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Avoided Wildfire Emissions Forecast Methodology Version 1.0

Workgroup Meeting 1

February 24, 2022

Purpose

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- To familiarize workgroup members with methodology development process
- To present an overview of key aspects of the draft methodology to workgroup members for their consideration
- To introduce critical areas where workgroup member feedback is desired

Housekeeping

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- Workgroup members have the opportunity to actively participate during the meeting
  - Please keep yourselves muted unless / until you would like to speak
- All other attendees/observers are in listen-only mode
- Observers are free to submit questions in the GoToWebinar question box
- We will follow up via email to answer any questions not addressed during the meeting
- The slides and a recording of the presentation will be posted online

Agenda

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Climate Action Reserve

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GHG Accounting Experts

- Originally created by California legislature in 2001
- Pioneered standardized GHG accounting, for compliance and voluntary carbon markets
- 78% of North American offset credits used in 2017 in the voluntary market* were issued by the Reserve
- 5+ of the 6 offset protocols used by ARB were developed by the Reserve, including the Forestry Protocol

Beyond Carbon Offsets

- **Climate Forward**
- GHG policy consulting
  - Mexico
  - Ontario
  - Quebec
  - World Bank, USDA, USAID
  - California agencies, and more

CLIMATE ACTION RESERVE

**Ecosystem Marketplace 2018 data*

Climate Forward:
a carbon project registry

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Issues Forecasted Mitigation Units (FMUs) to projects that follow Reserve-approved methodologies

- Follows ISO 14064-2 and GHG Protocol for Project Accounting Standards
- Credits typically issued about one year after project commencement, for the forecasted climate benefit over the project's lifetime

Expands the scope and scale of carbon project types

- Enormous potential for diverse, creative climate solutions

Tracks FMUs ownership and project activities in a publicly accessible database

- A registry of forward-looking GHG reductions to balance against forward-looking GHG impacts

Accelerating Climate Mitigation: CLIMATE FORWARD

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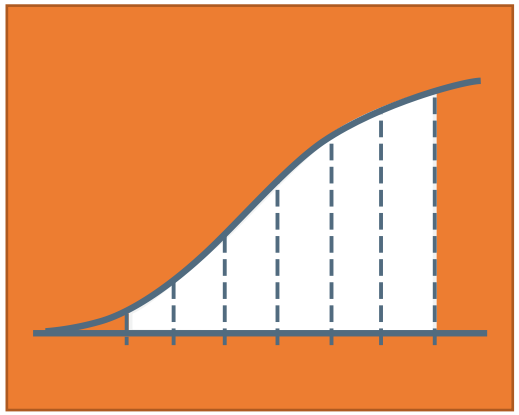
Offsets

Climate Reserve Tonnes

1 CRT = 1 tCO_2e of achieved reductions



Issued for achieved GHG removals

Used to mitigate any emissions

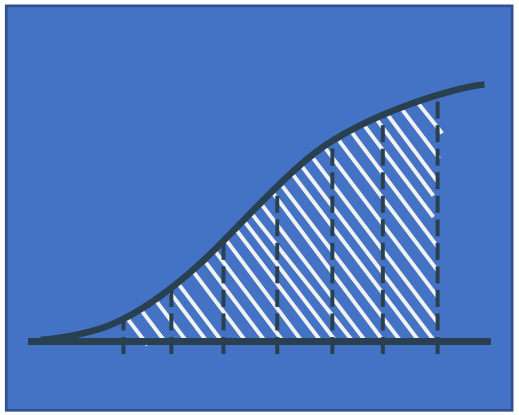
Protocols available for projects in North America

Reserve develops protocols for the offsets it issues

FMUs

Forecasted Mitigation Units

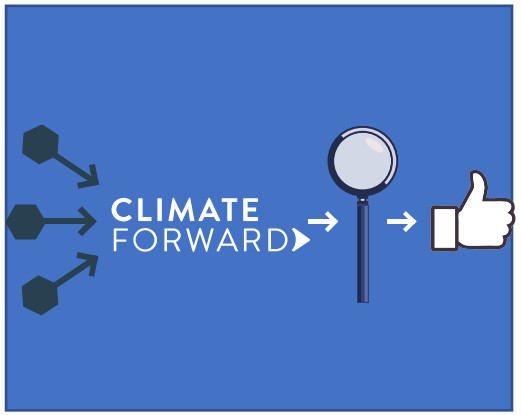
1 FMU = 1 tCO_2e of anticipated reductions



Issued for **forecasted** GHG removals

Used to mitigate anticipated emissions

Projects may be located anywhere in the world



External parties may submit forecast methodologies

tCO_2e = tonne of carbon dioxide equivalent

Introductions

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Jon Remucal
Marissa Schmitz
Jordan Mao

