration

Basis for rates: Central Valley Joint Venture

All urban areas



Basis for rate: California Forest Carbon Plan

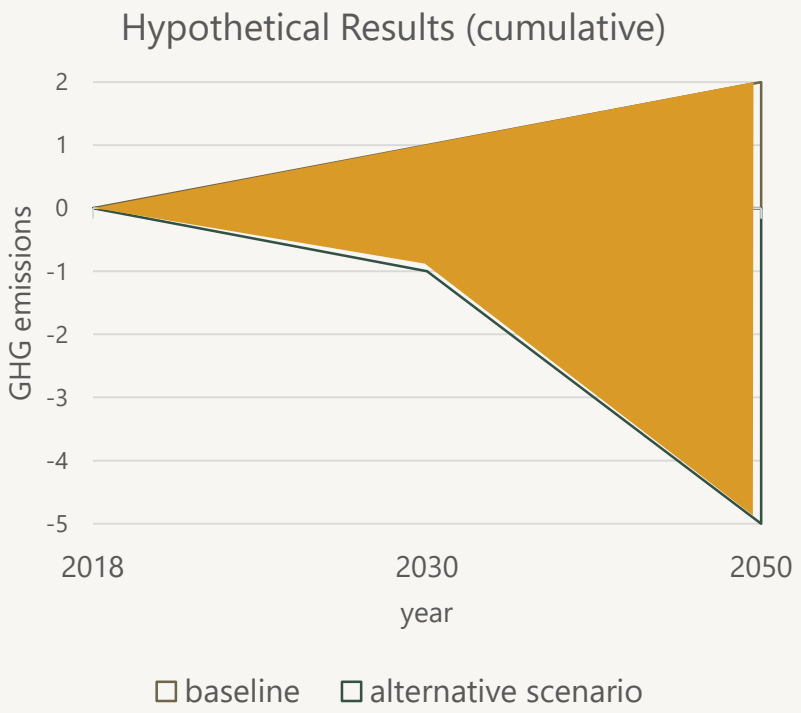
20%

increase in urban forest canopy cover

CALAND Results

Primer: Interpreting results

GHG output = baseline vs. alternative scenario



<u>Cumulative vs. annual average outputs:</u>

2030 outputs can be expressed as **cumulative** change in annual emissions over time, or a longer-term **annual average:**

Cumulative impact by 2030: **-2 MMT CO2e**
Cumulative impact by 2050: **-7 MMT CO2e**

32-Year Annual Average by 2030:

$$\frac{-7\ MMT}{32\ Years} \times 12\ years = -2.6\ MMT\ CO_2e$$

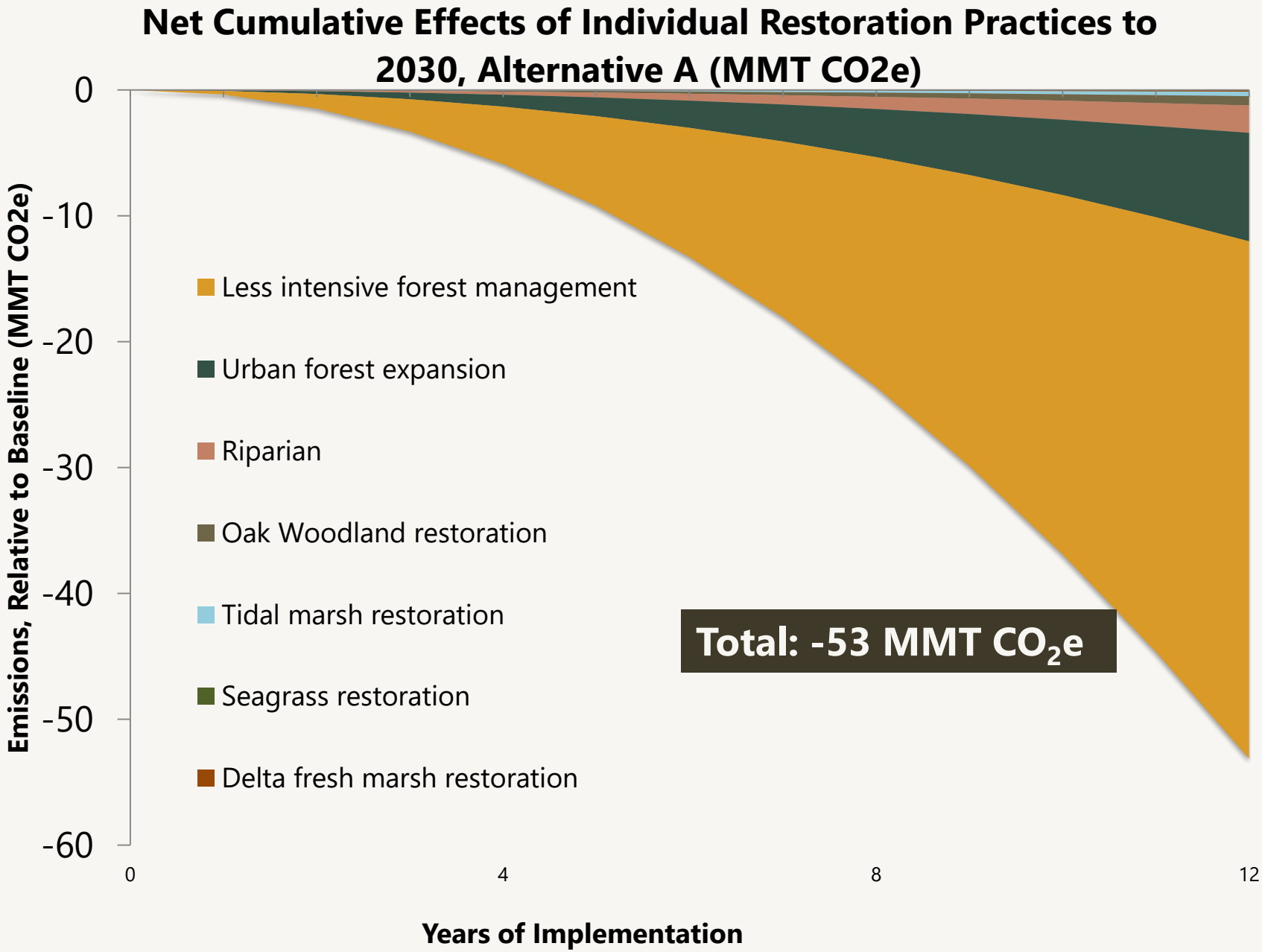
Average annual impact from 2019-2050 × Years from 2018-2030 = Total average impact by 2030

