

Urban Forest Project Reporting Protocol

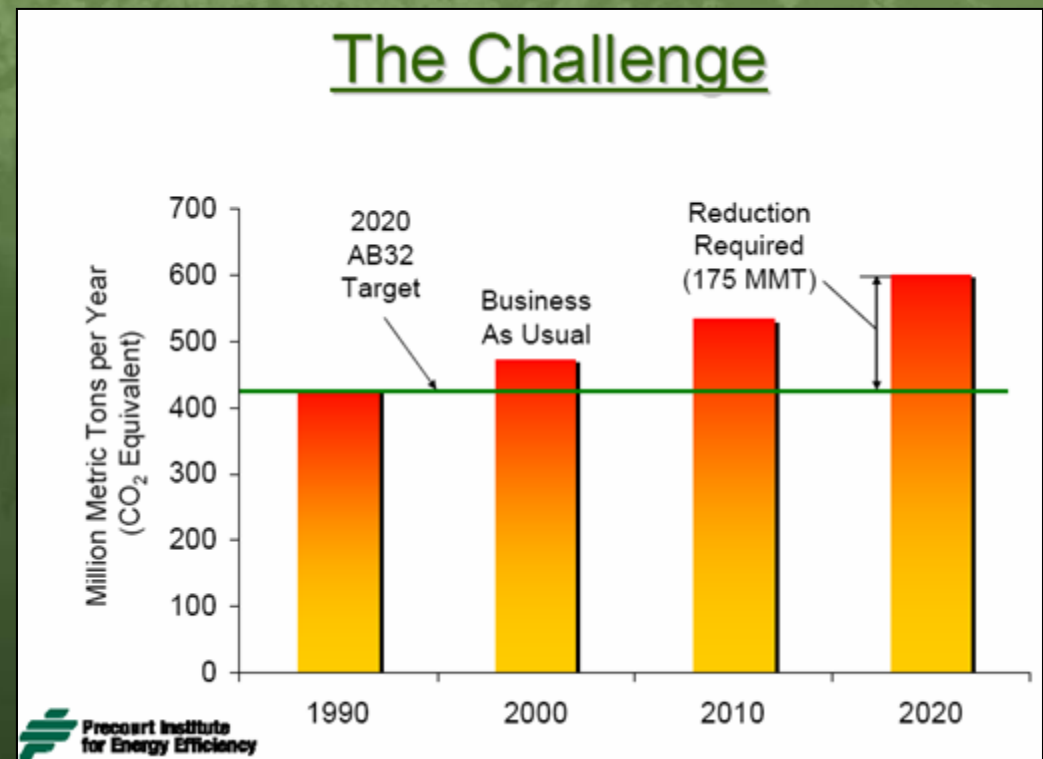


Center for Urban Forest Research, US Forest Service

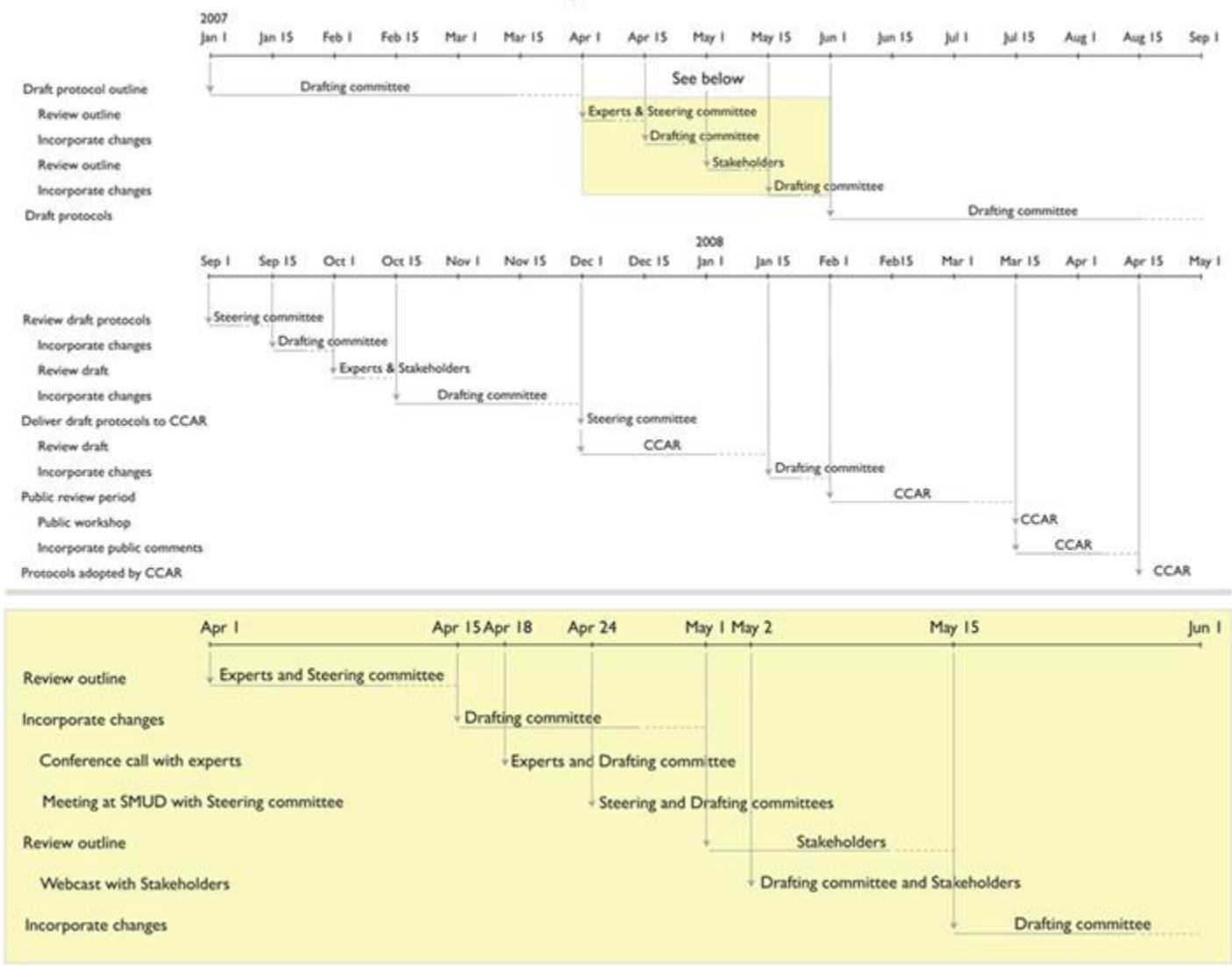
Kelaine Vargas

Urban Forests and Climate Change

- 50 million trees, 15 yr
- Sequester 4.5 Mt/yr
- 6,400 GWh/yr, \$485M
- Reduced emissions 1.8 Mt/yr
- Total 6.3 Mt/yr
- 4% of CAT target



California Urban Forestry Greenhouse Gas Protocol Timeline



Committees

Drafting committee

Glenn	Flamik	CDF
Sam	Hitz	CDF
Mary	Klaas-Schultz	CDF
Greg	McPherson	US Forest Service, Center for Urban Forest Research
John	Nickerson	CCAR
Michelle	Passero	Pacific Forest Trust / The Nature Conservancy
Tim	Robards	California Climate Action Registry
Emily	Russell-Roy	PFT
Kelaine	Vargas	US Forest Service, Center for Urban Forest Research
Laurie	Wayburn	Pacific Forest Trust
Doug	Wickizer	CDF

Steering committee