Thomas Buchholz
David Saah

John Nickerson

Jeff Ravage

Seth Baruch

Introductions

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Name (alphabetical)	Organization
Aaron Green	Colorado State Forest Service
Andrew Dunn	HQPlantations Pty Ltd
Bruce Springsteen	Placer County Air Pollution Control District
Christian Eggleton	FRST
Dan Porter	The Nature Conservancy
Ed Murphy	Sierra Pacific Industries
Elliott Vander Kolk	Sierra Nevada Conservancy
Harry Statter	Firewise Landscapes Inc / Frontline Wildfire Defense
Jens Stevens	US Forest Service

Introductions

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Name (alphabetical)	Organization
John Battles	University of California, Berkeley
John Cleland	Renew West
Mark Finney	US Forest Service
Matt Hurteau	University of New Mexico
Phil Saska	Blue Forest Conservation
Steve Eubanks	(Independent)
Tad Mason	TSS Consultants
Tadashi Moody	California Department of Forestry and Fire Protection

Funding support

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element
MARKETS

COCO

Why Address Wildfire Emissions?

Why address wildfire emissions?

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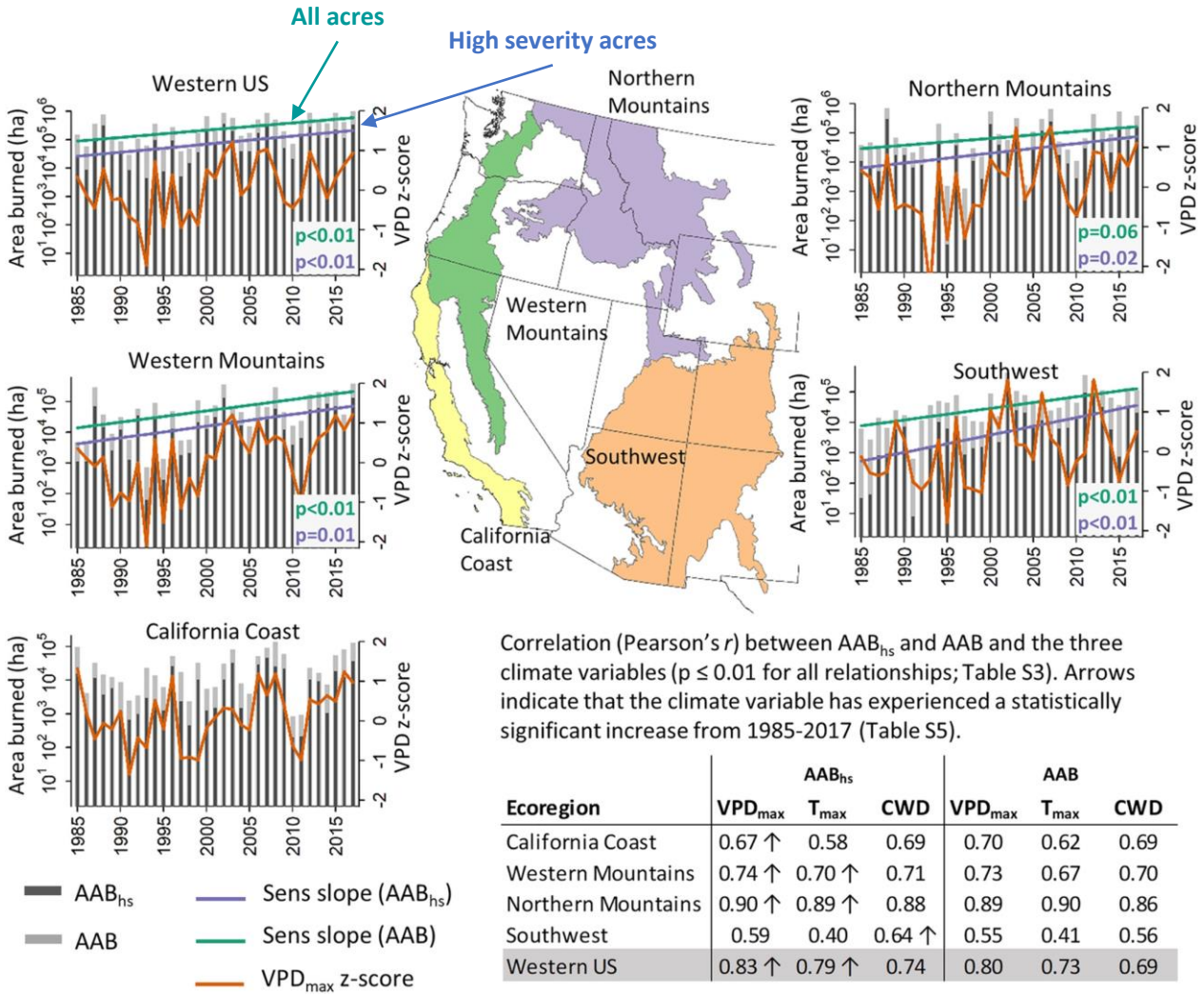
Loyalton Fire, Calpine, CA, August 2020 By Duncan Kennedy: CC-BY-SA-4.0