Primer: Interpreting results

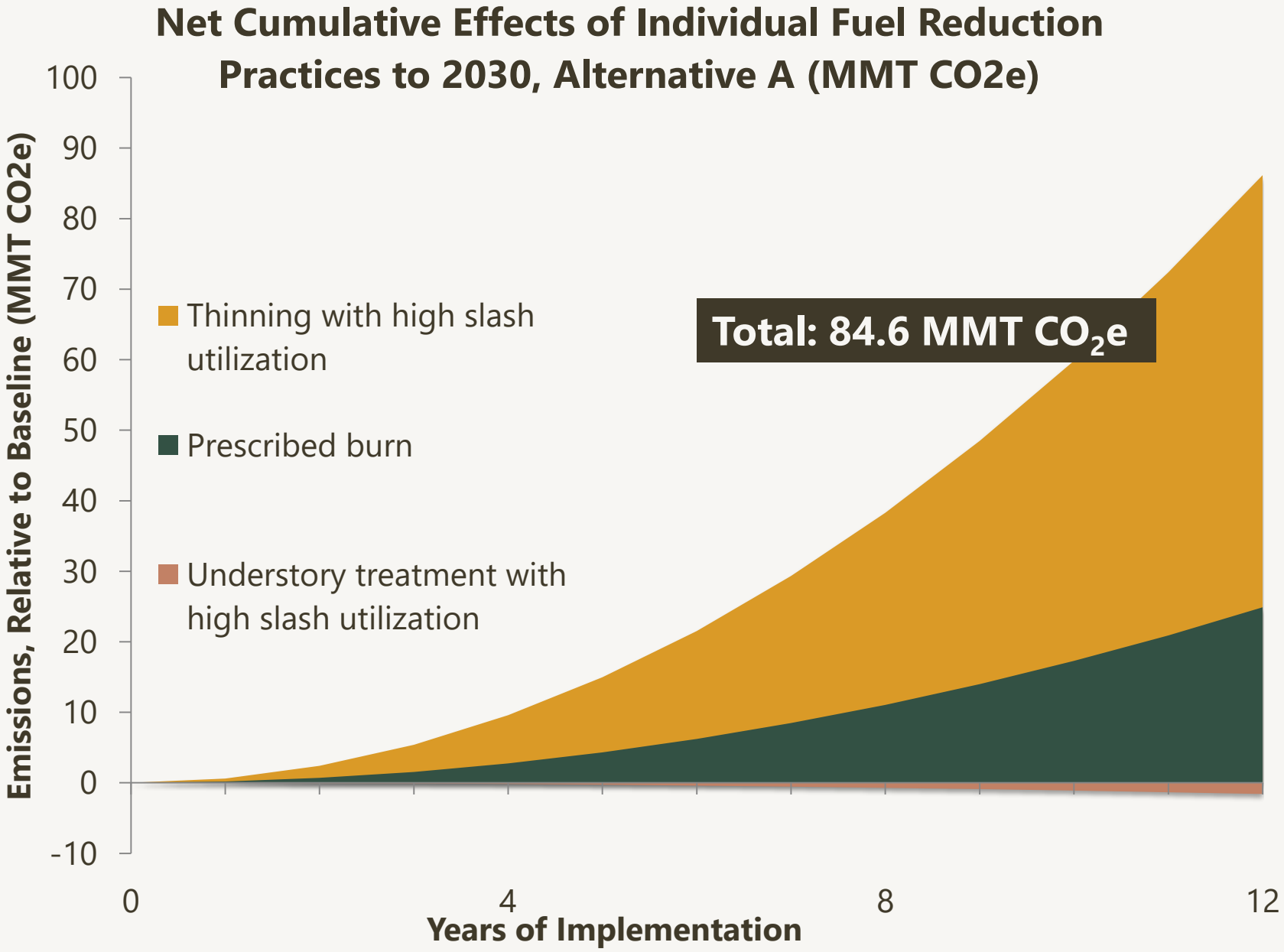
There are different ways to calculate expected outcomes of a given change in land use or management:

- in isolation
- integrated to show interactions between practices and other trends

ISOLATED ACTIVITY RESULTS

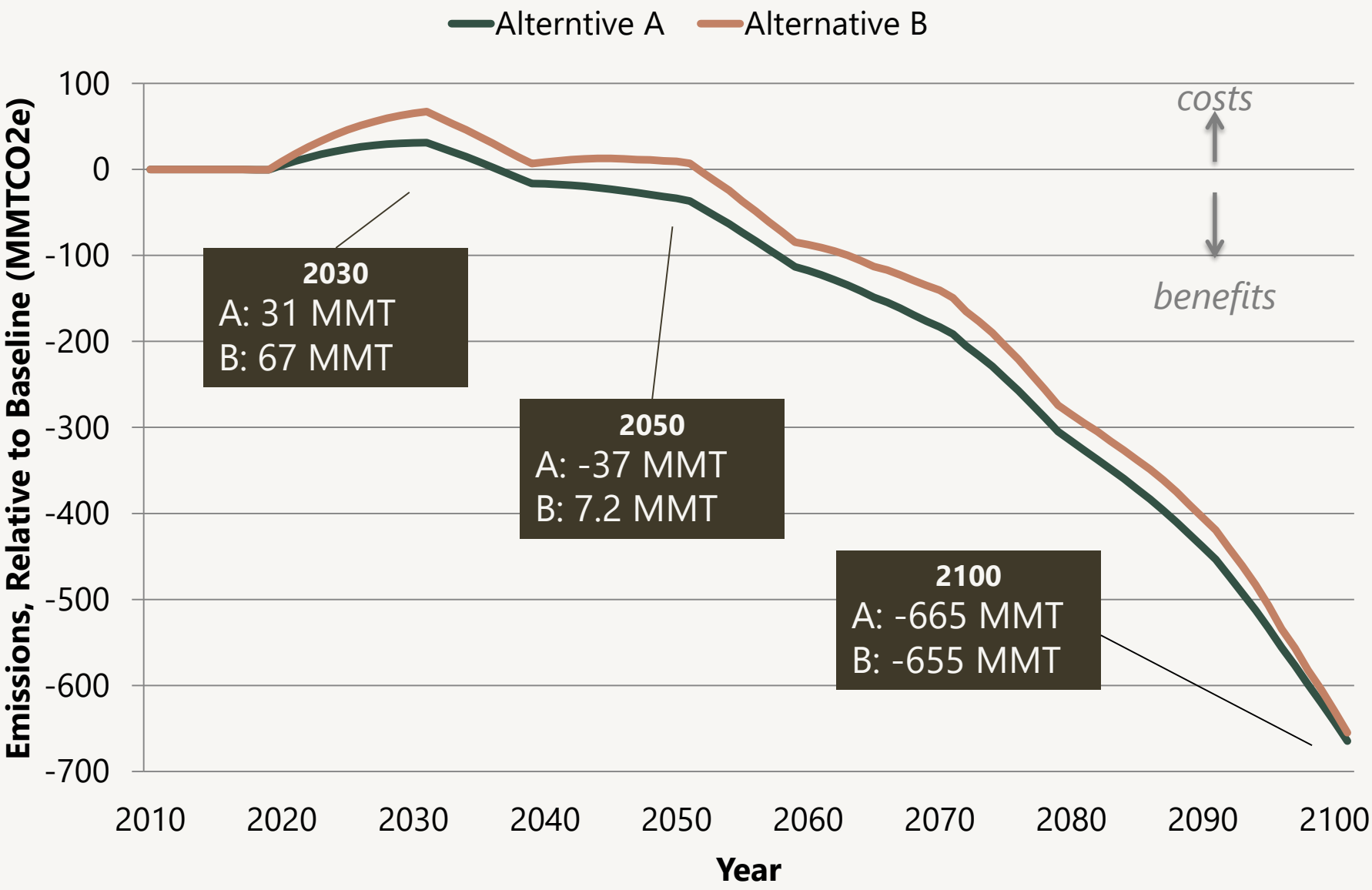


ISOLATED ACTIVITY RESULTS



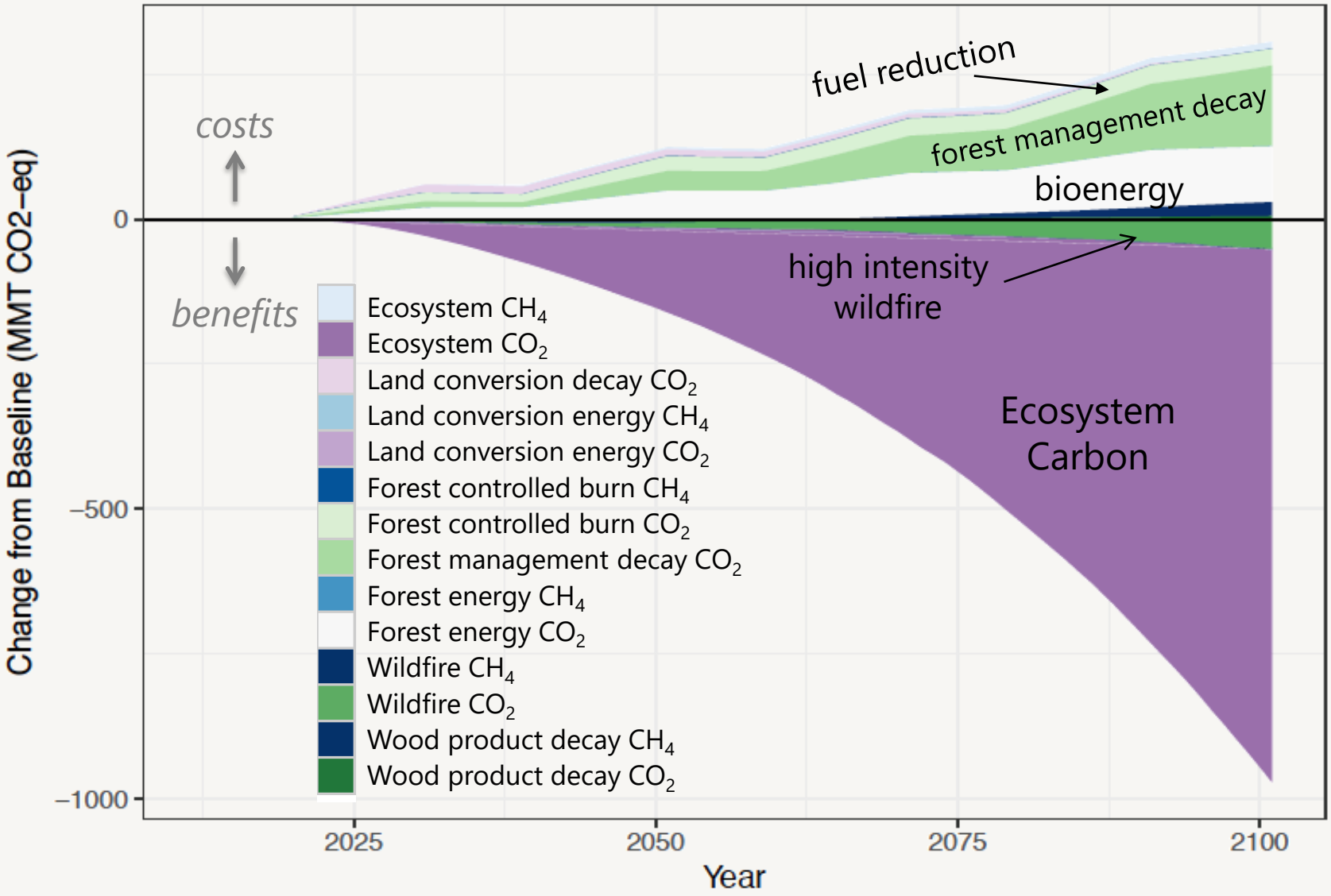
FULL CALAND RESULTS

Net Cumulative Emissions from CALAND, Alternatives A & B



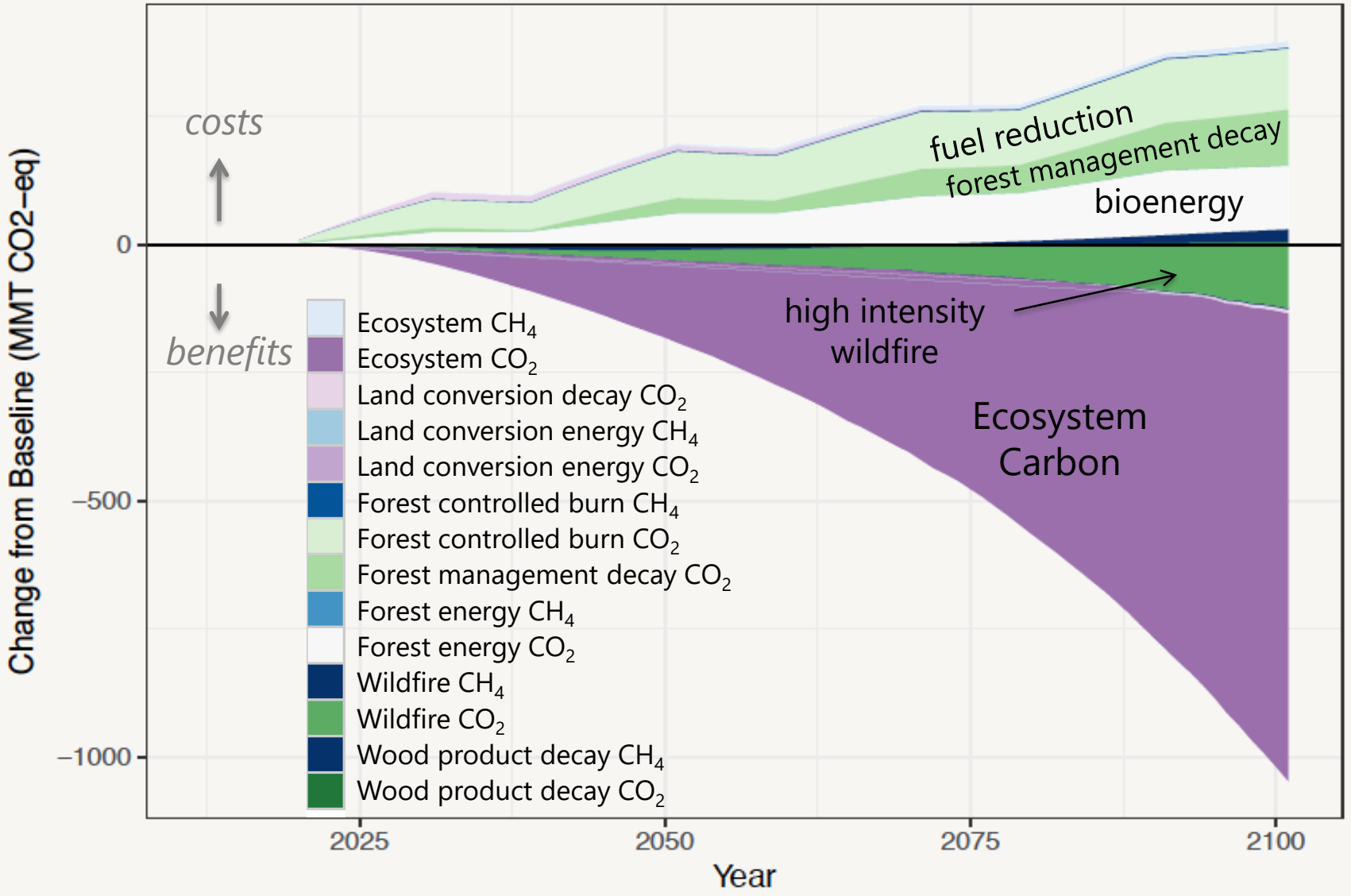
FULL CALAND RESULTS

Components of Net Cumulative Emissions, Alternative A