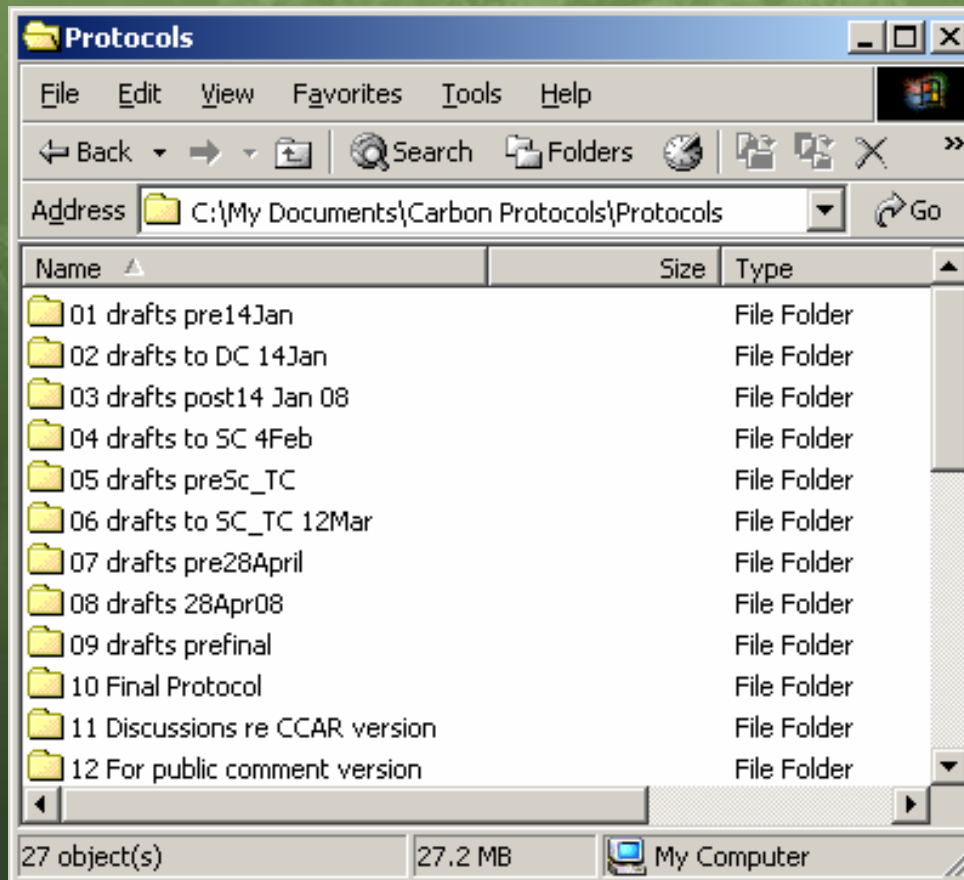
Kathryn	Bickel	CCAR
Glenn	Flamik	CDF
Bruce	Goines	US Forest Service, Region 5
Sam	Hitz	CDF
Bailey	Hudson	Arborist
Mary	Klaas-Schultz	CDF
Andy	Lipkis	TreePeople
Derek	Markolf	California Air Resources Board
Greg	McPherson	US Forest Service, Center for Urban Forest Research
Mark	Nechodom	US Forest Service, Pacific Southwest Research Station
John	Nickerson	CCAR
Jeanne	Panek	California Air Resources Board
Michelle	Passero	Pacific Forest Trust / The Nature Conservancy
Tim	Robards	California Climate Action Registry
Emily	Russell-Roy	Pacific Forest Trust
Misha	Sarkovich	Sacramento Municipal Utility District
Doug	Thompson	California Air Resources Board
Val	Tiangco	California Energy Commission, Public Interest Energy Research
Kelaine	Vargas	US Forest Service, Center for Urban Forest Research
Laurie	Wayburn	Pacific Forest Trust
Doug	Wickizer	CDF