Correlation (Pearson's *r*) between AAB$_{hs}$ and AAB and the three climate variables ($p \leq 0.01$ for all relationships; Table S3). Arrows indicate that the climate variable has experienced a statistically significant increase from 1985-2017 (Table S5).

	AAB$_{hs}$			AAB		
Ecoregion	**VPD$_{max}$**	**T$_{max}$**	**CWD**	**VPD$_{max}$**	**T$_{max}$**	**CWD**
California Coast	0.67 ↑	0.58	0.69	0.70	0.62	0.69
Western Mountains	0.74 ↑	0.70 ↑	0.71	0.73	0.67	0.70
Northern Mountains	0.90 ↑	0.89 ↑	0.88	0.89	0.90	0.86
Southwest	0.59	0.40	0.64 ↑	0.55	0.41	0.56
Western US	0.83 ↑	0.79 ↑	0.74	0.80	0.73	0.69

Parks, S. A., & Abatzoglou, J. T. (2020). Warmer and drier fire seasons contribute to increases in area burned at high severity in western US forests from 1985 to 2017. *Geophysical Research Letters*, *47*(22).

Methodology Development Process & Timeline

Methodology Development Overview

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GOAL: To create a robust Avoided Wildfire Emissions Forecast Methodology that provides best practices for GHG accounting to generate Forecast Mitigation Units (FMUs)

- Adhere to high quality mitigation credit criteria and the Reserve's principles
- Leverage lessons learned from emerging technologies, other protocols/methodologies and projects, other regulatory programs, other relevant standards
- Solicit and incorporate expert stakeholder feedback

Methodology Development Timeline

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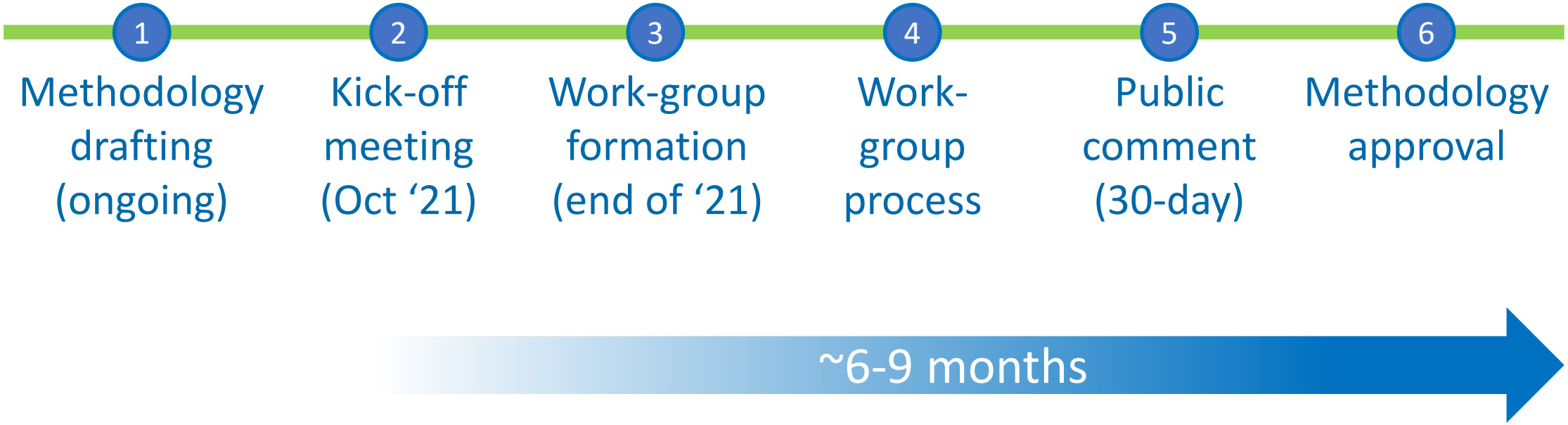

Workgroup Process and Expectations for Workgroup Members

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Process

- Methodology developers produce draft methodology for review
- Methodology developers identify and solicit feedback draft methodology, including specific methodology components
- Reserve staff schedule and hold workgroup meetings (at least 2)
- Methodology developers revise methodology based on feedback

