Chapter 6
Agriculture, Forestry, and Waste Management

Overview

The agriculture, forestry, and waste management (AFW) sectors are responsible for moderate amounts of Florida's current greenhouse gas (GHG) emissions. The total AFW contribution to carbon dioxide equivalent (CO_2e) gross emissions in 2005 was 15 million metric tons (MMt), or about 11 percent of the state's total. The AFW contribution to net emissions in 2005 was 3 percent of the state's total, after accounting for the net sequestration of carbon in the forestry sector.

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 6-1, emissions from soil carbon losses from agricultural soils, livestock soils, manure management, enteric fermentation, and fertilizer application all make significant contributions to the sector totals. Emissions include CO_2 emissions from oxidized soil carbon, application of urea, and application of lime. Sector emissions also include nitrous oxide emissions resulting from activities that increase nitrogen in the soil, including fertilizer (synthetic, organic, and livestock) application and production of nitrogen-fixing crops (legumes), and methane emissions from rice cultivation. There is no significant agricultural burning activity in Florida; therefore the emissions were estimated to be zero (forest prescribed burning is covered under the forestry sector).

Note that, in keeping with the U.S. Environmental Protection Agency's (EPA) methods and international reporting conventions, the inventory and forecast covers sources of GHGs from human activities. There could be some natural sources of GHGs that are not represented in the inventory and forecast; however these are not addressed in the Governor's Action Team on Energy and Climate Change (Action Team) process. In the forestry sector, since all of the state's forests are managed in some way, all emissions are treated as "anthropogenic," or from human activities. 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 inventory and forecast (as part of the carbon stock modeling performed by the U.S. Forest Service [USFS]). However, methane 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.

The CO_2 emissions occurring from the cultivation of organic soils always has been a primary contributor to the state's total agricultural GHG emissions. By 2025, the contribution from this source is estimated to be more than 70 percent of the total agricultural emissions. Methane emissions from digestive processes in ruminant animals, known as enteric fermentation, are declining due to lower animal populations; however, they are estimated to be the second

highest contributor to agriculture sector totals in 2025 at about 13 percent. The next highest contributor in 2025 is estimated to be livestock manure application to soils at about 6 percent.

Forestry and land use emissions refer to the net carbon dioxide (CO_2) flux[1] from forested lands in Florida, which account for about 47 percent of the state's land area. The inventory is divided into two primary subsectors: the forested landscape, and urban forestry and land use. Both subsectors capture net carbon sequestered in forest biomass, urban trees, landfills, and harvested wood products. In addition, other GHG sources such as nitrous oxide emissions from fertilizer application in urban areas and CH_4 and N_2O emissions from prescribed burns and wildfires are included.

As shown in Table 6-1, USFS data suggest that Florida's forests sequestered about 21 $MMtCO_2e$ per year in 2005 (this excludes estimates of carbon flux from forest soils based on recommendations from the USFS). The negative numbers in Table 6-1 indicate a CO_2 sink rather than a source. Even after accounting for the GHG sources from urban soils and prescribed burns or wildfires, the forestry and land use sector is still estimated to have been a net GHG sink of more than 20 $MMtCO_2e$ in 2005. Hence, during this period, forest carbon losses due to forest conversion, wildfire, and disease was 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, as well as in harvested wood products (such as furniture and lumber) and the disposal into landfills of forest products. The forecast for the sector out to 2025 shows a slightly declining trend in the levels of sequestration due to losses of forested area associated with development.

Figure 6-2 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 5 percent of Florida'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 remain at about 5 percent.

The Action Team acknowledges that there are higher levels of uncertainty in the GHG emissions and forecasts in the AFW sectors compared with those in other sectors (e.g., those where emissions are tied directly to energy consumption). There is a need for continuing investment in research and measurement to refine the AFW Inventory & Forecast report (details on key uncertainties are presented in the appendices).

Opportunities for GHG mitigation in the AFW sector involve measures that can reduce emissions within the sector or reduce emissions in other sectors. Within the sector, changes in crop cultivation can reduce GHG emissions by building soil carbon (indirectly sequestering carbon from the atmosphere) or through more efficient nutrient application (reducing N_2O

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

emissions and embedded GHG emissions within the nutrients). Reforestation projects can achieve GHG reductions by increasing the carbon sequestration capacity of the state's forests.

