Chapter 5
Forestry, Agriculture, and Waste Management Sectors

Overview of GHG Emissions

The forestry, agriculture, and waste management (FAW) sectors are responsible for small amounts of Alaska's current greenhouse gas (GHG) emissions. The combined contribution from the agriculture and waste management sectors to carbon dioxide equivalent (CO_2e) gross emissions in 2005 was 0.68 million metric tons (MMt), or about 1.3% of the state's gross emissions (excluding forest carbon sinks). Of the FAW sectors' total gross emissions, the emissions from the agriculture sector are minimal, comprising about 0.1% of the state's gross emissions. Alaska's coastal forests were responsible for the sequestration of 1.4 million metric tons of carbon dioxide equivalent ($MMtCO_2e$) in 2005. It is important to note that the FAW sector emissions exclude combustion-related GHGs, such as diesel fuel consumption in the agriculture and forestry sectors. These fuel combustion emissions are included as part of the industrial fuel combustion sector and are covered in the Residential, Commercial, and Industrial (RCI) Sectors chapter. Within the waste management sector, only direct emissions from landfills, waste combustion, and wastewater treatment plants are counted toward the waste management sector emissions. Indirect emissions from the collection of waste and on-site operations that include fossil fuel combustion and electricity use are not counted in the waste management inventory (these are represented in the transportation, industrial combustion, and electricity generation sectors, respectively).

Agricultural emissions include methane (CH_4) and nitrous oxide (N_2O) emissions from enteric (intestinal) fermentation, manure management, agriculture soils, and agriculture residue burning. As shown in Figure 5-1, N_2O emissions from nitrogen inputs to soils (agricultural soils: crops, livestock, and fertilizer) represent about half of the sector emissions, while livestock production (manure management, enteric fermentation) contribute the other half. Note again the Y-axis of Figure 5-1, indicating the very small contributions from the agriculture sector in Alaska.

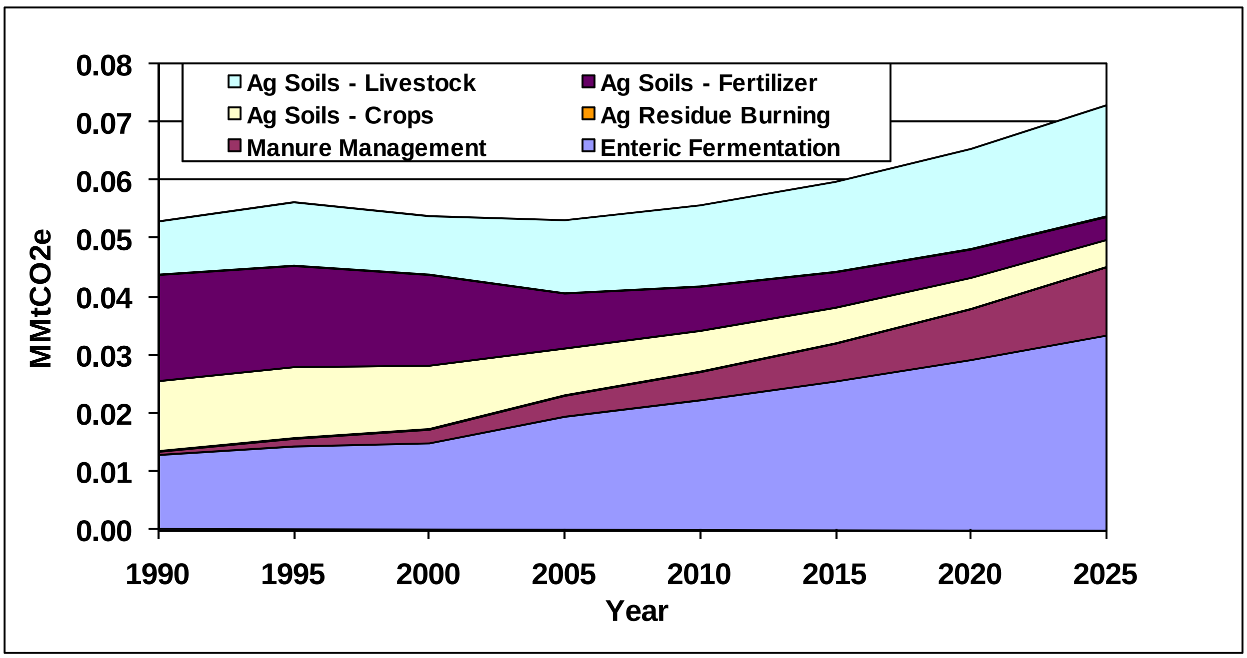
Forestland emissions refer to the net carbon dioxide (CO_2) flux[1] from forested lands in Alaska, which account for about 35% of the state's land area.[2] About 10% of Alaska's forests are temperate coastal forests, with the remainder being the interior boreal forests. Sitka spruce, hemlock, and cedar are the dominant species in the southeast and south-central coastal parts of the state, while white spruce, black spruce; black cottonwood, aspen, and paper birch are found in the interior forests. As described further below, the Alaska inventory and forecast (I&F), Appendix D, included an assessment of the CO_2 flux from natural and managed forests, although only the net emissions from the managed forests are counted toward the anthropogenic (human-caused) GHG inventory of Alaska's forestry sector.