FULL CALAND RESULTS

Components of Net Cumulative Emissions, Alternative B



FULL CALAND RESULTS

Summary Results (all figures in MMT CO_2e)

Mean impacts

(uncertainty range)

Scenario	Actual cumulative effect ($MMTCO_2e$)			32-year annual average[1] ($MMTCO_2e$)
	2030	2050	2100	2030
Alternative A	**31.4** (18.8 - 45.2)	**-36.6** (-64.3 - -5.4)	**-664.6** (-752.5 - -574.0)	**-13.7** **(-24.1 - -2.0)**
Alternative B	**67.5** (47.7 - 89.0)	**7.2** (-35.3 - 54.5)	**-655.0** (-779.7 - -526.7)	**2.7** **(-13.2 – 20.4)**

[1] Calculated based on annualized cumulative impact in 2050, which includes both the long-term impacts of treated forest area from 2019-2030 and impacts of additional treated acreage after 2030.

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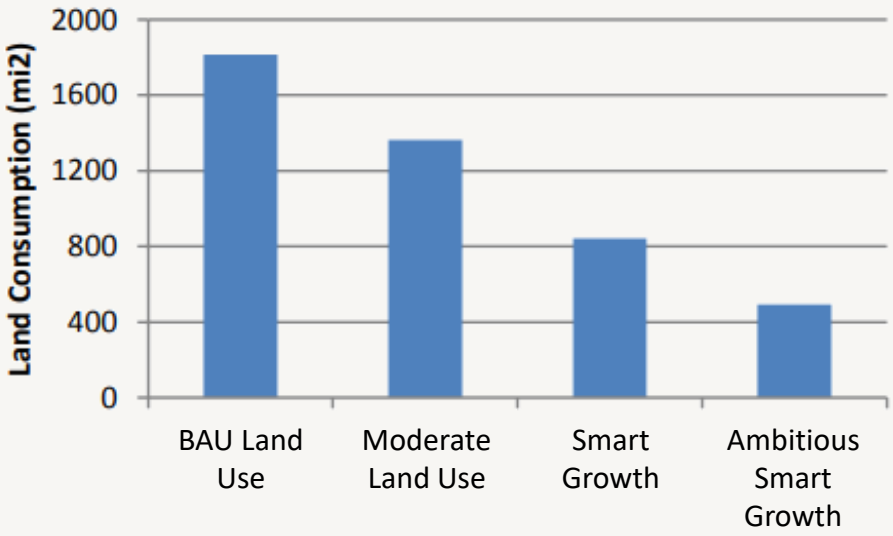
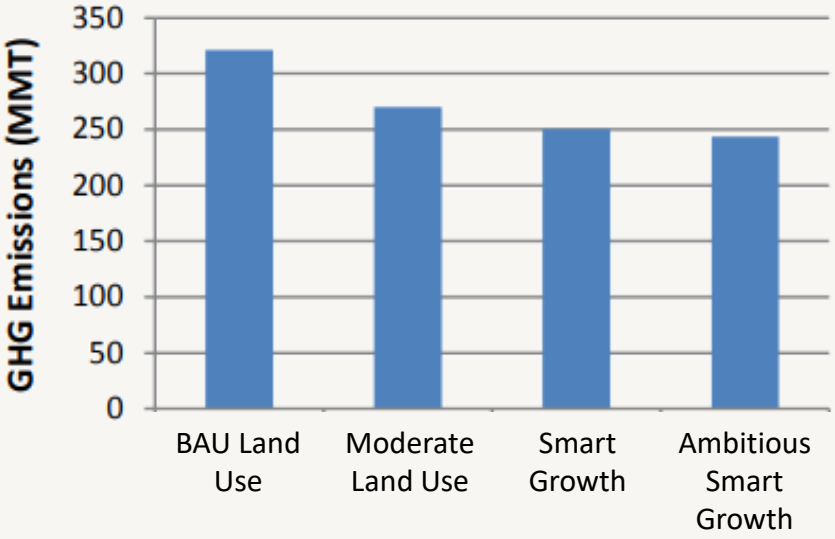
RapidFire