Figure 6-1. Historical and projected net GHG emissions from the Agriculture Sector, Florida, 1990–2025

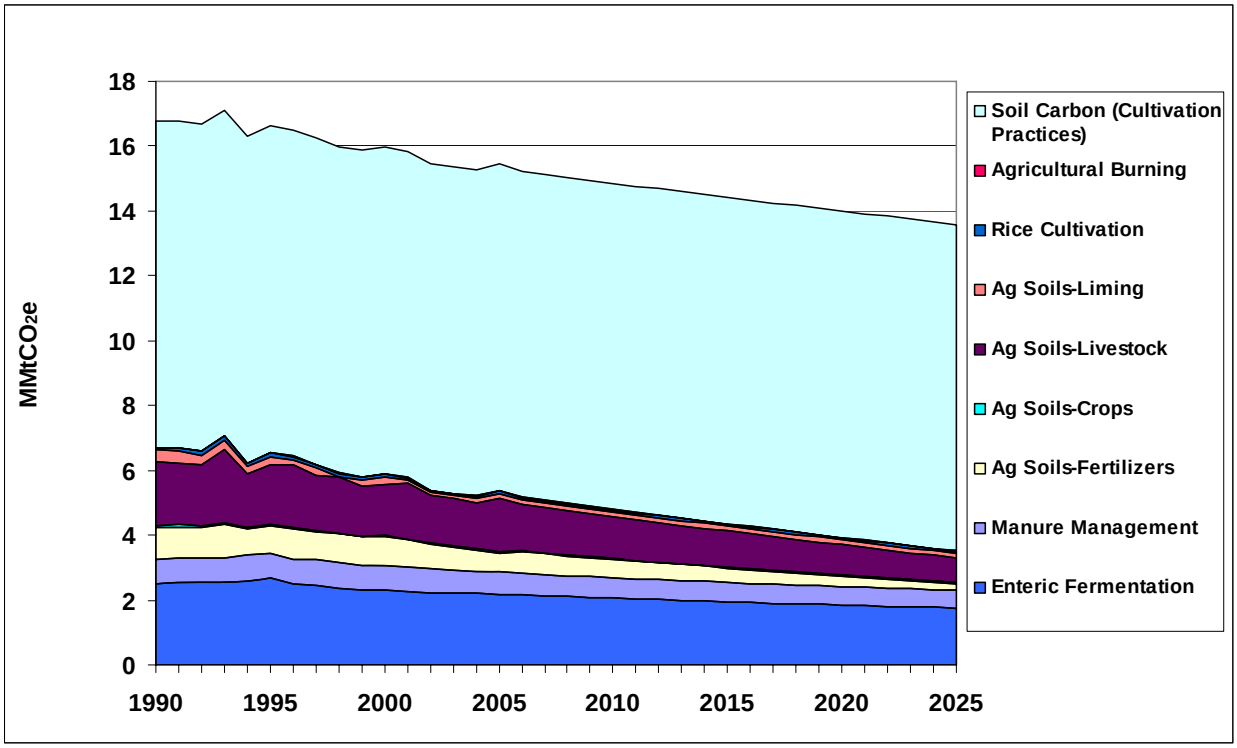
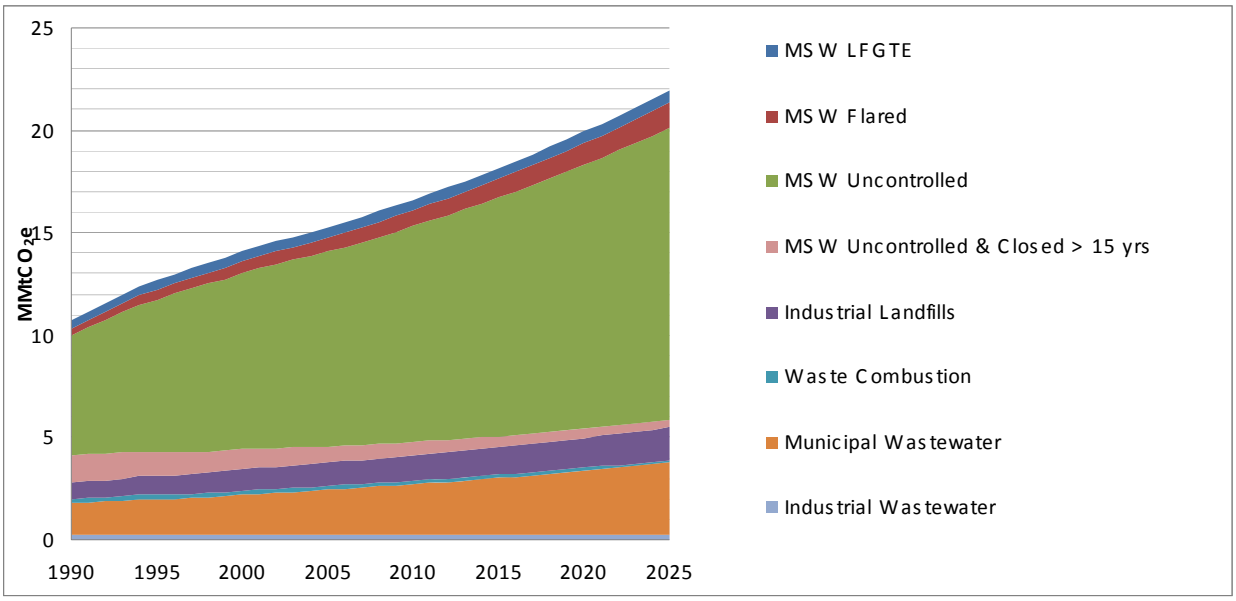