[1] "Flux" refers to both emissions of CO_2 to the atmosphere and removal (sinks) of CO_2 from the atmosphere.

[2] Alaska Forest Association, http://www.akforest.org/facts.htm, reports 129 million acres of forested lands. The total land area in Alaska is 365 million acres (http://www.netstate.com/states/geography/ak_geography.htm). Data used in this appendix from the University of Alaska-Fairbanks are based on geographic information indicating that Alaska has about 162 million acres of forested lands (about 23 million acres are in the temperate [coastal] maritime forest).

In keeping with U.S. Environmental Protection Agency (EPA) methods and international reporting conventions, the Alaska I&F covers sources of GHGs from human activities. There are also notable natural sources of GHGs that are addressed in the forestry sector of the I&F; however, these are not included as part of the state's baseline (anthropogenic) emissions. The most notable of these are CO_2 emissions from forest carbon stock losses in the boreal forest, which are thought to be significant (see the Forestry appendix of the I&F report for more details). In Alaska's I&F, the boreal forest is treated as a natural source, since there is minimal forest management. In contrast, the state's coastal forests are actively managed for the production of wood products and are treated as anthropogenic sources (as are all forests in the contiguous United States). GHG reporting conventions treat all managed forests as anthropogenic sources. Sources, such as CO_2 from forest fires and decomposing biomass, are captured within the I&F (as part of the carbon stock modeling performed by the U.S. Forest Service). However, CH_4 emissions from decomposition of organic matter/biomass in forests are not currently captured due to a lack of data. This methane is from decomposition in oxygen-free (anaerobic) areas, particularly marshes and bogs.

Figure 5-1. Historical and projected gross greenhouse gas emissions from the agriculture sector, Alaska, 1990–2025



Ag = agriculture. $MMtCO_2e$ = million metric tons of carbon dioxide equivalent. Agricultural burning emissions are too small to show on the chart.

As shown in Table 5-1, University of Alaska-Fairbanks (UAF) data suggest that Alaska's coastal (managed) forests sequestered about 1.4 $MMtCO_2e$/year in 2005. According to UAF data, there are minimal non-CO_2 emissions from managed fire in the coastal forests of Alaska. The negative numbers in Table 5-1 indicate a CO_2 sink rather than a source. Hence, during this period, forest carbon losses due to forest conversion, wildfire, disease, and removals were estimated to be smaller than the CO_2 sequestered in forest carbon pools, such as live trees, debris on the forest floor, and forest soils. The forecast for the sector out to 2025 remains a net sequestration of –1.4

$MMtCO_2e$, which is the total for just the managed coastal forests in the state for the reasons described above.