Scenarios and Results

Measuring additional GHG benefits of land conservation

Land consumption and GHG emissions from different land use scenarios





Land consumption and GHG emissions are from building energy and transportation.

Annual GHG benefits from alternative land use scenarios in 2050

-23
MMT CO_2e

Moderate land use scenario

-32
MMT CO_2e

Smart growth land use scenario

-35
MMT CO_2e

Ambitious smart growth land use scenario

Avoided GHGs in 2050 over business-as-usual land use scenario from building energy and transportation

Annual GHG benefits from alternative land use scenarios in 2050

Land use scenario that would approximately achieve 75% reduction in land conversion for development by 2030

Compared to -0.3 MMT CO_2e cumulative net sequestration benefits from 2019-2050 shown in CALAND from 75% reduction in conversion

-35

MMT CO_2e

Ambitious smart growth land use scenario

4 2030/2050 GOALS

Combining model outputs

Combined 2030 outputs

Using **CALAND cumulative** outputs and **COMET's annual** average output:

Alternative A CALAND + **Alternative A COMET** = **21.6 MMT CO_2e (net source)**

Alternative B CALAND + **Alternative B COMET** = **56.8 MMT CO_2e (net source)**

Combined 2030 outputs

Using **CALAND's annual average** outputs, and **COMET's annual** average outputs:

Alternative A CALAND + **Alternative A COMET** = **-19 MMT CO_2e (net sink)**

Alternative B CALAND + **Alternative B COMET** = **-8 MMT CO_2e (net sink)**

Combined 2050 outputs

Using **CALAND cumulative** outputs and **COMET's annual** average output:

Alternative A CALAND + **Alternative A COMET** = **-41.9 MMT CO_2e (net sink)**

Alternative B CALAND + **Alternative B COMET** = **-3.5 MMT CO_2e (net sink)**

*assumes COMET results are constant through 2050

Long-term objective

2017 Scoping Plan directive:

Maintain lands as a **resilient long-term** carbon sink

5 STRATEGIES FOR IMPLEMENTATION

Implementation needs

Eco-regional refinement, goal setting, and research

Rural economic development and workforce

Innovations in technology

Economic incentives

Technical assistance

Monitoring and reporting

Tracking funding & implementation

- Continue to track bond funds at CNRA and CCI projects at CARB
- Report annually on projected outcomes of implemented funds

Tracking actual GHG benefits

- Monitor outcomes of sample projects funded by bonds at CNRA
- Measure actual carbon dynamics through CARB inventory and other assessments via satellite imagery and other tools

6 FINAL PLAN TIMELINE & NEXT STEPS

Draft timeline

November

CARB meeting November 15/16th

Finalize Implementation Plan

Public comment period opens November 2

December

Public comment period closes December 10

Integrate public comments

Release final plan

THANK YOU

7 QUESTIONS & DISCUSSION

ADDITIONAL COMET INFORMATION

COMET PRACTICE DESCRIPTIONS

Cropland Management

Practice Name & USDA Conservation Practice Standard (CPS)	Description of Practice and Implementation Requirements
Cover Crop (CPS 340)	*Grasses, legumes, and forbs planted for seasonal vegetative cover.* HSP Implementation: 3 implementation options include basic, multiple species and pollinator enhancement. Species planting and termination guidelines are included.
Mulching (CPS 484)	*Applying plant residues or other suitable materials to the land surface.* HSP Implementation: 1-3 inches thickness of straw or other natural materials that last for 3 months or longer or 2-3 inches thickness of wood chips that are hardy enough to last for several years.