Expectations

- Review, comment on and provide recommendations on draft methodology and specific methodology components, as requested by methodology developers
- Participate in workgroup meetings via webinar
- Provide any additional written comments on public comment draft of methodology

Methodology Overview

Methodology Components

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Eligibility

- Defining the project
- Ownership
- Start Date / Crediting period
- Project Location
- Additionality
  - Performance Standard Test
  - Legal Requirement Test
  - Enhancement Payments
- Regulatory compliance
- Permanence

Project Area

Defining GHG boundary

Quantification

- Delineating the project area
- Quantifying project emissions/removals
- Programmatic risk deduction

Monitoring / Reporting / Confirmation

- Sampling
- Confirmation field visit

Section 2

The GHG Reduction Project

2.1 Project Definition

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Activity or set of activities that result in reduced wildfire emissions from forestlands relative to business-as-usual

Fuel treatments

- Mastication
- Broadcast / prescribed burning
- Thinning
  - Thin from below
  - Crown thinning
  - Selection cut
- Pruning
- Mechanical removal of surface fuels

2.2 Project Proponent

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Who can be issued FMUs?

Project proponent:

- Entity with Climate Forward registry account
- Entity undertaking the implementation of actions that will generate GHG reductions and the reporting of those actions to Climate Forward
  - Organizing
  - Planning
  - Overseeing
  - Directly implementing
- Not required to be underlying landowner
- Can aggregate across ownerships, including across ownership types

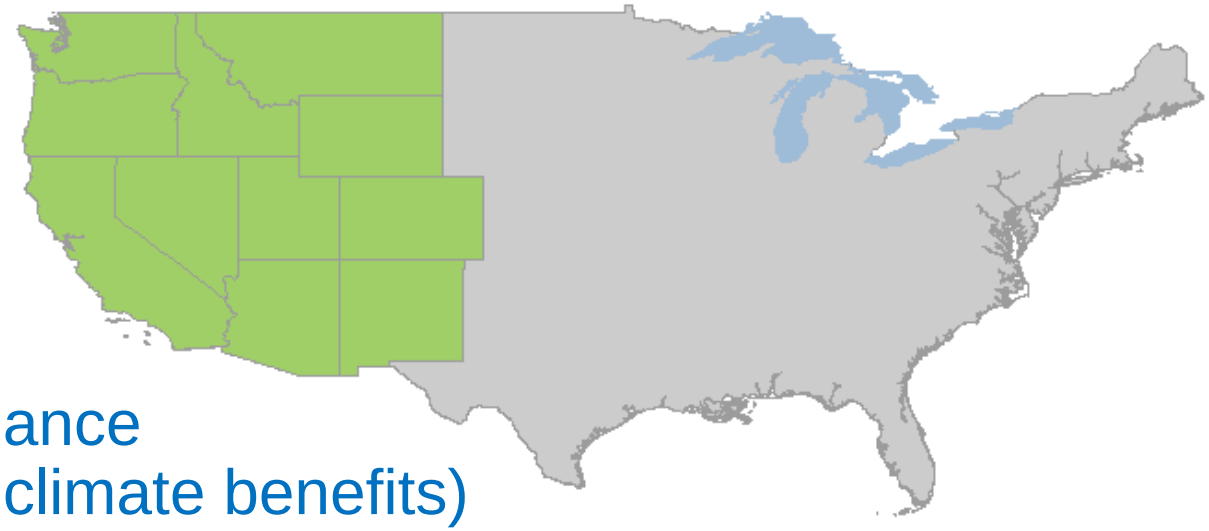
Focus of crediting is on action(s) being taken

Section 3

Eligibility

3 Location

- Western U.S.
- Limited based on data availability
- Private or public lands
- May be on locations where prior AWE projects took place (subject to performance standard test and quantification of net climate benefits)
- May be on locations where other C projects exist (e.g., stacked with an IFM project), but need to seek Reserve approval and guidance



3 Start Date & Crediting Period

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Project start date

- Date that fuel treatment activities are first initiated
- May be up to 12 months prior to release of final methodology

Project listing deadline

- Submitted for listing within 1 year of the project start date
- If start date is prior to release of the methodology, may be submitted up to 1 year after the methodology release date

Crediting period

- 40 years

3.3 Additionality

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- Projects must yield surplus GHG removals “additional” to what would have occurred in the absence of the project
- Performance standard test
  - Fuel treatments remain an uncommon activity, especially relative to the need
  - Projects pass test as long as significant fuel treatments haven’t occurred in the project area within the past three years.
- Legal requirement test
  - Project activities must not be legally required
- Enhancement payment stacking
  - Projects are not expressly prohibited from submitting projects based on areas for which they have received enhancement payments (e.g., grant funding to support fuel treatment work), unless they are paid on the basis of the climate benefits ($/tCO2e) generated
  - If considering stacking, seek Reserve guidance as soon as possible

3.6 Ownership & Double-Counting

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Ownership

- Credits issued to the project proponent on the basis of the implementation of fuel treatments and their influence on future fire behavior within the project area.
- Project proponent owns the credits issued for the benefits quantified, regardless if they are attributable to fuel treatment sites or other, non-treated areas within the project area (wildfire shadow areas).