For a more complete understanding of the estimated GHG emissions from managed and unmanaged forests in the state, Table 5-1 provides information developed by UAF researchers for both. These estimates are not included in the statewide GHG inventory of anthropogenic emissions for the reasons described above. In 2025, it is shown that these forests (mostly interior boreal forests) are estimated to produce a net emission of over 53 $MMtCO_2e$ (state-level flux total minus the estimate for managed forests, which rivals the state's total anthropogenic emissions (see Chapter 2). About two-thirds of this is contributed by CH_4 emissions in both forested areas of the state, excluding the coastal forests (for which estimates were not available). While not included in Table 5-1, methane emissions from the tundra (treeless) ecosystems of the state could be even more significant than those shown here for the inland forested areas (potentially a factor of 3 or more).

Table 5-1. Forestry and land-use flux and reference case projections ($MMtCO_2e$)

Source	CO_2e Flux ($MMtCO_2e$)[a]					
	1990	2000	2005	2010	2020	2025
State-Level Forest Flux						
CO_2 Flux	4.6	12	12	12	12	12
Non-CO_2 Gases From Fire	4.5	4.9	4.9	4.9	4.9	4.9
CH_4 Flux[b]	16	21	24	26	31	36
Total—State Level	**25**	**38**	**41**	**43**	**48**	**53**
Flux for Managed Forests[c]						
CO_2 Flux	–0.3	–1.4	–1.4	–1.4	–1.4	–1.4
Non-CO_2 Gases From Fire	0.0	<0.01	<0.01	<0.01	<0.01	<0.01
CH_4 Flux	N/A	N/A	N/A	N/A	N/A	N/A
Total—Managed Forests	**–0.3**	**–1.4**	**–1.4**	**–1.4**	**–1.4**	**–1.4**

Positive values represent net CO_2e emissions. Non-CO_2 gases are methane and nitrous oxide.

[a] Values reported are 10-year averages of annual data surrounding the year reported (e.g., 1990 average is the average of data for 1985–1994). For 2000, data are only available through 2002. After 2000, flux estimates are assumed to remain constant.

[b] Includes total statewide emissions from forested areas, excluding the coastal forests. The UAF estimate for the 1980–1996 period was used for 1990. The UAF growth rate of 0.5 $MMtCO_2e$/yr was used for forecast years. See the section on CH_4 emissions from Alaskan ecosystems in the Forestry appendix of the I&F report.

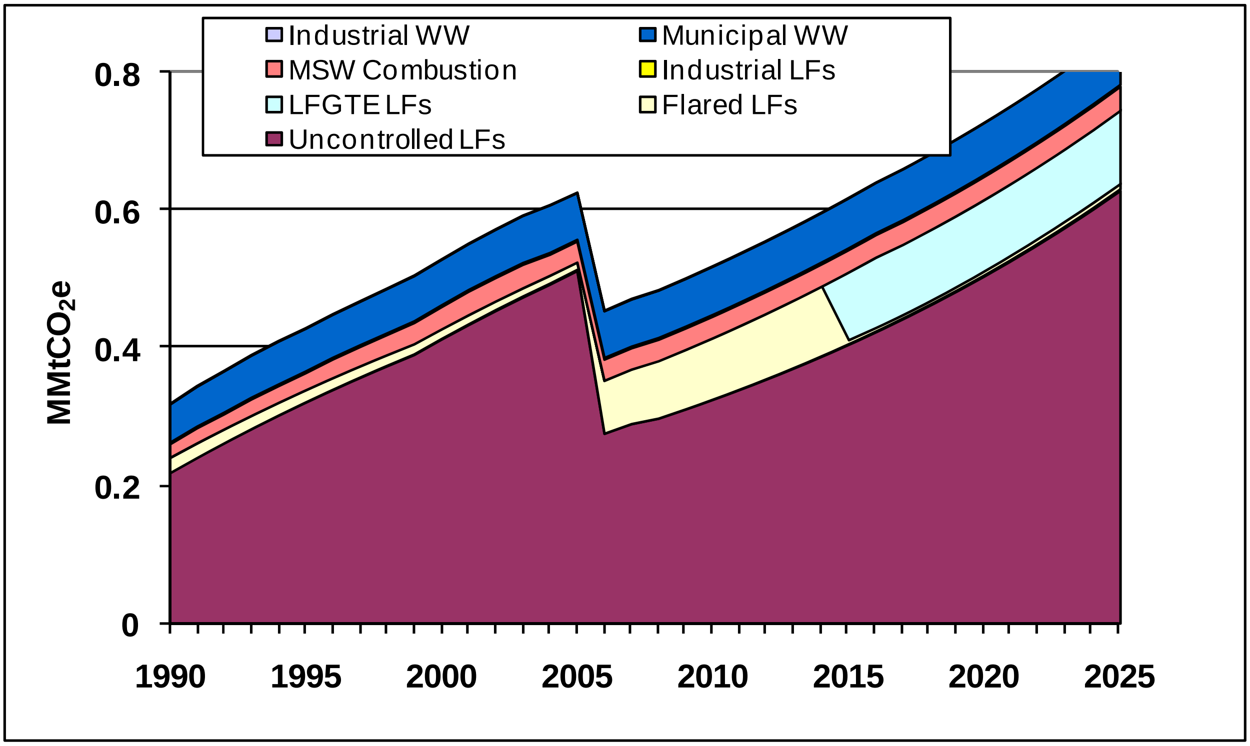
[c] Managed forests are the coastal maritime forests of the state. CH_4 flux estimates were not available for managed forests.

