

MAINE FORESTRY CLIMATE MITIGATION OPTIONS - EARLY COMMERCIAL THIN, VERSIONS 1 & 2

Avg annual GHG Flow
2005-2020
15 yr. horizon 58 yr. horizon

Early Commercial Thin, Version1 - 40,000 acres harvested per year

Kmtco2e (15) Kmtco2e (58)

Acres treated per year (avg forest)	40,000		
Cords removed per acre	8		
Cft removed per acre	1,024		
Pounds removed per acre (5000 short pounds/cord)	40,000		
Wet Tons removed per acre (2.5 short tons/cord)	20		
Dry Tons removed per acre (.5)	10		
MT removed per acre	9.07		
MTC removed per acre (.50 conversion)	4.54		
MTCO2e removed per acre (2.079 MT CO2e/cord)	16.632		
Total KMTCO2e removed yr 0-15	9,979		
% to durable wood	20%		
kMTCO2 to Durable wood (sum yrs 0-15)	1,996		
kMTCO2 Products in use - storage (avg yr 7.5)		31.63	7.32
kMTCO2 Landfill - storage (avg yr 7.5)		6.73	14.70
kMTCO2 Biomass energy - annual emission		-57.48	-59.21
Mbtus Biomass Energy (17.0 Mbtus per dry ton)	8,812,800		
Mwh Biomass Energy (11550 btu per Kwh)	763,013		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	329	21.94	21.94
kMTCO2 Other WP - Emission (avg yr 7.5)		-40.52	-51.83
kMTCO2 Forest Sequestration (stand replacement) (avg yr 7.5)		26.41	204.91
kMTCO2 Logging residue (avg yr 7.5)		-22.93	-71.05
kMTCO2 Building materials substitution (avg yr 7.5)		10.46	10.46
Total GHG Savings		-23.76	77.25

% to pulp	60%
kMTCO2 to Durable wood (sum yrs 0-15)	5,988

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kMTCO2 Products in use - storage (avg yr 7.5)		94.04	9.78
kMTCO2 Landfill - storage (avg yr 7.5)		31.53	41.71
kMTCO2 Biomass energy - annual emission Mbtus Biomass Energy (17.0 Mbtus per dry ton)	25,563,240	-166.73	-172.64
Mwh Biomass Energy (11550 btu per Kwh)	2,213,268		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	955	63.64	63.64
kMTCO2 Other WP - Emission (avg yr 7.5)		-122.62	-175.04
kMTCO2 Forest Sequestration (stand replacement) (avg yr 7.5)		79.22	614.72
kMTCO2 Logging residue (avg yr 7.5)		-68.78	-213.14
kMTCO2 Building materials substitution (avg yr 7.5)		33.85	33.85
Total GHG Savings		-55.85	202.89
% to elec gen	20%		
kMTCO2 Biomass energy - annual emission Mbtus Biomass energy (17.0 Mbtus per dry ton)	1995.84	-133.06	-133.06
Mwh Biomass energy (11550 btu per Kwh)	20,400,000		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	1,766,234		
	762	50.79	50.79
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)	544	26.41	204.91
kMTCO2 Logging residue (avg yr 7.5)		-22.93	-71.05
Total GHG Savings		-78.79	51.59
Option Total GHG Savings		-158.40	331.73

**Early Commercial Thin, Version2 -
80,000 acres harvested per year**

		Kmtco2e (15) Kmtco2e (58)	
		Avg annual GHG Flow 2005-2020	
		15 yr. horizon	58 yr. horizon
Acres treated per year (avg forest)	80,000		
Cords removed per acre	8		
Cft removed per acre	1,024		
Pounds removed per acre (5000 short pounds/cord)	40,000		
Wet Tons removed per acre (2.5 short tons/cord)	20		
Dry Tons removed per acre (.5)	10		
MT removed per acre	9.07		
MTC removed per acre (.50 conversion)	4.54		
MTCO2e removed per acre (2.079 MT CO2e/cord)	16.632		
Total KMTCO2e removed yr 0-15	19,958		
% to durable wood	20%		
kMTCO2 to Durable wood (sum yrs 0-15)	3,992		
kMTCO2 Products in use - storage (avg yr 7.5)		63.25	14.64
kMTCO2 Landfill - storage (avg yr 7.5)		13.47	29.41
kMTCO2 Biomass energy - annual emission		-114.96	-118.42
Mbtus Biomass Energy (17.0 Mbtus per dry ton)	17,625,600		
Mwh Biomass Energy (11550 btu per Kwh)	1,526,026		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	658	43.88	43.88
kMTCO2 Other WP - Emission (avg yr 7.5)		-81.03	-103.65
kMTCO2 Forest Sequestration (stand replacement) (avg yr 7.5)		52.81	409.81
kMTCO2 Logging residue (avg yr 7.5)		-45.85	-142.09
kMTCO2 Building materials substitution (avg yr 7.5)		20.93	20.93
Total GHG Savings		-47.51	154.50
% to pulp	60%		
kMTCO2 to Durable wood (sum yrs 0-15)	11,975		
kMTCO2 Products in use - storage (avg yr 7.5)		188.09	19.56