Double-counting

- Avoid crediting for same GHG benefits recognized under another project
- However, stacking projects may be allowed where no double-counting would occur

Section 4

Project Area

4 Project Area

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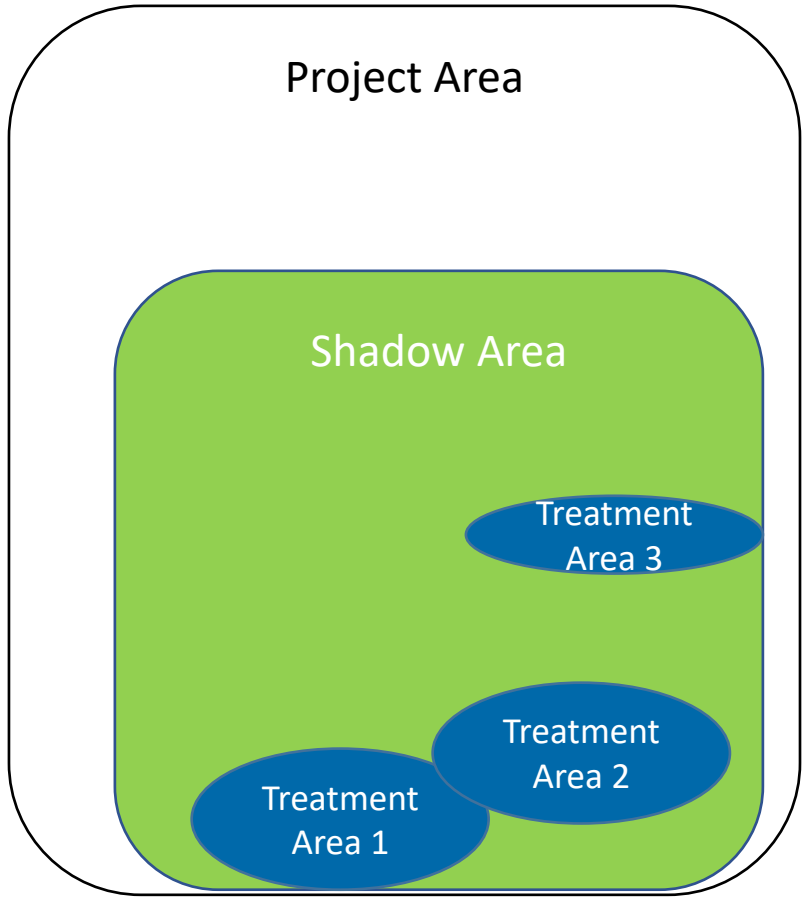
- Project area consists of:
  - Treatment areas – Locations where fuel treatment activities are performed
  - Non-treatment areas – Locations where fuel treatments are not performed but that have the potential to have fire behavior and severity influenced by activities in treatment areas
- May comprise multiple ownerships/ownership types
- Delineated through modeling process



Section 5

GHG Assessment Boundary

5 GHG Assessment Boundary

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Included pools:

- Standing live and dead trees
- Shrubs and herbaceous understory
- Lying dead wood
- Litter and duff
- Harvested wood products in use and in landfills (as long as not stacked with another project that accounts for it)
- Biomass combustion emissions (from prescribed burns and wildfires)
- Mobile combustion emissions (heavy machinery use for fuel treatments)