Table 6-1. GHG emissions (sinks) from the Forestry Sector

Subsector	1990	2000	2005	2010	2020	2025
Forested Landscape (excluding soil carbon)	-3.38	-21.1	-21.1	-21.0	-20.9	-20.9
Urban Forestry and Land Use	-14.4	-5.65	-6.23	-6.23	-6.23	-6.23
Forest Wildfires	1.35	1.15	0.16	1.00	1.00	1.00
Forest Prescribed Fires	5.70	4.14	6.66	5.70	5.70	5.70
Sector Total	**-10.8**	**-21.4**	**-20.5**	**-20.5**	**-20.4**	**-20.4**

* Positive numbers indicate net emission. Based on USFS input, emissions from soil organic carbon are left out of the forestry sector summary due to a high level of uncertainty.

Figure 6-2. Estimated historical and projected emissions from waste and wastewater management in Florida



$MMtCO_2e$ = million metric tons carbon dioxide equivalent; MSW = Municipal Solid Waste; LFs = landfills; WW = wastewater.

For GHG reductions outside of the AFW sector, actions taken within the sector such as production of liquid biofuels can offset emissions in the transportation sector, while biomass used to produce electricity or steam can reduce emissions in the energy supply and demand (ESD) sector. Similarly, actions that promote solid waste reduction or recycling can reduce emissions within the sector (future landfill CH_4), as well as emissions associated with the production of recycled products (recycled products often require less energy to produce than similar products from virgin materials). Finally, urban forestry projects can reduce energy consumption within buildings through shading and wind protection.

The following are primary opportunities for GHG mitigation identified by the Action Team:

- **Agricultural crop management:** Implement programs with growers to utilize cultivation practices that build soil carbon and reduce nutrient consumption. By building soil carbon, CO_2 is indirectly sequestered from the atmosphere. New technologies in the area of precision agriculture offer opportunities to reduce nutrient application and fossil fuel consumption. Improved harvesting techniques could also reduce fossil fuel consumption.
- **Agricultural land use management approaches to protect/enrich soil carbon:** Incentive programs are needed to protect crop lands from conversion to developed use or the conversion of lands in conservation programs back to conventional tillage/plowing which releases CO_2. By protecting these areas from development, the carbon in above-ground biomass and below-ground soil organic carbon can be maintained and additional emissions of CO_2e to the atmosphere can be avoided. Indirectly, these measures also support the

objectives of "smart" development by helping to direct more efficient development patterns (see Chapter 5, Transportation and Land Use (TLU), Policy Option TLU-3—Smart Growth Planning).