Technical advisory committee

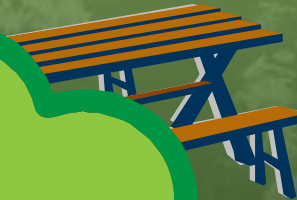
Kamran	Abdollahi	Southern University
Rich	Birdsey	US Forest Service, Global Change
Ken	Decio	California Integrated Waste Mgmt Board
Pierre	duVair	California Energy Commission
Gordon	Heisler	US Forest Service, Syracuse
Ken	Holman	Community Forestry Coordinator, MN DNR, Forestry
David	Katz	Sacramento Tree Foundation
Gary	Klein	California Energy Commission
Jeff	Kline	US Forest Service, Pacific Southwest Research Station
Scott	Maco	Davey Resource Group
Doug	McCreary	UC Berkeley, Integrated Hardwood Range Management Program
Melissa	McHale	Colorado State University
Dave	Nowak	US Forest Service, Syracuse
Eric	Oldar	California Dept. of Forestry and Fire Protection
Diane	Pataki	UC Irvine
Norm	Pillsbury	California Polytechnic State University
Stephanie	Pincetl	US Forest Service, Pacific Southwest Research Station
Keith	Roberts	Sacto Sustainability
Neil	Sampson	The Sampson Group
Tom	Scott	UC Riverside, Integrated Hardwood Range Management Program
Sam	Sherrill	University of Cincinnati
Mark	Trexler	Director, EcoSecurities Global Consulting Services
Andrea	Tuttle	UC Berkeley
Jude	Wait	Development director, Lomakatsi Restoration Project
Rob	Williams	California Biomass Collaborative/UCD

Stakeholder committee		Connie Gallippi	Heath Packard	Forest and Fish Conservation Caucus
James Allen	Melanie Gentles	Cindy Parsons	LADWP Environmental Services	
Curtis Alling	George Gentry	Miguel Perez-Gibson	Forest and Fish Conservation Caucus	
Mike Alonzo	George Gonzalez	David Roger	Urban forestry consultant	
Manuel Alvarado	John Goodfellow	Greg San Martin	Climate Protection, PG&E	
Joe Bates	Jeff Harris	Daran Santi	PG & E	
Robert Beebe	Jay Hart	Janet Santos Cobb	California Oak Foundation	
Joe Benassini	Dudley Hartel	Mike Schonherr	PG & E	
Steve Brink	Clay Hinkle	Frank Schultz	Southern California Edison	
Micah Brosnan	Ron Hostick	Mitch Sears	City of Davis	
Doug Brown	Nancy Hughes	Kemba Shakur	Urban ReLeaf	
Lee Butterfield	Eric Johnson	Dan Smith	Casey Trees	
Rob Cain	Betony Jones	Carl Somers	Trust for Public Lands	
Keith Cline	Patti Keating	Guy Stivers	Dudek Engineering and Environmental Consultants	
Phil Cody	Kimberly Klunich	Ray Tretheway	Sacramento Tree Foundation	
Larry Costello	Dan Knapp	Ken Trott	Woodland Tree Foundation	
Mike Daleo	Jerri Lehaie	Andy Trotter	West Coast Arborist	
Paula Daniels	Jared Liu	Richard Williams	UC Santa Barbara	
Florence Daviet	Bill Machado	Scott Wilson		
Rachel Dinno	Sandy Macias	Deric Wittenborn	Ellison, Schneider & Harris	
Eric Douglas	Gordon Mann			
Steve Dugas	Ryan McCaughey		CSU Fresno	
Rose Eperson	Mark McLoughlin		Stonegate Properties	
Alice Ewen-Walker	Jacqueline McRae		Los Angeles Dept.of Water and Power, Trees for a Greener LA	
Richard Farmer	Peter Miller		Natural Resources Defence Council	
Herb Fong	Pam Murray		PG&E	
Rebecca Fotu	Sam Oludunfe		University of California, San Diego	
Leslie Friedman Johnson	Conservation Strategy Group			