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kMTCO2 Landfill - storage (avg yr 7.5)		63.07	83.43
kMTCO2 Biomass energy - annual emission		-333.46	-345.28
Mbtus Biomass Energy (17.0 Mbtus per dry ton)	51,126,480		
Mwh Biomass Energy (11550 btu per Kwh)	4,426,535		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	1,909	127.28	127.28
kMTCO2 Other WP - Emission (avg yr 7.5)		-245.25	-350.07
kMTCO2 Forest Sequestration (stand replacement) (avg yr 7.5)		158.43	1229.44
kMTCO2 Logging residue (avg yr 7.5)		-137.56	-426.27
kMTCO2 Building materials substitution (avg yr 7.5)		67.71	67.71
Total GHG Savings		-111.71	405.78
% to elec gen	20%		
kMTCO2 Biomass energy - annual emission	3991.68	-266.11	-266.11
Mbtus Biomass energy (17.0 Mbtus per dry ton)	40,800,000		
Mwh Biomass energy (11550 btu per Kwh)	3,532,468		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	1,524	101.57	101.57
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)	1,089	52.81	409.81
kMTCO2 Logging residue (avg yr 7.5)		-45.85	-142.09
Total GHG Savings		-157.59	103.18
Option Total GHG Savings		-316.80	663.46

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – REGULAR LIGHT HARVEST, VERSIONS 1 & 2

	Avg annual GHG Flow 2005-2020		
	15 yr. horizon	58 yr. horizon	
			Kmtco2e (15) Kmtco2e (58)
More Light Harvest, Version1 – 113,000 acres harvested per year			
Acres treated per year (avg forest)	113,000		
Cords removed per acre	2		
Cft removed per acre	256		
Pounds removed per acre (5000 short pounds/cord)	10,000		
Wet Tons removed per acre (2.5 short tons/cord)	5		
Dry Tons removed per acre (.5)	2.5		
MT removed per acre	2.27		
MTC removed per acre (.50 conversion)	1.13		
MTCO2e removed per acre (2.079 CO2e/cord)	4.158		
Total KMTCO2e removed yr 0-15	7,048		
% to durable wood	45%		
kMTCO2 to durable wood (yr 0-15)	3,172		
kMTCO2 Products in use - storage (yr 7.5)		50.26	11.63
kMTCO2 Landfill - storage (yr 7.5)		10.70	23.36
kMTCO2 Biomass energy - annual emission		-90.81	-93.77
Mbtus biomass energy (17.0 Mbtus per dry ton)	7,705,491		
Mwh biomass energy (11550 btu per Kwh)	667,142		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	288	19.18	19.18
kMTCO2 Other WP - emission (yr 7.5)		-64.38	-77.60
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		41.96	325.61
kMTCO2 from logging residue		-36.43	-112.90
kMTCO2 from building materials substitution		16.63	16.63
Total GHG Savings		-52.90	112.15
% to pulp	48%		
kMTCO2 to pulp (yr 0-15)	3,383		

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kMTCO2 Products in use - storage (yr 7.5)		53.13	5.53
kMTCO2 Landfill - storage (yr 7.5)		17.82	23.57
kMTCO2 Biomass energy - annual emission		-94.20	-97.54
Mbtus biomass energy (17.0 Mbtus per dry ton)	14,443,231		
Mwh biomass energy (11550 btu per Kwh)	1,250,496		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	539	35.96	35.96
kMTCO2 Other WP - emission (yr 7.5)		-69.28	-98.89
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		44.76	347.32
kMTCO2 from logging residue		-38.86	-120.42
kMTCO2 from building materials substitution		19.13	19.13
Total GHG Savings		-31.56	114.63
% to elec gen	7%		
kMTCO2 Biomass energy - annual emission	493	-32.89	-32.89
Mbtus Biomass energy (17.0 Mbtus per dry ton)	5,042,625		
Mwh Biomass energy (11550 btu per Kwh)	436,591		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	188	12.55	12.55
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		6.53	50.65
kMTCO2 Logging residue (avg yr 7.5)		-5.67	-17.56
Total GHG Savings		-19.48	12.75
Option Total GHG Savings		-103.93	239.53