- **Production of liquid biofuels:** Production of renewable fuels, such as ethanol from crop residue, forestry biomass, or municipal solid waste, and biodiesel from waste vegetable oils can produce significant reductions when they are used to offset consumption of fossil fuels (e.g., gasoline and diesel in transportation and other combustion sources). This is particularly true when these fuels are produced using processes and/or feedstocks that emit much lower GHG emissions than those from conventional sources (sometimes referred to as "advanced" or "next generation" biofuels). The goals to produce more biofuels in-state are linked to the recommendations under TLU-1 for establishing a low carbon fuel standard and thus consuming more biofuels in-state.
- **Expanded use of forest and agricultural biomass:** Expanded use of renewable energy from biomass removed from the state's pine plantations and managed forests, crop residues, lawn and garden waste, or municipal solid waste can achieve GHG benefits by offsetting fossil fuel consumption (to produce either electricity or heat/steam). Programs to expand sustainably produced biomass fuel production will likely be needed to supply a portion of the fuel mix for the renewable energy goals of ESD Policy Option ESD-5 (see Chapter 3.)
- **Enhancement/protection of forest carbon sinks:** Through a variety of programs, enhanced levels of CO_2 sequestration can be achieved and carbon stored in the state's forest biomass. These include afforestation[2] projects, reforestation programs (restocking of poorly stocked forests), urban tree programs, wildfire risk reduction, and other forest health programs. Programs aimed at reducing the conversion of forested lands to non-forest cover also will be important to retain what is currently a net forest CO_2 sink in Florida.
- **Changes in municipal solid waste (MSW) management practices:** By promoting advanced MSW practices, the "cradle to grave" GHG emissions associated with collecting, transporting, and managing MSW can be reduced. Hence, the emissions addressed here include those from both fossil fuel use and waste management (primarily landfills).

Key Challenges and Opportunities

In the agricultural sector, the Action Team found significant opportunity in promoting biofuels production using feedstocks and production methods with superior GHG benefits (superior to conventional starch-based ethanol). It should be noted that the GHG benefits did not include any indirect impacts associated with emissions resulting from land use change.[3] The recommendations on biofuels production were aimed primarily at production of advanced

[2] Afforestation refers to the establishment of forest on lands that have not historically been under forest cover.
[3] Recent research (e.g., Searchinger, T., et al., "Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land Use Change," *Sciencexpress*, February 2008) has indicated that incorporating land conversion impacts into GHG analysis may remove any GHG benefits. Due to concerns and uncertainties such as these, The Action Team developed a biofuels production recommendation focused on biomass, not food crops.

(cellulosic) biofuels. The production and use of these fuels was found to offer substantial GHG reduction potential (more than eight $MMtCO_2e$ by 2025; see AFW-7 in Appendix D). The Action Team quantified two separate goals associated with biofuels production and use: a primary goal of using 20 percent of available biomass to produce biofuels by 2025, and a secondary goal to produce enough biofuel in-state to offset 25 percent of the state's fossil liquid fuels consumption by 2025. Based on the available estimated biomass resources in the state, this secondary goal will be difficult to achieve without significant reductions in fossil fuel use by 2025 (for example, emphasizing the importance of TLU recommendations aimed at reducing vehicle miles traveled).

The Action Team recommendation AFW-4 promotes the expanded use of biomass as an energy source for producing electricity, heat, or steam. Use of biomass to supplant fossil fuels is estimated to reduce about 40 $MMtCO_2e$ by 2025. The Action Team conducted a limited assessment of the available biomass resources in the state that indicated sufficient resources were available through 2025 to achieve the goals for both the liquid biofuels recommendation above and this biomass for energy option. However, the Action Team also recognizes the need for additional research on this issue, so that better estimates of sustainably-produced energy feedstocks are assured. As shown in Table D-1 of Appendix D, the Action Team currently estimates that the policy recommendations and Business As Usual (BAU) biomass demand will require about 75 percent of the available biomass supply.

Related to biomass utilization for energy purposes, recommendation AFW-9 seeks to improve commercialization of technologies to utilize biomass feedstocks or to produce bio-products. These technologies could include biomass gasification of wastewater treatment plant biosolids, livestock manure, or other organic wastes for energy use and as a direct GHG reduction measure. These technologies also could include anaerobic digestion of livestock manure, or other wastes to reduce methane emissions, and then utilize the methane for energy purposes. Research and development is needed (pilot-scale projects) in addition to funding or other incentives to build commercial-scale facilities.