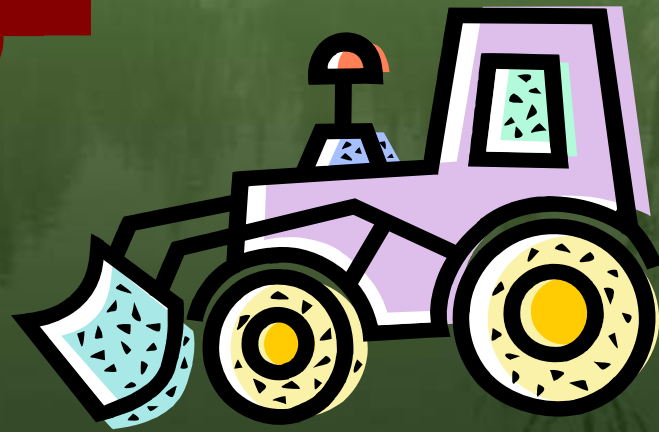
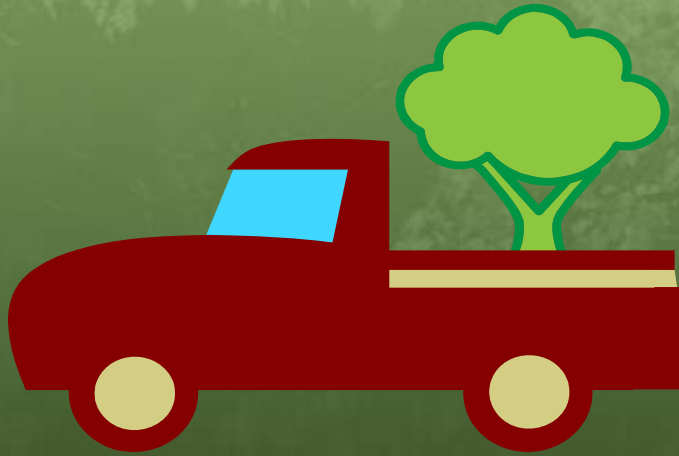
Along the way...