CH_4 = methane; CO_2 = carbon dioxide; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; N/A = not applicable.

Figure 5-2 shows estimated historical and projected emissions from the management and treatment of solid waste and wastewater. Emissions from waste management consist largely of CH_4 emitted from landfills, while emissions from wastewater treatment include both CH_4 and N_2O. Emissions are also included for municipal solid waste (MSW) combustion. Overall, the waste management sector accounted for about 1.2% of Alaska's total gross emissions in 2005. While emissions are expected to grow significantly by 2025, the contribution to the state's total is expected to increase to only 1.4%.

For municipal solid waste landfills (LFs), emissions were estimated for three categories: uncontrolled sites; sites with methane collection and flaring; and sites with methane collection and landfill gas-to-energy (LFGTE) equipment. The landfill emissions shown in Figure 5-2 represent the methane emissions that are not collected and combusted. The first key shift in Figure 5.2 occurs around 2006, when the Anchorage landfill began flaring landfill gas. This action accounts for the noticeable reduction in emissions around 2006 in Figure 5-2. The second shift in emissions is predicted for 2015, when an LFGTE project comes online at the Anchorage landfill, generating energy from the landfill gas that was previously flared. (Levels of uncaptured methane emissions remain the same; however, the landfill category changes from flared to LFGTE.) The direct emissions from the waste management sector are expected to increase by more than a factor of 2.5 from 1990 to 2025 under business-as-usual conditions.

Figure 5-2. Estimated historical and projected greenhouse gas emissions from waste and wastewater management in Alaska, 1990–2025



$MMtCO_2e$ = million metric tons of carbon dioxide equivalent; MSW = municipal solid waste; LFs = landfills; LFGTELFs = landfill gas-to-energy landfills; WW = wastewater.

Key Challenges and Opportunities

While the FAW sectors are not shown to contribute substantially to Alaska's net GHG emissions, they still have substantial opportunity to reduce emissions within both their own sectors as well as other sectors. The principal means identified to reduce emissions from actions taken in the FAW sectors were to:

- Adopt management practices to increase carbon sequestration or mitigate future carbon losses in forestlands;

- Improve production and utilization of biomass for use in both solid fuel and liquid fuel applications offsetting the use of fossil fuels; and

- Improve methods for managing and recycling MSW.

Opportunities for GHG mitigation in the FAW and other sectors include advanced recycling of MSW emissions from end-of-life management (landfilling, waste combustion), as well as the emissions associated with the embodied energy in the waste materials (i.e., the energy associated with the production and transport of packaging and products). Production and use of biofuels can offset emissions from fossil fuel combustion in the electricity supply, RCI, energy use, and transportation sectors.