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More Light Harvest, Version 2 - 170,000 acres harvested per year

		Kmtco2e (15) Kmtco2e (58)	
		Avg annual GHG Flow	
		2005-2020	
		15 yr. horizon	58 yr. horizon
Acres treated per year (avg forest)	170,000		
Cords removed per acre	2		
Cft removed per acre	256		
Pounds removed per acre (5000 short pounds/cord)	10,000		
Wet Tons removed per acre (2.5 short tons/cord)	5		
Dry Tons removed per acre (.5)	2.5		
MT removed per acre	2.27		
MTC removed per acre (.50 conversion)	1.13		
MTCO2e removed per acre (2.079 CO2e/cord)	4.158		
Total KMTCO2e removed yr 0-15	10,603		
% to durable wood	45%		
kMTCO2 to durable wood (yr 0-15)	4,771		
kMTCO2 Products in use - storage (yr 7.5)		75.61	17.49
kMTCO2 Landfill - storage (yr 7.5)		16.10	35.15
kMTCO2 Biomass energy - annual emission		-136.62	-141.07
Mbtus biomass energy (17.0 Mbtus per dry ton)	11,592,332		
Mwh biomass energy (11550 btu per Kwh)	1,003,665		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	433	28.86	28.86
kMTCO2 Other WP - emission (yr 7.5)		-96.86	-116.74
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		63.13	489.85
kMTCO2 from logging residue		-54.81	-169.84
kMTCO2 from building materials substitution		25.01	25.01
Total GHG Savings		-79.58	168.72
% to pulp	48%		
kMTCO2 to pulp (yr 0-15)	5,089		
kMTCO2 Products in use - storage (yr 7.5)		79.94	8.31
kMTCO2 Landfill - storage (yr 7.5)		26.80	35.46

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kMTCO2 Biomass energy - annual emission		-141.72	-146.74
Mbtus biomass energy (17.0 Mbtus per dry ton)	21,728,754		
Mwh biomass energy (11550 btu per Kwh)	1,881,277		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	811	54.09	54.09
kMTCO2 Other WP - emission (yr 7.5)		-104.23	-148.78
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		67.33	522.51
kMTCO2 from logging residue		-58.46	-181.17
kMTCO2 from building materials substitution		28.77	28.77
Total GHG Savings		-47.47	172.46
% to elec gen	7%		
kMTCO2 Biomass energy - annual emission	742	-49.48	-49.48
Mbtus Biomass energy (17.0 Mbtus per dry ton)	7,586,250		
Mwh Biomass energy (11550 btu per Kwh)	656,818		
kMTCO2 Displaced (950 lbs CO2 per Mwh) annual	283	18.89	18.89
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		9.82	76.20
kMTCO2 Logging residue (avg yr 7.5)		-8.53	-26.42
Total GHG Savings		-29.30	19.18
Option Total GHG Savings		-156.36	360.36

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – INCREASED STOCKING OF POORLY STOCKED LANDS

	Avg annual GHG Flow 2005-2020		
	15 yr. horizon	58 yr. horizon	
Increased Stocking Poorly Stocked Lands With Fast Growing Trees	Kmtco2e (15) Kmtco2e (58)		
Acres 15 years	375,000		
MTC per acre biomass nonsoil (Spruce fir 7.5 yrs)	8.71		
kMTCO2e per acre biomass nonsoil (Spruce fir 7.5 yrs)	0.032		
MTC per acre biomass nonsoil (Spruce fir 58.2 yrs)	26.90		
kMTCO2e per acre biomass nonsoil (Spruce fir 58.2 yrs)	0.098		
kMTCO2e total avg annual acres w 8% adder	860.72	860.72	2,658.26
Option Total GHG Savings - 20%> Spruce Fir		172.14	531.65