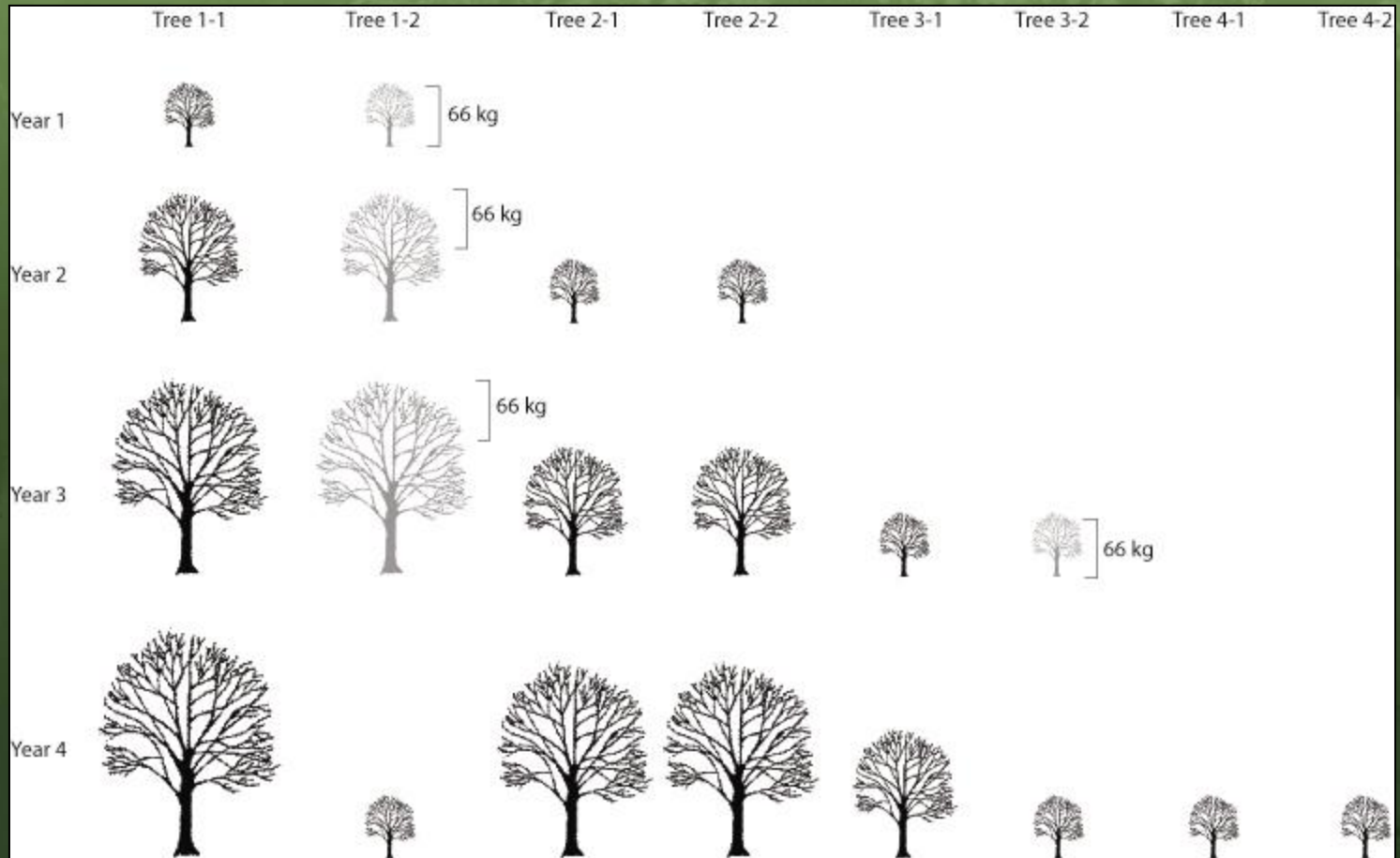
Urban forest GHG benefits



Project-related emissions



Additionality