Enhanced management of the state's forests can lead to higher levels of carbon sequestration. These enhancements can be achieved through reforestation projects in the state's boreal forest following severe wildfires or infestation by insects or disease. Wildfire fuel treatment projects reduce the risk of severe wildfires and minimize the subsequent losses of forest carbon sequestration in addition to protection of property around boreal communities. These fuel reduction projects have the potential to generate biomass for use as solid fuel or liquid/gaseous fuel feedstock that would offset the use of fossil fuels in other sectors.

In the state's coastal forest, pre-commercial thinning (PCT) projects in managed forests create higher levels of carbon storage per unit area in trees that will ultimately yield carbon sequestered in durable wood products (e.g., building frames, furniture).[3] These durable wood products can sequester carbon for decades or longer.

Overview of Policy Recommendations and Estimated Impacts

The Alaska Climate Change Mitigation Advisory Group (MAG) recommends a set of three policies for the FAW sector that offer the potential for economic benefits and emission savings. Implementing these policy recommendations could lead to emission reductions of:

- 1.1 $MMtCO_2e$/year by 2025, and
- 9.5 $MMtCO_2e$ cumulative from 2009 through 2025, after adjusting for overlaps with other sectors.

The overall cost-effectiveness of the FAW recommended policies is about $25 per metric ton of CO_2 equivalent. (tCO_2e). This average value includes policies that have both cost savings and much higher likely costs per ton (see Table 5-2).

The three policy recommendations for the FAW sectors address a diverse array of activities capturing emission reductions both within and outside of these sectors (e.g., energy consumption in the energy supply and demand (ESD) and transportation and land use (TLU) sectors). The estimated impacts of the individual policies are shown in Table 5-2. The MAG policy recommendations are described briefly here and in more detail in Appendix H of this report. The

[3] PCT is the removal of trees not for immediate financial return, but to reduce the stocking to concentrate growth on the more desirable trees. PCT is generally done between the ages of 15 and 25 years in southeast Alaska, with the ages being lower in the more productive southern half of the forest.

recommendations not only result in significant emission reductions, but also offer a host of additional benefits, including protection of biodiversity and watersheds, economic development, and job growth. To yield the levels of savings described here, the recommended policies need to be implemented in a timely, aggressive, and thorough manner.

The following are primary opportunities for GHG mitigation identified and approved unanimously by the MAG:

- **Forest management for carbon sequestration:** One of the ways in which the state's coastal forests could be managed to increase the potential for long-term carbon sequestration would be through conducting more PCT and commercial thinning (CT) projects (FAW-1A).[4] Over time, these projects shift the carbon in biomass from smaller-diameter to larger-diameter trees that can be harvested for use in durable wood products. The carbon in durable wood products is stored over long periods in the form of structures, furniture, and other products. At the time of harvest, a forest stand that has received management via PCT will yield more timber for durable wood products than a similar stand that has not been thinned. As indicated in Table 5-2 below, the MAG opted not to report the future incremental carbon sequestered as a result of forest thinning projects, since the reductions are not assured until harvest, which would occur outside of the policy period (i.e., beyond 2025).

- **Enhancement/protection of forest carbon sinks:** Through a variety of programs, enhanced levels of CO_2 sequestration can be achieved and carbon can be stored in the state's forest biomass. These include reforestation programs, particularly in the boreal forest in areas impacted by severe wildfire (FAW-1D). These tend to be areas that might not regenerate and come back under forest cover for many decades. While the cost-effectiveness was estimated at the higher end of the range of all quantified options (~\$92/tCO_2), achieving the goals of FAW-1D was estimated to produce 150,000 tCO_2 reductions annually by 2025 (see Table 5-2).

- **Wildfire Fuel Treatment Programs:** Forest protection can be achieved through fuel treatment programs that reduce the risk of catastrophic (stand-replacement) wildfires (FAW-1B and 1C). These programs protect existing carbon stocks, along with their annual potential for continued carbon sequestration. Due to a current lack of information to quantitatively assess the GHG reductions for reduced wildfire risk achieved by fuel treatment programs, the MAG approved FAW-1 elements B and C as non-quantified policies (as shown in Table 5-2).