AFW-10 seeks to increase the production and consumption of locally-produced (state or regional) agricultural products. To the extent that this can be accomplished, overall energy consumption associated with getting food to consumers is reduced and food security in Florida is strengthened. Due to the complexities of the design considerations needed to achieve a more efficient food production system in the state and a lack of data on current food imports, this recommendation requires additional assessment.

Also, within the agriculture sector, the Action Team recommends programs to promote soil management to increase soil carbon levels, thereby indirectly sequestering carbon from the atmosphere. These programs, combined with additional measures to promote more efficient nutrient application, were estimated to achieve a reduction of more than one $MMtCO_2e$ per year by 2025. Mechanisms that would assist farmers in reaching the goals of these recommendations include consideration of carbon sequestration offsets in any future cap-and-trade program in which the state participates.

Also related to terrestrial carbon management, land use management approaches in the agriculture and forestry sectors are recommended to protect existing above and below ground carbon stocks and potentially enhance terrestrial sequestration in the future. By preserving agricultural and forested lands (AFW-1 and AFW-6), the Action Team estimates GHG savings in 2025 of more than one $MMtCO_2e$. To achieve these reductions, the state will need to work closely with local planning agencies, landowners, and other stakeholders to identify lands suitable for acquisition and conservation easements as well as funding mechanisms. Some of the support could come through existing state programs, such as Florida Forever. Another benefit to these options, which was not quantified, is the reduction in vehicle-miles traveled due to more efficient development patterns (see TLU-3).

It should be noted that the estimates for GHG reductions for forest preservation above are conservatively low. The assumed losses of forest to development of about 7,400 acres per year are based on total forest area losses between 1995 and 2005 and include forest area gains that occurred as a result of land use change (such as agricultural land converted to forests). Also, due to high levels of uncertainty in existing emission estimates, the benefits estimated for AFW-1 do not include soil carbon; however significant losses in soil carbon occur when forests are converted to developed use.

Within the forestry sector, forest management programs (AFW-2 and AFW-3) have the potential to deliver more than 24 $MMtCO_2e$/year of GHG reductions in 2025. These programs include reforestation and afforestation, urban forestry, and wildfire reduction/restocking/other forest health approaches to minimize terrestrial carbon losses, while enhancing carbon sequestration. The urban forestry component also has the potential to reduce fossil fuel consumption through shading and wind protection of homes and commercial buildings.

For the urban forestry component of AFW-2, the goals are to increase canopy cover in Florida communities such that by 2025, 3 percent of total metropolitan GHG emissions will be offset through carbon sequestration and energy reductions. The recommendation includes a secondary goal to increase tree canopy cover in all developed areas with population greater than 500 residents per square mile to 30 percent by 2025.

Action Team recommendation AFW-8 seeks to reduce the "cradle to grave" GHG emissions associated with MSW management. The recommendation recognizes that a holistic approach to developing an efficient solid waste system is needed to reduce GHG emissions associated with waste collection, transport, and final management (such as landfilling). The goal of AFW-8 is to reduce these "cradle to grave" emissions by 25 percent by 2025. The Action Team recognizes that there are a number of different approaches for waste management entities to use in reducing emissions, including the use of more efficient collection and transport vehicles, use of renewable fuels, and landfill gas management (such as greater methane collection at landfills and use of advanced waste management approaches, including bioreactors). Based on the recommendation, more than four $MMtCO_2e$ of GHG emissions are estimated to be reduced annually by 2025.

Overview of Policy Recommendations and Estimated Impacts

As noted above, the 10 policy recommendations for the AFW sector address an array of activities capturing emission reductions, both within and outside of the AFW sectors (such as energy consumption in the ESD and TLU sectors). Taken as a whole, the AFW recommendations offer significant cost-effective emission reductions, as shown in Table 6-2.