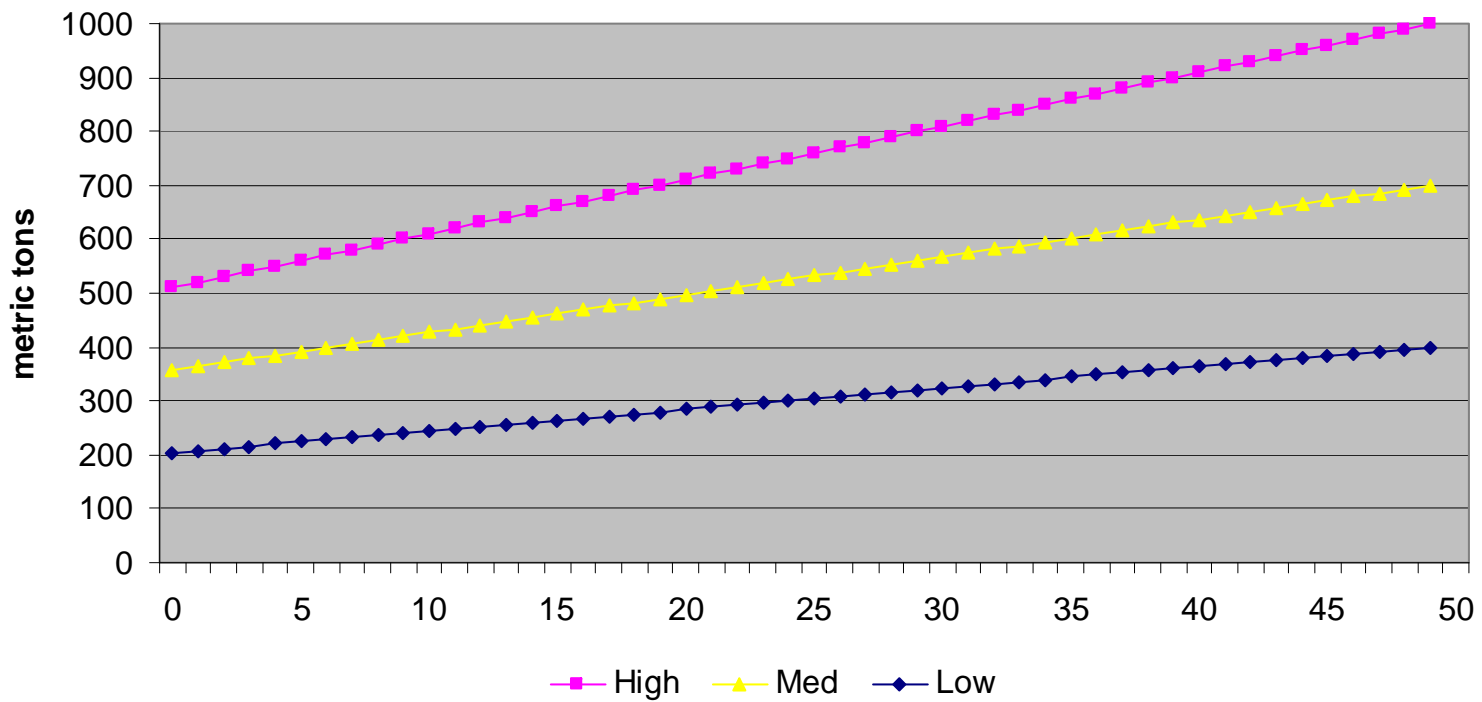


Leakage

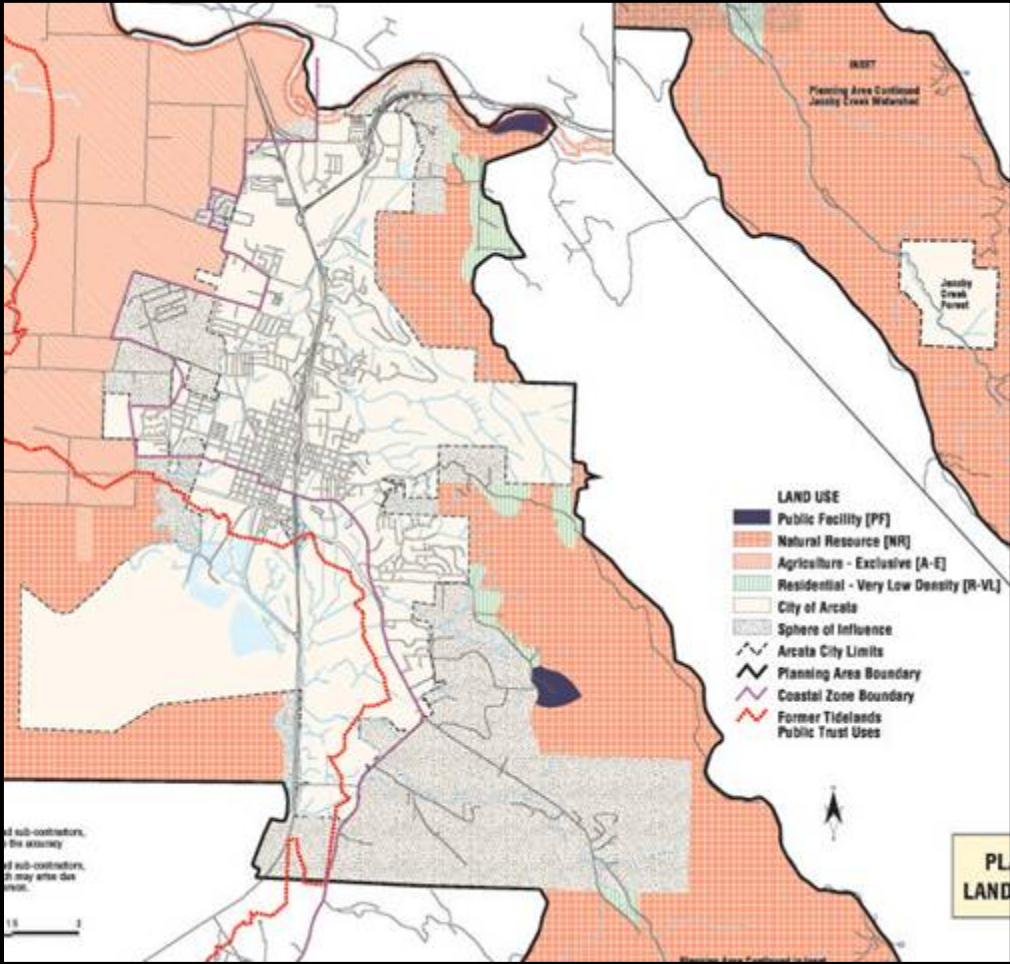
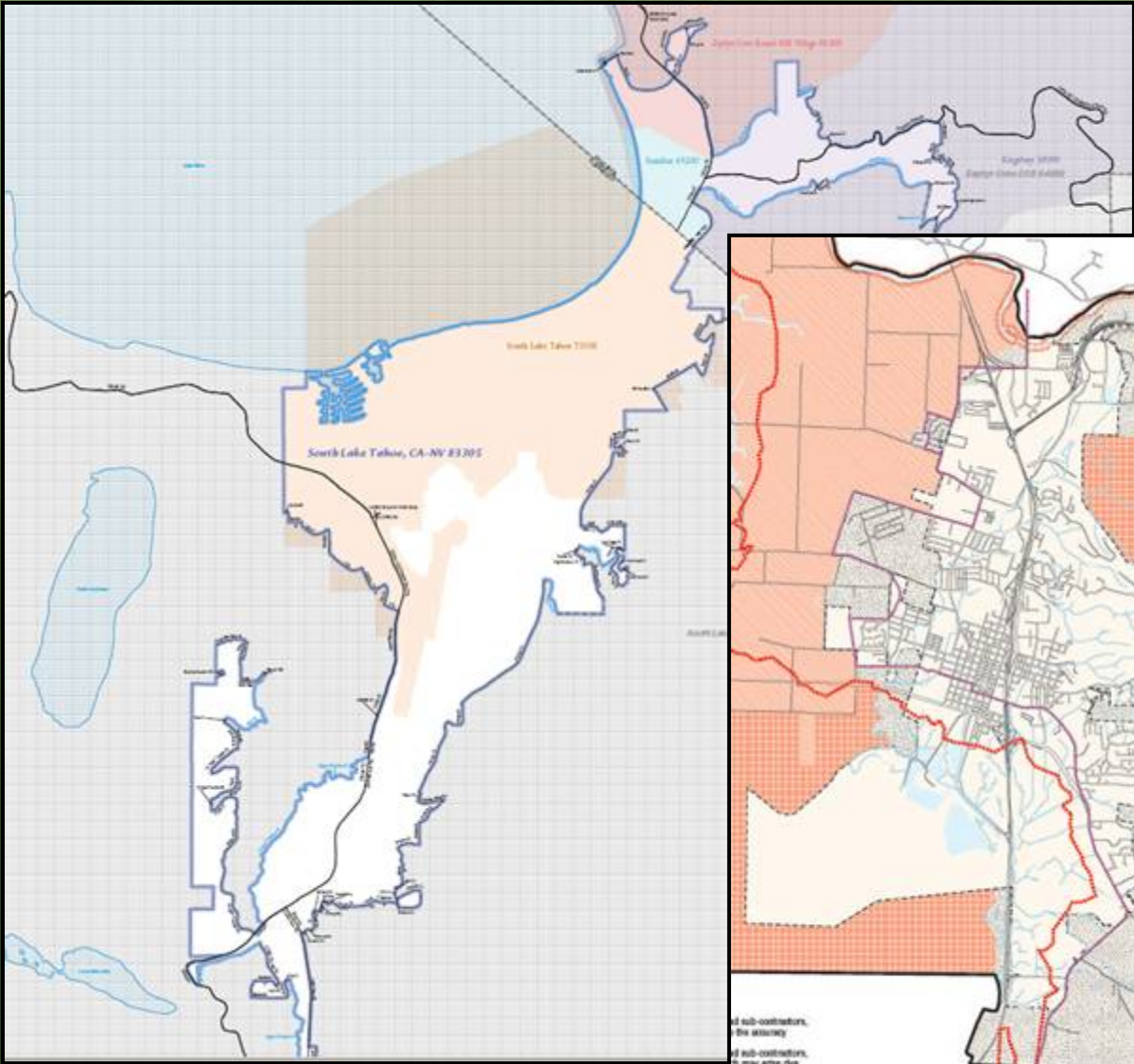