- **Expanded use of biomass feedstocks to produce energy:** Expanded use of renewable energy from biomass removed from forests during wildfire risk reduction programs, mill residues, lawn and garden waste, or MSW can achieve GHG benefits by offsetting fossil fuel consumption (to produce either electricity or heat/steam). FAW-2A and 2B offer two recommendations for achieving GHG reductions in this area. Combined, these two elements would produce 220,000 tCO_2e in reductions annually in 2025. Production of renewable fuels, such as ethanol from forestry biomass or MSW, can produce significant reductions when they are used to offset consumption of fossil fuels (e.g., gasoline in transportation).

[4] CT is any type of thinning producing merchantable material at least equal to the value of the direct costs of harvesting. The age range for conducting CT on highly productive lands is considered 55–60 years.

This is particularly true when these fuels are produced using processes and/or feedstocks that have much lower fossil fuel inputs than those from conventional sources (sometimes referred to as “advanced” or “next-generation” biofuels). The goals of FAW-2C produced an estimated reduction of 90,000 tCO_2e in 2025 at a cost of $52/$tCO_2e$.

- **Changes in MSW management practices:** By promoting source reduction, advanced MSW recycling practices, and improved organics management, the overall GHG emissions associated managing MSW can be reduced. The reductions come from lower landfill methane emissions and lower CO_2, CH_4, and N_2O emissions from waste combustion in the state. Even larger reductions are achieved when product life-cycle emissions are considered. By generating less waste in the first place or recycling waste that is generated, the emissions associated with product/packaging production and transport are reduced. It is important to note that these life-cycle emission reductions occur both within and outside Alaska, depending on where the product/packaging originated. When the life-cycle GHG reductions of source reduction/recycling/organics management are considered, these programs yield 650,000 tCO_2e/yr in reductions by 2025. An overall cost savings was estimated for this policy (–$8/$tCO_2e$), primarily through avoided landfill costs.

Table 5-2. Summary list of Forestry, Agriculture, and Waste Management policy recommendations

Policy No.	Policy Recommendation	GHG Reductions MMtCO$_2$e)				Net Present Value 2010–2025 (2005 $MM)	Cost-Effective-ness ($/tCO$_2$e)	Level of Support
		2015	2020	2025	Total 2010–2025			
FAW-1	Forest Management Strategies for Carbon Sequestration							
	A Coastal Forest Management Pre-Commercial Thinning	Included under FAW-2, along with all options using biomass in other sectors						Unanimous
	B. Boreal Forest Mechanical Fuels Treatment Projects							Unanimous
	C. Community Wildfire Risk Reduction Plans							Unanimous
	D. Boreal Forest Reforestation After Fire or Insect and Disease Mortality	0.09	0.12	0.15	1.6	$150	$92	Unanimous
FAW-2	Expanded Use of Biomass Feedstocks for Energy Production							
	A. Biomass Feedstocks to Offset Heating Oil Use	0.01	0.03	0.04	0.3	$27	$90	Unanimous
	B. Biomass Feedstocks for Electricity Use	0.07	0.12	0.18	1.5	$59	$38	Unanimous
	C. Biomass Feedstocks to Offset Fossil Transportation Fuels	0.03	0.06	0.09	0.8	$41	$52	Unanimous
FAW-3	Advanced Waste Reduction and Recycling	0.27	0.45	0.65	5.3	–$43	–$8	Unanimous
	Sector Total Before Adjusting for Overlaps	0.47	0.78	1.11	9.5	$234	$25	
	Sector Total After Adjusting for Overlaps	0.47	0.78	1.11	9.5	$234	$25	
	Reductions From Recent Actions (CAFE standards)	N/A	N/A	N/A	N/A	N/A	N/A	
	Sector Total Plus Recent Actions	0.47	0.78	1.11	9.5	$234	$25	

CAFE = corporate average fuel economy; FAW = Forestry, Agriculture, and Waste Management (Technical Work Group); GHG = greenhouse gas; $MM = million dollars; MMtCO$_2$e = million metric tons of carbon dioxide equivalent; $/tCO$_2$e = dollars per metric ton of carbon dioxide equivalent.