Section 6

Quantifying GHG Emission Reductions

6.1 - 6.7 Quantification

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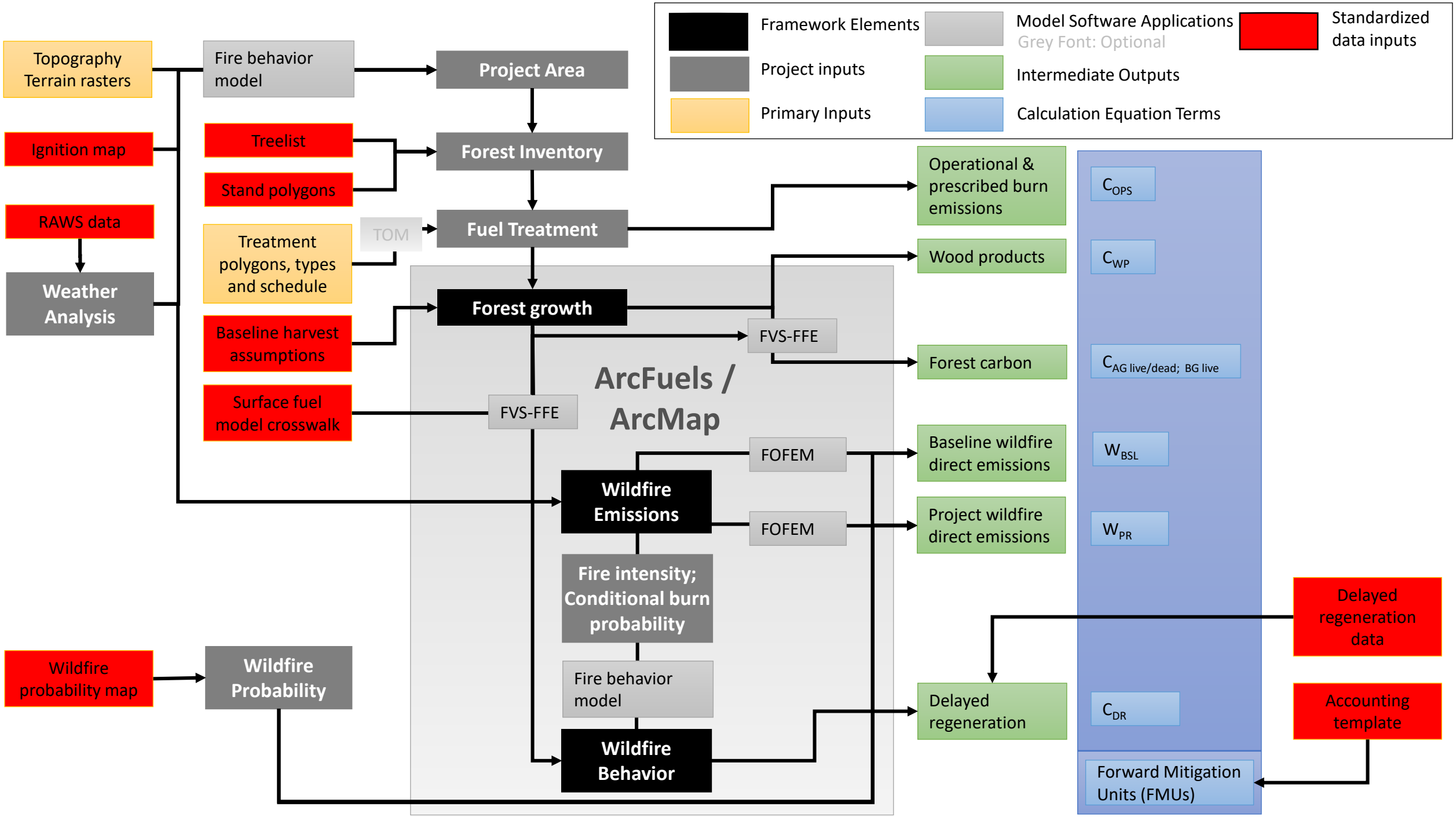
Accounting steps

1) Project area delineation, selection, and characterization
2) Weather data
3) **Management scenario development and fuel reduction treatment design**
4) Forest carbon (forest growth and sequestration) calculation
5) Forest removals life cycle assessment (wood products) calculation
6) Wildfire emissions calculation
7) **Delayed regeneration calculation**
8) **Fire ignition probability (fire return interval) assessment**
9) Aggregated emissions accounting


Framework Elements
Model Software Applications
Grey Font: Optional
Standardized data inputs
Project inputs
Intermediate Outputs
Primary Inputs
Calculation Equation Terms
Topography Terrain rasters
Fire behavior model
Project Area
Ignition map
Treelist
Forest Inventory
Stand polygons
RAWS data
TOM
Fuel Treatment
Treatment polygons, types and schedule
Weather Analysis
Forest growth
Baseline harvest assumptions
FVS-FFE
Surface fuel model crosswalk
FVS-FFE
ArcFuels / ArcMap
FOFEM
Wildfire Emissions
FOFEM
Fire intensity; Conditional burn probability
Fire behavior model
Wildfire Behavior
Wildfire probability map
Wildfire Probability
Operational & prescribed burn emissions
Wood products
Forest carbon
Baseline wildfire direct emissions
Project wildfire direct emissions
Delayed regeneration
C_{OPS}
C_{WP}
$C_{AG\ live/dead;\ BG\ live}$
W_{BSL}
W_{PR}
C_{DR}
Delayed regeneration data
Accounting template
Forward Mitigation Units (FMUs)