Permanence

Certified Reductions Withheld (1,000 MT certified/yr)



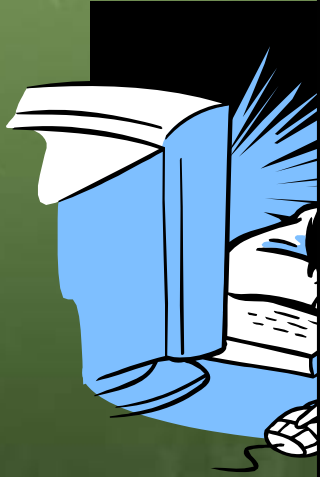
Urban



Urban vs. forest trees



At the end...



Urban Forest Greenhouse Gas Reporting Protocol

June 1, 2008



CUFR Tree Carbon Calculator

Jim Simpson and Greg McPherson

- Excel workbook
- Calculates
 - Annual carbon sequestration and total carbon storage
 - Effect of tree shade on residential heating and cooling energy use and GHG emissions
 - Aboveground biomass for estimating other GHG benefits
- Calculates **and** allows forecasting
- “Proof of concept” software still in the testing phase
- Single tree calculator in present form

Entering project data

	A	B	C	D	E	F	G	H	I	J	K																												
1	<h2 style="margin: 0;">CUFR Tree Carbon Calculator</h2> <p style="margin: 0;">USDA Forest Service Center for Urban Forest Research</p>																																						
2																																							
3																																							
4																																							
5	<p>Table E1 Project Data entry</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Data name</th> <th style="width: 10%;">Data entry</th> <th style="width: 10%;">Units</th> <th style="width: 50%;">Description</th> </tr> </thead> <tbody> <tr> <td>Flag1</td> <td style="text-align: center;">0</td> <td></td> <td>Tree age selected</td> </tr> <tr> <td>Flag2</td> <td style="text-align: center;">1</td> <td></td> <td>Shade & climate selected</td> </tr> <tr> <td>Climate Zone</td> <td style="text-align: center;">3</td> <td></td> <td>Inland Empire</td> </tr> <tr> <td>Electricity CO2 emissions factor§</td> <td style="text-align: center;">382</td> <td>(kg/MWh)</td> <td></td> </tr> <tr> <td>Electricity CH4 emissions factor§</td> <td style="text-align: center;">0.0067</td> <td>(kg/MWh)</td> <td></td> </tr> <tr> <td>Electricity N2O emissions factor§</td> <td style="text-align: center;">0.0017</td> <td>(kg/MWh)</td> <td></td> </tr> </tbody> </table> <p style="text-align: center; font-size: small;">§required for energy project</p>											Data name	Data entry	Units	Description	Flag1	0		Tree age selected	Flag2	1		Shade & climate selected	Climate Zone	3		Inland Empire	Electricity CO2 emissions factor§	382	(kg/MWh)		Electricity CH4 emissions factor§	0.0067	(kg/MWh)		Electricity N2O emissions factor§	0.0017	(kg/MWh)	
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California climate zones