Cropland Management

Practice Name & USDA Conservation Practice Standard (CPS)	Description of Practice and Implementation Requirements
No Till (CPS 329)	*Limiting soil disturbance to manage the amount, orientation and distribution of crop and plant residue on the soil surface year around.* HSP Implementation: (1) No tillage; (2) Planting method is no-till drilling or hand planting.
Reduced Till (CPS 345)	*Managing the amount, orientation, and distribution of crop and other plant residue on the soil surface year-round while limiting soil-disturbing activities used to grow and harvest crops in systems where the field surface is tilled prior to planting.* HSP Implementation: (1) Mulch tillage, vertical tillage, chiseling or disking to limit soil disturbance, or (2) Tillage/planting systems with few tillage operations.

Grazing Land Management

Practice Name & USDA Conservation Practice Standard (CPS)	Description of Practice and Implementation Requirements
Prescribed Grazing (CPS 528)	*Managing the harvest of vegetation with grazing and/or browsing animals.* HSP Implementation: Design and implement a grazing system to enhance pasture condition or rangeland health and ecosystem function and optimize efficiency and economic return through monitoring & record keeping. Required: (1) Records of grazing dates and stubble height after grazing; (2) short term monitoring- photos and forage production; (3) sensitive area protection.
Silvopasture (CPS 381)	*An application establishing a combination of trees or shrubs and compatible forages on the same acreage.* HSP Implementation: ≥20 plants/acre is required.

Woody Planting

Practice Name & USDA Conservation Practice Standard (CPS)	Description of Practice and Implementation Requirements
Hedgerow Planting (CPS 422)	*Establishment of dense vegetation in a linear design to achieve a natural resource conservation purpose.* HSP Implementation: Single row planting must include cool and warm season perennial, pollinator friendly, mature width and height are specified; ≥200 live tree/shrubs plants/acre.
Riparian Forest Buffer (CPS 391)	*An area predominantly trees and/or shrubs located adjacent to and up-gradient from watercourses or water bodies.* HSP Implementation: 7 implementation options for plantings; ≥35 live tree/shrubs plants per acre.
Windbreak Shelterbelt Establishment (CPS 380)	*Windbreaks or shelterbelts are single or multiple rows of trees or shrubs in linear configurations.* HSP Implementation: Two implementation options, minimum width specified of mature shrubs or trees; ≥200 plants/acre

Herbaceous Planting

Practice Name & USDA Conservation Practice Standard (CPS)	Description of Practice and Implementation Requirements
Riparian Herbaceous Cover (CPS 390)	*Grasses, sedges, rushes, ferns, legumes, and forbs tolerant of intermittent flooding or saturated soils, established or managed as the dominant vegetation in the transitional zone between upland and aquatic habitats.* HSP Implementation: 4 implementation options all include removal of are from crop production, various numbers of species of native plants must be included.

Compost Application

Practice Name	Description of Practice and Implementation Requirements
Compost on Annual Cropland (C:N<11)	Application rate must be between 2.2-3.6 Dry tons/Acres
Compost on Annual Cropland (C:N>11)	Application rate must be between 4.0-5.3 Dry tons/Acres
Compost on Perennial Cropland (C:N<11)	Application rate must be between 1.5-2.9 Dry tons/Acres
Compost on Perennial Cropland (C:N>11)	Application rate must be between 4.0-5.3 Dry tons/Acres
Compost on non-irrigated rangeland	Application rate must be between 4.0-5.3 Dry tons/Acres
Compost on irrigated pasture	Application rate must be between 4.0-5.3 Dry tons/Acres

Compost Application Practices may not be implemented on APNs where soil organic matter content is greater than 20 percent by dry weight in top 20 cm (or 8 inch) depth. Application rates were developed in coordination with an expert science panel and the Air Resources Board.

ADDITIONAL CALAND INFORMATION

RATES OF IMPLEMENTATION BY ECOREGION AND PRACTICE

CALAND MODEL INPUTS: CUMULATIVE ACRES TO 2030 BY ECOREGION: North Coast, Klamath, Sierra, Eastside, Central Coast

	North Coast		Klamath/Interior		Sierra/Cascade		Eastside		Central Coast	
Practice	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*
Thinning	60,500	60,500	173,000	173,000	347,000	561,000	76,500	31,500	11,500	11,500
Forest understory treatment	38,500	38,500	28,500	28,500	180,500	201,000	8,000	9,000	4,000	4,000
Prescribed burn	82,500	82,500	24,500	24,500	113,000	702,000	35,000	39,500	12,500	12,500
Improved forest management	435,000	497,500	84,500	108,000	38,500	52,000	8,500	11,500	17,500	22,500
Oak woodland restoration	10,500	15,750	500	1,000	1,000	1,500	500	1,000	7,500	11,250
Meadow restoration	-	-	4,000	4,000	82,000	82,000	8,000	8,000	-	-
Delta fresh marsh restoration	-	-	-	-	-	-	-	-	-	-
Coastal marsh	24,000	24,000	-	-	-	-	-	-	19,500	19,500
Soil conservation practices	2,500	2,500	-	-	500	500	500	500	2,500	2,500
Rangeland compost	2,000	2,000	-	-	-	-	-	-	-	-
Riparian Restoration	2,500	4,500	4,000	23,000	3,500	31,000	3,000	7,000	5,000	21,000
Seagrass restoration	2,000	2,500	-	-	-	-	-	-	2,000	2,500
TOTAL	660,000	730,250	319,000	362,000	766,000	1,631,000	140,000	108,000	82,000	107,250