GHG offset protocol: Avoided emissions from significant wildfires

Calculation template v 8/15/2016

Example: Eldorado case study (2015-2018 QUEBROW project)

MT CO_2e/acre fire shed

Parameter	Time (yrs)								
	0	5	10	15	20	25	30	35	40
Baseline									
Forest stock and growth	(318.7)	(338.8)	(354.2)	(374.4)	(389.7)	(408.3)	(423.2)	(440.4)	(453.8)
Constant (annual) probability of fire		1.66%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%	1.7%
Periodic (5-year) probability of fire		8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
Wildfire		39.7	42.2	42.7	45.6	47.1	49.0	49.9	53.5
Non-CO2 GHGs		33.6	34.6	35.5	36.6	37.5	38.5	39.5	40.8
Weighted 5 year interval		6.1	6.4	6.5	6.8	7.0	7.3	7.4	7.8
Weighted cumulative		6.1	12.5	18.9	25.8	32.8	40.1	47.5	55.3
Total cumulative	(318.7)	(332.7)	(341.7)	(355.4)	(363.9)	(375.5)	(383.2)	(392.9)	(398.5)
(Fuel treatment) Project									
Forest stock and growth	(318.7)	(322.6)	(333.3)	(349.1)	(359.0)	(375.1)	(387.5)	(402.0)	(415.4)
Wildfire		20.8	21.9	23.7	25.2	25.5	26.6	26.8	28.4
Non-CO2 GHGs		28.7	29.1	28.9	29.1	29.7	30.2	30.5	32.3
Weighted 5 yr interval		4.1	4.2	4.4	4.5	4.6	4.7	4.8	5.0
Weighted cumulative		4.1	8.3	12.7	17.2	21.8	26.5	31.3	36.3
Net slash removed (zero for Climate Forward)		2.96				0.54			
Net slash diverted to bioenergy LCA		(1.1)	(1.1)	(1.1)	(1.1)	(1.3)	(1.3)	(1.3)	(1.3)
Net merchantable removed		2.55				0.22			
Wood products produced		(1.72)	-	-	-	(0.15)	-	-	-
Wood products in use or landfill (%)		43%	43%	43%	43%	43%	43%	43%	43%
Harv. & trsp. incl. presc. burn emissions		0.1	-	-	-	0.0	-	-	-
Wood products LCA		(1.0)	(1.0)	(1.0)	(1.0)	(1.1)	(1.1)	(1.1)	(1.1)
Net mill waste fate		(0.8)	-	-	-	(0.1)	-	-	-
Mill waste bioenergy LCA (zero for Climate Forward)		(0.2)	(0.2)	(0.2)	(0.2)	(0.3)	(0.3)	(0.3)	(0.3)
Mill waste fate non-bioenergy in-use (%)	100%	40%	10%	5%	0%	0%	0%	0%	0%
Mill wastefate non-bioenergy LCA		(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)	(0.1)
Net wood product substitution LCA		(1.8)	(1.8)	(1.8)	(1.8)	(2.0)	(2.0)	(2.0)	(2.0)
Avoided vegetation type conversion									
Vegetation type conversion baseline (%)		29%	32%	32%	34%	33%	35%	34%	36%
Vegetation type conversion project (%)		20%	25%	25%	27%	23%	30%	27%	27%
Weighted 5 yr interval LCA		(2.5)	(2.6)	(2.5)	(2.8)	(3.8)	(2.7)	(3.3)	(4.0)
Cumulative LCA		(2.5)	(5.1)	(7.6)	(10.3)	(14.1)	(16.8)	(20.1)	(24.1)
Total cumulative (pre risk deduction)	(318.7)	(325.2)	(334.3)	(348.2)	(356.4)	(372.2)	(382.5)	(395.6)	(408.0)
Net cumulative (pre risk deduction)	-	7.5	7.4	7.2	7.5	3.3	0.7	(2.7)	(9.5)
Net periodic (pre risk deduction)	-	7.52	(0.07)	(0.27)	0.37	(4.22)	(2.64)	(3.36)	(6.81)