Note that negative costs represent a monetary savings.

Overlap Discussion

The amount of GHG emissions reduced or sequestered and the costs of a policy recommendation within the sectors considered in the MAG process in some cases overlap with other policies in the same sector. For the FAW Technical Work Group recommendations to the MAG, there is overlap between FAW-1 and FAW-2 for the production and utilization of biomass. FAW-1 elements A–C all have the potential to produce biomass that can be used for fuel feedstocks under FAW-2. Note that for FAW-1A, the MAG recognizes that the costs to collect, process, and transport most of the biomass generated from coastal forest thinning projects will be too costly to use as an energy source. The biomass feedstocks generated from the FAW-1 elements was added to the FAW biomass supply assessment (see Appendix H). The GHG reductions for using the biomass from FAW-1 or other sources were quantified under FAW-2.

There are no overlaps between the FAW biomass policies and the policies in the ESD or TLU sectors. Biomass demand from ESD-3 has been accounted for in the biomass supply/demand assessment provided in Appendix H.

Forestry, Agriculture, and Waste Management Sector Policy Descriptions

The FAW sectors include emission mitigation recommendations related to the protection and enhancement of forest carbon sinks, the use of biomass energy and production of renewable biomass fuels, and lower MSW management emissions through source reduction and advanced recycling waste. Details on the structure of these recommendations, possible implementation methods, and their estimated GHG reductions and costs can be found in Appendix H.

As part of the work conducted by the MAG and to support work in other sectors, an assessment of biomass feedstock supply and demand was conducted in the FAW sectors. The results of this assessment are provided in Appendix H following the initial summary table. Briefly, the total biomass feedstock that would be available at a delivered cost of less than $40/dry ton was nearly 500,000 dry tons/yr considering all feedstocks. With a delivered cost estimate of less than $100/dry ton, the total available feedstocks were estimated to be about 1.2 million dry tons/yr. The total demand from recommendations in the FAW and other sectors was estimated to be 527,000 dry tons/yr.

FAW-1. Forest Management Strategies for Carbon Sequestration

Alaska forests can play a unique role in both preventing and reducing GHG emissions while providing for a wide range of social and environmental benefits. These benefits include clean air and water, wildlife habitat, recreation, subsistence activities, forest products, and a host of other uses and values. Carbon is stored in the above-ground biomass and in the organic and mineral components of the soil. Permafrost soils add an additional dimension and complication to the role soils play in the boreal, subarctic, and arctic ecosystems, and the potential impacts of increased wildland fire in these regions have wide-ranging implications. Additionally, the state has two distinct forest ecosystems—the boreal and coastal forests—and the types of forest management activities that may apply to each from a carbon management perspective may also differ.

Coastal Forest Policy Options

- Increase the amount of durable wood products produced from managed forests. Durable wood products produced as part of the timber harvest can serve to effectively sequester carbon for extended periods. Examples of management practices could be:

- Extended rotations;
- PCT or commercial thinning CT of young-growth stands of timber;
- Fertilization treatments; and
- Other silvicultural treatments that would meet the intent of this policy recommendation.

- Consider is the lower energy intensity of wood product manufacture when compared with other building products. Wood substitution prevents GHG emissions because it is typically less carbon intensive in production compared with wood substitutes (e.g., cement, steel, and plastic).

The quantification of GHG reductions from management options in the coastal forest were based on a goal of thinning 4,000 acres/yr by 2010, 8,000–10,000 acres/yr by 2015, and 6,000 acres/yr by 2025. See Appendix H, FAW-1 Element A for more details.

Boreal Forest Policy Options

- Implement fuel-reduction projects that utilize both prescribed fire and mechanical treatments to reduce fuel loads and burn intensity and overall GHG emissions in wildland fires.
- Complete Community Wildfire Protection Plans to identify fuel types and community risks to aid in prioritization of fuel treatment work.
- Rapidly reforest sites impacted by fire or by insect and disease outbreaks to ensure full stocking and a quick return to forest cover.