**MAINE FORESTRY CLIMATE MITIGATION OPTIONS – ACTIVE
SOFTWOOD INCREASE**

	Avg annual GHG Flow 2005-2020		
		15 yr. horizon Kmtco2e (15)	58 yr. horizon Kmtco2e (58)
Active Softwood Increase			
Acres treated per year (avg forest)	36,000		
Cords removed per acre	2		
Cft removed per acre	256		
Pounds removed per acre (5000 short pounds/cord)	10,000		
Wet Tons removed per acre (2.5 short tons/cord)	5		
Dry Tons removed per acre (.5)	2.5		
MT removed per acre	2.27		
MTC removed per acre (.50 conversion)	1.13		
MTCO2e removed per acre (2.079 CO2e/cord)	4.158		
Total kMTCO2e removed yr 0-15	2,245		
% to durable wood	41.3%		
kMTCO2 to durable wood (yr 0-15)	926		
kMTCO2 Products in use - storage (yr 7.5)		14.68	3.40
kMTCO2 Landfill - storage (yr 7.5)		3.46	6.82
kMTCO2 Biomass energy - annual emission Mbtus biomass energy (17.0 Mbtus per dry ton)	4,089,690	-26.67	-27.48
Mwh biomass energy (11550 btu per Kwh)	354,086		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	153	10.18	10.18
kMTCO2 Other WP - emission (yr 7.5)		-18.80	-24.05
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		12.25	95.09
kMTCO2 from logging residue		-10.64	-32.97
kMTCO2 from building materials substitution		4.86	4.86
Total GHG Savings		-10.69	35.85
% to pulp	44.0%		
kMTCO2 to pulp (yr 0-15)	988		
kMTCO2 Products in use - storage (yr 7.5)		15.52	1.61
kMTCO2 Landfill - storage (yr 7.5)		5.20	6.88
kMTCO2 Biomass energy - annual emission Mbtus biomass energy (17.0 Mbtus per dry ton)	4,217,935	-27.51	-28.49

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Mwh biomass energy (11550 btu per Kwh)	365,189		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	158	10.50	10.50
kMTCO2 Other WP - emission (yr 7.5)		-20.23	-28.88
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		13.07	101.43
kMTCO2 from logging residue		-11.35	-35.17
kMTCO2 from building materials substitution		5.59	5.59
Total GHG Savings		-9.22	33.48
% to elec gen	6.4%		
kMTCO2 Biomass energy - annual emission	144	-9.60	-9.60
Mbtus biomass energy (17.0 Mbtus per dry ton)	1,472,625		
Mwh biomass energy (11550 btu per Kwh)	127,500		
kMTCO2 displaced (950 lbs CO2 per Mwh) annual	55	3.67	3.67
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		1.91	14.79
kMTCO2 Logging residue (avg yr 7.5)		-1.66	-5.13
Total GHG Savings		-5.69	3.72
% herbicide treatment	8.3%		
kMTCO2 Biomass herbicide removal	187	-3.98	-12.33
kMTCO2 Forest Sequestration (stand replacement) (yr 7.5)		1.61	12.47
Total GHG Savings		-2.37	0.14
Option Total GHG Savings		-27.97	73.19

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – FOREST LAND PROTECTION

		Avg annual GHG Flow 2005-2020	
		15 yr. horizon	58 yr. horizon
		Kmtco2e (15)	Kmtco2e (58)
Forest Land Protection			
Forest Savings			
Baseline Forest Cover Acres Lost per year (NRI)	9,440		
30% Land Savings Target over 15 years, annual acres saved	2,832		
MTC per acre saved forest biomass (nonsoil)	44.60		
MTC per acre forest soil saved - 25% loss on 2/3 acres, 100% loss 0.1155 acres	8.75		
kMTCO2e per acre saved forest (nonsoil)	0.163		
kMTCO2e per acre saved forest (soil)	0.032		
kMTCO2e saved per acre per year total	0.195		
kMTCO2e total acres saved per year total biomass and soil	553.02	553.02	553.02
kMTCO2e credit for wood products & landfills		-90.60	-44.32
kMTCO2 credit from building materials substitution		-29.38	-29.38
kMTCO2 displaced electric power		-58.03	-59.94
Total GHG savings from forest cover and soils		375.01	419.38
Transportation Savings			
Acres of land cover saved 15 years	42,480		
Acres of land cover saved per year	2,832		
Housing units affected (3 home per acre LC average)	2,113		
Density increases resulting from land conservation	144.12%		
VMT per household before	22,000		
VMT per household after	20,900		
Gallons fuel reduction per HH from land conservation	51		
KMTCO2e avoided per HH from land conservation/VMT annual	0.000455		
KMTCO2e avoided all HH from land conservation/VMT annual	0.96		
Total GHG Transportation Savings		0.96	0.96