Large delta BSL vs. Project

Limited additional timber production

Large delta BSL vs. Project

Net GHG benefits over time

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6.8 Performance Decline

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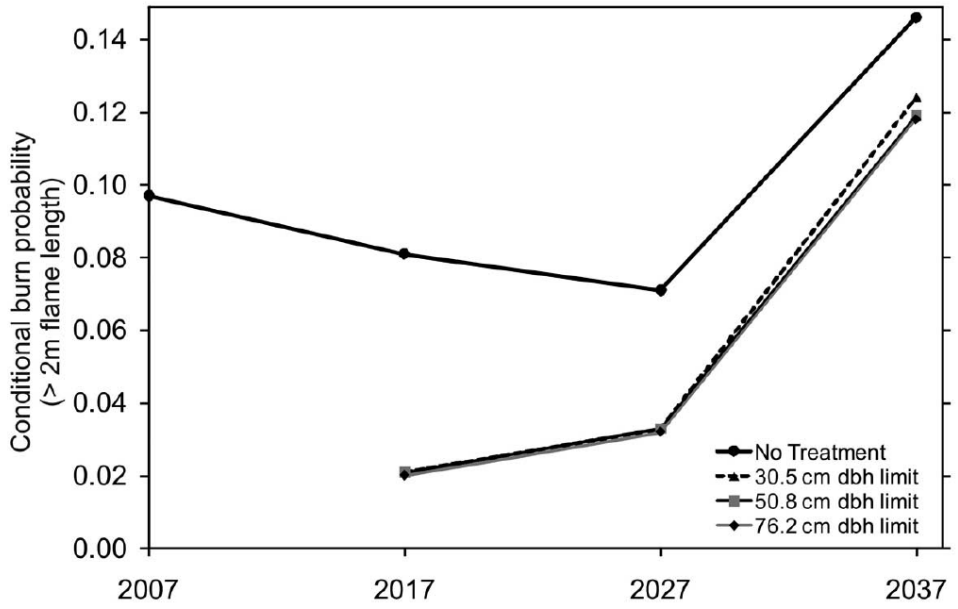
Fuel treatments have limited efficacy periods—accounted for in project modeling

10% programmatic ex ante risk discount is applied to all projects to address:

- Goal of crediting on conservative basis
- Uncertainty associated with estimating future climate benefits from treatments today
- Uncertainty associated with probabilistic occurrence of future wildfires



6.11 Permanence Risk

Risk that forests within the project area will experience a disturbance—namely wildfire—and release sequestered C into the atmosphere.

➔ Focus of methodology is to address that risk.

Basis for crediting:

- Reducing the risk of high severity and/or large wildfires and high GHG emissions associated with such fires
- Not the additional C sequestered above the baseline

There is no risk to the permanence of the basis of the credits issued.

Section 7 / Section 8 / Section 9

Project Monitoring / Reporting / Confirmation

7 Monitoring / 8 Reporting

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Projects proponents gather data and information to provide documentation and reports indicating how the project has been implemented and meets all requirements of the methodology, including eligibility and quantification.

Required Project Implementation Report addresses all project monitoring and reporting requirements—template provided by Reserve.

Quantification reporting template also to be provided.

9 Confirmation

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Confirmation guidance outlines requirements for confirmation bodies and their review of project documentation and data.

Focus of confirmation process

Eligibility	Quantification

• Location
• Ownership
• Additionality
• Regulatory compliance
• Double-counting
	• Modeling and data
	  • Standardized data/parameterization requirements
	  • Project-specific adjustments
	• Field data*

Only a single confirmation effort is required—no ongoing monitoring, reporting and verification required.

7.1 Monitoring / 9.4 Confirmation

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Project proponent must provide evidence substantiating the data serving as the basis for modeling

Plot attribute	Project proponent	Confirmation body
Location	Georeferenced datapoints; plots stratified by treatment type	Confirm location, statistics
# of plots	Based on treatment size	Confirm plot number in accordance with procedures
Imaging	360 degree fisheye pre- and post-treatment	Confirm image match
Image interpretation	• Dominant overstory and understory vegetation specie(s) • Fire behavior fuel model choice • Canopy base height estimate • Canopy height estimate • Overstory closure estimate	Confirm choice (random selection of 20% of plots; 90% match for each metric)

Next Steps

Focal Areas for Feedback

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- Crediting period length
- Enhancement payments and additionality
- Weather data
- Baseline harvest scenarios
- Model parameterization and assumptions
  - Standardized vs. site-specific
  - Are standardized parameters and assumptions conservative and/or reasonable?
- Fuel model assignments
- Regeneration models
- Programmatic discount
- Tolerances for confirmation of photo plots

Logistics

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- Meeting on March 10 (*tentative*)
- Focus will be in-depth discussion of specific topics identified by drafting group, plus any additional topics raised by workgroup members
- After second workgroup meeting, submit comments/feedback by **Friday, March 25**
- Reach out any time to discuss methodology topics or process
- Reserve staff and drafting group will determine if additional workgroup meetings are desired, otherwise will produce draft for public comment

Questions or Comments?

Contact Information

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jremucal@climateactionreserve.org

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