The quantification of GHG reductions from management options applied in the boreal forest included three approaches: Element B—mechanical fuel treatments of 2,500 acres annually by 2025, Element C—development and implementation of community wildfire risk reduction plans (75 plans by 2025), and Element D—complete boreal forest reforestation projects on 25% of high-site-class lands by 2025.[5] See Appendix H, FAW-1 Elements B–D for more details.

This option was unanimously approved by the MAG.

FAW-2. Expanded Use of Biomass Feedstocks for Energy Production

This policy recommendation would increase the amount of biomass available from forestry and MSW for generating heat/electricity and liquid/gaseous biofuels to displace the use of fossil energy sources. It would also foster the development of biomass-to-energy projects where they are compliant with environmental requirements.

The FAW-2 recommendation included three elements. FAW-2A is a goal to use biomass feedstocks to offset 10% of the state's heating oil use in commercial and residential applications

[5] An estimate of high-site-class lands (areas with significant potential for soil erosion as a result of severe wildfire) is not yet available for Alaska. As a surrogate estimate, the Center for Climate Strategies used estimates of areas with "high burn severity" as defined by the U.S. Geological Survey and U.S. Forest Service in the Monitoring Trends in Burn Severity Program, available at: http://mtbs.gov/index.html.

by 2025. The quantification of this goal envisioned the use of community-scale biomass combustion units to provide distributed heating in Alaska communities that have access to biomass feedstocks and that currently rely on heating oil to supply much of their commercial and residential heating. In the latter part of the policy period (after 2015), the recommendation assumes that these types of applications will also be able to economically provide both heating as well as co-generation of electricity for community use (again, these combined heating and power units would displace local fossil fuel-based generation units).

FAW-2B is a goal to use biomass feedstocks to produce 5% of the state's electricity by 2025. The analysis of reductions and costs for this element assumed that biomass would be used to co-fire with coal in the state's existing coal-fired power plants, although the analysis considers the net reductions and costs of using biomass as a fuel source as compared to the mix of fossil fuels that make up the state's current generating capacity (72% coal, 15% oil, 13% natural gas).

Finally, FAW-2C is a goal to use biomass feedstocks to produce sufficient biofuels to offset 5% of the state's fossil transportation fuels. The analysis of this policy assumes that the goal is met through production and consumption of cellulosic ethanol. Under this scenario for meeting the recommendation's goal, by 2025, the state would need five cellulosic ethanol plants that would produce 12 million gallons of ethanol. Biomass feedstock requirements are estimated at 124,000 dry tons/yr by 2025.

This policy was unanimously approved by the MAG.

FAW-3. Advanced Waste Reduction and Recycling

This policy recommendation will reduce overall waste generation and GHG emissions through increased recycling and active management of organic wastes. Recycling decreases upstream GHG emissions from material production and transportation, and management of organic wastes decreases downstream GHG emissions associated with the production of methane in landfills. This policy will also increase economically sustainable recycling and organic management efforts, including new and existing programs, by encouraging participation of both residential and commercial consumers, by identifying existing markets and technologies, and by supporting the development of necessary in-state infrastructure. Overall accomplishment of the goal will be documented via a reduction in the volume of waste deposited into landfills.

The overall goal of FAW-3 is to reduce the overall waste stream (MSW directed into either landfills or waste combustion) by 25% by 2025. The recommendation envisions achieving this goal through a combination of MSW management approaches. Source reduction and reuse reduce the waste stream by addressing and minimizing waste generation at its source. For waste that can not be reduced at the source, increased MSW diversion (from landfills or waste combustion) can produce substantial net GHG benefits through recycling programs or organics management approaches, including composting. As described in detail under FAW-3 in Appendix H, the significant life-cycle GHG reductions in 2025 totaled 650,000 tCO_2e. A net cost savings was estimated for this policy largely through avoided landfilling costs.

This policy was unanimously approved by the MAG.