Sample template for gathering data

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
4														
5														
6		Tree and Building Data												
		Species	Dbh (in)	Condition	\$Azimuth	\$Distance	\$Trees/ building	\$Vintage	\$AC equipment	\$Heating equipment	\$Energy	Heating emissions factor CO2\$	Heating emissions factor CH4\$	Heating emissions factor N2O\$
7	Tree ID	code	or Age											
8	1	BRPO	10	alive	7	2	0	3	1	1	yes	53.1	0.0059	0.0001
9	2	CICA	40	alive	3	1	1	1	1	1	yes	53.1	0.0059	0.0001
10	3	CICA	40	alive	3	1	0	1	0	0	yes	0	0	0
11	4	CICA	40	alive	3	1	1	1	0	1	yes	53.1	0.0059	0.0001
12	5	CICA	40	alive	3	1	1	1	1	4	yes	73	0.0059	0.0001
13	6													
14														
15														

Start \ Data Template \ CTCC \ Output Template

Entering tree data

	A	B	C	D	E	F	G																																												
16	<div style="border: 2px solid blue; padding: 10px;"> <p style="text-align: center;">Tree and Building Data entry</p> <p>Enter Tree data below one tree at a time, then record results</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 30%;">Data name</th> <th style="width: 15%;">Data entry</th> <th style="width: 15%;">Units</th> <th style="width: 40%;">Description</th> </tr> </thead> <tbody> <tr> <td>Species</td> <td>CICA</td> <td></td> <td>Cinnamomum camphora</td> </tr> <tr> <td>Tree dbh or age</td> <td>40</td> <td>Age (years)</td> <td>22.3 in DBH & 44.8 ft high</td> </tr> <tr> <td>Tree azimuth</td> <td>3</td> <td></td> <td>E</td> </tr> <tr> <td>Tree distance class</td> <td>1</td> <td></td> <td>Adj</td> </tr> <tr> <td>Building vintage</td> <td>1</td> <td></td> <td>pre-1950</td> </tr> <tr> <td>air conditioning equip.</td> <td>1</td> <td></td> <td>Central air/heat pump</td> </tr> <tr> <td>Heating equip.</td> <td>1</td> <td></td> <td>natural gas</td> </tr> <tr> <td>Heating emissions factor- CO₂</td> <td>53.1</td> <td>(kg/MBtu)</td> <td></td> </tr> <tr> <td>Heating emissions factor CH₄</td> <td>0.0059</td> <td>(kg/MBtu)</td> <td></td> </tr> <tr> <td>Heating emissions factor N₂O</td> <td>0.0001</td> <td>(kg/MBtu)</td> <td></td> </tr> </tbody> </table> </div>							Data name	Data entry	Units	Description	Species	CICA		Cinnamomum camphora	Tree dbh or age	40	Age (years)	22.3 in DBH & 44.8 ft high	Tree azimuth	3		E	Tree distance class	1		Adj	Building vintage	1		pre-1950	air conditioning equip.	1		Central air/heat pump	Heating equip.	1		natural gas	Heating emissions factor- CO ₂	53.1	(kg/MBtu)		Heating emissions factor CH ₄	0.0059	(kg/MBtu)		Heating emissions factor N ₂ O	0.0001	(kg/MBtu)	
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Start / Data Template / **CTCC** / Output Template

Results

Carbon Calculator Results (annual)								
Energy reductions		Emission reductions (CO ₂ equivalents)			CO ₂ Sequestration	Total CO ₂ Stored	Above ground biomass	
Cooling kWh/tree	Heating MBtu/tree	Cooling (kg/tree)	Heating (kg/tree)	Cooling + Heating (kg/tree)	(kg/tree)	(kg/tree)	(dry weight) (kg/tree)	
722.39	0.040	276.1	2.1	278.2	117.3	2516.4	1069.6	
kWh/tree	GJ/tree	lb/tree	lb/tree	lb/tree	(lb/tree/year)	(lb/tree)	(lb/tree)	
722.39	0.042	608.7	4.7	613.4	258.7	5,547.8	2,358.2	

Sample template for results

Summary of Carbon Calculator Results (annual)											
Tree ID	Species code	Energy reductions		Emission reductions (CO2 equivalents)			CO2 Sequestration (kg/tree)	Total CO2 Stored (kg/tree)	Above ground biomass (dry weight) (kg/tree)		
		Cooling (kWh/tree)	Heating (MBtu/tree)	Cooling (kg/tree)	Heating (kg/tree)	Cooling + Heating (kg/tree)					
1	BRPO	21.67	-0.004	8.3	-0.2	8.1	11.2	54.4	23.1		
2	CICA	722.39	0.040	275.6	2.1	277.8	117.3	2516.4	1069.6		
3	CICA	0	0	0	0	0.0	117.3	2516.4	1069.6		
4	CICA	0	0.040	0	2.1	2.1	117.3	2516.4	1069.6		
5	CICA	722.39	0.012	275.6	0.7	276.3	117.3	2516.4	1069.6		
Total		1,466	0.088	560	5	564	481	10,120	4,302		

See Annex D in the Protocol for details

Thank you!



And especially to all of our committee members!