CALAND MODEL INPUTS: CUMULATIVE ACRES TO 2030 BY ECOREGION: Central Valley, South Coast, Deserts, Delta

Practice	Central Valley		South Coast		Deserts		Delta	
	Alt. A	*Alt. B*	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*	*Alt. A*	*Alt. B*
Thinning	500	500	39,000	39,000	-	-	-	-
Forest understory treatment	1,000	1,000	21,000	21,000	-	-	-	-
Prescribed burn	500	500	17,500	17,500	-	-	-	-
Improved forest management	-	-	13,000	13,500	-	-	-	-
Oak woodland restoration	10,000	32,000	7,000	10,500	-	-	-	-
Meadow restoration	500	500	2,500	2,500	-	-	-	-
Delta fresh marsh restoration	-	-	-	-	-	-	30,000	33,500
Coastal marsh	-	-	8,500	8,500	-	-	9,000	14,000
Soil conservation practices	500	500	6,000	6,000	16,500	16,500	-	-
Rangeland compost	-	-	500	500	-	-	-	-
Riparian Restoration	70,000	113,000	7,000	15,500	4,000	4,500	10,000	15,000
Seagrass restoration	-	-	2,000	2,500	-	-	-	-
TOTAL	83,000	148,000	124,000	137,000	20,500	21,000	49,000	62,500

CALAND MODEL INPUTS: ANNUAL RATE OF IMPLEMENTATION

Practice	*Acres/ year* Alt. A	Alt. B	*Ecoregions*
Forest thinning, prescribed burn, & understory treatment	106,500	171,500	All except Deserts, Delta
Improved forest management	50,000	59,000	North Coast, Klamath, Central Coast, Sierra, South Coast
Oak woodland restoration	3,000	6,000	All except Eastside, Deserts, Delta
Meadow restoration	8,000	8,000	Klamath, Sierra, Eastside
Delta fresh marsh	2,500	3,000	Delta
Coastal marsh	5,000	5,500	North, Central, & South Coast; Delta
Soil conservation & rangeland compost	2,500	2,500	North, Central, & South Coast; Sierra, Central Valley, Deserts
Riparian restoration	9,000	19,500	All regions
Seagrass restoration	500	700	North, Central, & South Coast
TOTAL	187,000	275,700	Statewide

CALAND MODEL INPUTS: ANNUAL RATE OF IMPLEMENTATION

	North Coast		Klamath		Sierra		Eastside		Central Coast		Central Valley		South Coast		Deserts		Delta		TOTAL	
Practice	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B	Alt. A	Alt. B
Thinning	5,040	5,040	14,420	14,420	28,920	46,750	6,380	2,630	960	960	40	40	3,250	3,250	-	-	-	-	59,010	73,090
Forest understory treatment	3,210	3,210	2,380	2,380	15,040	16,750	670	750	330	330	80	80	1,750	1,750	-	-	-	-	23,460	25,250
Prescribed burn	6,880	6,880	2,040	2,040	9,420	58,500	2,920	3,290	1,040	1,040	40	40	1,460	1,460	-	-	-	-	23,800	73,250
Improved forest management	36,250	41,460	7,040	9,000	3,210	4,330	710	960	1,460	1,880	-	-	1,080	1,130	-	-	-	-	49,750	58,760
Oak woodland restoration	880	1,310	40	80	80	130	40	80	630	940	830	2,670	580	880	-	-	-	-	3,080	6,090
Meadow restoration	-	-	330	330	6,830	6,830	670	670	-	-	40	40	210	210	-	-	-	-	8,080	8,080
Delta fresh marsh restoration	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2,500	2,790	2,500	2,790
Coastal marsh	2,000	2,000	-	-	-	-	-	-	1,630	1,630	-	-	710	710	-	-	750	1,170	5,090	5,510
Soil conservation practices	210	210	-	-	40	40	40	40	210	210	40	40	500	500	1,380	1,380	-	-	2,420	2,420
Rangeland compost	170	170	-	-	-	-	-	-	-	-	-	-	40	40	-	-	-	-	210	210
Riparian Restoration	210	380	330	1,920	290	2,580	250	580	420	1,750	5,830	9,420	580	1,290	330	380	830	1,250	9,070	19,550
Seagrass restoration	170	210	-	-	-	-	-	-	170	210	-	-	170	210	-	-	-	-	510	630
TOTAL	55,020	60,870	26,580	30,170	63,830	135,910	11,680	9,000	6,850	8,950	6,900	12,330	10,330	11,430	1,710	1,760	4,080	5,210	186,980	275,630

CALAND Results