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Option Total GHG Savings	375.97	375.97
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MAINE FORESTRY CLIMATE MITIGATION OPTIONS – INCREASED AGE OF FORESTS

Increased Age of Forests - TBD

Avg annual GHG Flow
2005-2020
15 yr. horizon 58 yr. horizon
Kmtco2e (15) Kmtco2e (58)

**MAINE FORESTRY CLIMATE MITIGATION OPTIONS – AFFORESTATION
AND RESTORATION OF NONFORESTED LANDS**

Avg annual GHG Flow
2005-2020

15 yr. horizon 58 yr. horizon

**Afforestation And Restoration Of
Nonforested Lands - TBD**

Kmtco2e (15) Kmtco2e (58)

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – INCREASED USE OF SHORT ROTATION WOOD CROPS (SRWC)

Avg annual GHG Flow
2005-2020

15 yr. horizon 58 yr. horizon

Increased Use Of Short Rotation Wood Crops (SRWC) - TBD

Kmtco2e (15) Kmtco2e (58)

**MAINE FORESTRY CLIMATE MITIGATION OPTIONS – BIOMASS
ELECTRICITY FEEDSTOCKS, VERSIONS 1 & 2**

	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
Biomass Electricity Feedstocks (Displacement Only) - Version1 Options	Kmtco2e (15)	Kmtco2e (58)
Early commercial thin – 40,000 acres	136.36	136.36
More light harvests – 113,000 acres	67.69	67.69
Active softwood increase	24.35	24.35
Option Total GHG Savings	228.40	228.40

	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
Biomass Electricity Feedstocks (Displacement Only) - Version2 Options	Kmtco2e (15)	Kmtco2e (58)
Early commercial thin – 80,000 acres	272.73	272.73
More light harvests – 170,000 acres	101.84	101.84
Active softwood increase	24.35	24.35
Option Total GHG Savings	398.91	398.91

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – EXPANDED USE OF WOOD PRODUCTS, VERSIONS 1 & 2

	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
Expanded Use of Wood Products (Storage and Displacement) - Version1 options	Kmtco2e (15)	Kmtco2e (58)
Early commercial thin – 40,000 acres	169.99	61.41
Regular light harvests – 113,000 acres	139.15	52.91
Active softwood increase	40.64	15.45
Option Total GHG Savings	349.77	129.77
Expanded Use of Wood Products (Storage and Displacement) - Version2 options	Kmtco2e (15)	Kmtco2e (58)
	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
Early commercial thin – 80,000 acres	339.97	122.83
Regular light harvests – 170,000 acres	209.34	79.60
Active softwood increase	40.64	15.45
Option Total GHG Savings	589.95	217.87

MAINE FORESTRY CLIMATE MITIGATION OPTIONS – COMBINED SAVINGS OF OPTIONS, VERSIONS 1 & 2

	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
COMBINED FORESTRY PACKAGE GHG SAVINGS – Version1 options		
Early commercial thin – 40,000 acres	-158.40	331.73
More light harvests – 113,000 acres	-103.93	239.53
Increased Stocking With Fast Growing Trees	172.14	531.65
Active softwood increase	-27.97	73.19
Increased Age of Forests	TBD	TBD
Forest Protection	375.97	375.97
Biomass Electricity Feedstocks (counted in measures above)	228.40	228.40
Expanded Use of Wood Products (counted in measures above)	349.77	129.77
COMBINED FORESTRY PACKAGE GHG SAVINGS – Version2 options		
	Kmtco2e (15) Kmtco2e (58)	
	Avg annual GHG Flow 2005-2020	
	15 yr. horizon	58 yr. horizon
Early commercial thin – 80,000 acres	-316.80	663.46
More light harvests – 170,000 acres	-156.36	360.36
Increased Stocking With Fast Growing Trees	172.14	531.65
Active softwood increase	-27.97	73.19
Increased Age of Forests	TBD	TBD
Forest Protection	375.97	375.97
Biomass Electricity Feedstocks (counted in measures above)	398.91	398.91
Expanded Use of Wood Products (counted in measures above)	589.95	217.87

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