Table 6-2. Summary List Policy Recommendations

Option No.	Policy Option	GHG Reductions ($MMtCO_2e$)			Net Present Value 2009–2025 (Million $)	Cost-Effectiveness ($/tCO2e)	Energy Security Fuel Savings	Level of Support
		2017	2025	Total 2009–2025				
AFW-1	Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses	0.5	0.6	7.2	$186	$26		Approved
AFW-2	Afforestation and Restoration of Non-Forested Lands							
	A. Forested Landscape							Approved
	Afforestation	1.6	3.1	28	$134	$4.9		
	Reforestation	6.1	11.6	104	$555	$5.3		
	B. Urban Forestry	4.6	8.7	78	$759	$10	3.5 million short tons coal, or 76,000 cubic feet natural gas	Approved
AFW-3	Forest Management for Carbon Sequestration							
	A. Pine Plantation Management	0.5	0.9	7.9	$84	$11		Approved
	B. Non-Federal Public Land Management	0.3	0.4	3.9	$41	$11		Approved
AFW-4	Expanded Use of Agriculture, Forestry, and Waste Management (AFW) Biomass Feedstocks for Electricity, Heat, and Steam Production	21	40	361	$7,432	$21	22 million short tons coal or 486,000 cubic feet natural gas	Cond. Approval
AFW-5	Promotion of Farming Practices That Achieve GHG Benefits							
	A. Soil Carbon Management	0.5	0.9	8.0	–$74	–$9	5 million gallons of diesel fuel	Approved
	B. Land-Use Management That Promotes Permanent Cover	N/Q						Approved
	C. Nutrient Management	0.2	0.3	2.6	$68	$26		Approved

	D. Improved Harvesting Methods to Achieve GHG Benefits	N/Q						Approved
AFW-6	Reduce the Rate of Conversion of Agricultural Land and Open Green Space to Development	0.2	0.5	4.2	$394	$93		Approved
AFW-7	In-State Liquid/Gaseous Biofuels Production	4.0	8.2	68	–$532	–$8	4,075 million gallons gasoline and 271 million gallons diesel	Approved
AFW-8	Promotion of Advanced Municipal Solid Waste (MSW) Management Technologies (Including Bioreactor Technology)	1.9	4.4	34	$294	$9	190,000 short tons coal or 4,000 cubic feet NG and 109 million gallons diesel	Approved
AFW-9	Improved Commercialization of Biomass-to-Energy Conversion and Bio-Products Technologies							
	A. Manure Digestion/Other Waste Energy Utilization	0.04	0.09	0.8	–$13	–$17	4,500 short tons coal or 100 cubic feet natural gas	Approved
	B. WWTP Biosolids Energy Production & Other Biomass Conversion Technologies	2.4	5.0	42	$1,848	$44	2.5 million short tons coal or 55,000 cubic feet natural gas	Approved
	C. Bio-Products Technologies and Use	0.2	0.3	2.6	–$161	–$62		Approved
AFW-10	Programs to Support Local Farming/Buy Local	N/Q						Approved
	Sector Totals	**44**	**85**	**752**	**$11,014**	$**15**		
	Sector Total After Adjusting for Overlaps*	***25***	***58***	***469***	***$5,974***	***$13***		
	Reductions From Recent Actions	**—**	**—**	**—**	**—**	**—**		
	Sector Total Plus Recent Actions	***25***	***58***	***469***	***$5,974***	***$13***		

GHG = greenhouse gas; $MMtCO_2e$ = million metric tons of carbon dioxide equivalent; $\$/tCO_2e$ = dollars per metric ton of carbon dioxide equivalent; N/Q = not quantified; WWTP = wastewater treatment plant.

* See below for discussion of overlap adjustments.

Note that negative costs represent a monetary savings.

Negative values in the Net Present Value and the Cost-Effectiveness columns represent net cost savings associated with the recommendations. Totals in some columns may not add to the totals shown due to rounding.

Agriculture, Forestry, and Waste Management Sector Policy Descriptions

The AFW sectors include emissions mitigation opportunities related to the use of biomass energy, protection and enhancement of forest and agricultural carbon sinks, control of agricultural N_2O emissions, production of renewable liquid fuels, reforestation/afforestation, and lower MSW emissions.

AFW-1 Forest Retention—Reduced Conversion of Forested to Non-Forested Land Uses

By retaining forest cover in the state, the current levels of carbon dioxide sequestration (more than 20 $MMtCO_2/yr$) are protected. In addition, significant losses in both above-ground carbon and soil carbon occur during conversion to developed use. The goals of this recommendation are to stabilize the state's forest base and to achieve no net loss in forested lands by 2015. The goals will need to be achieved through a variety of mechanisms, which could include additional funding to existing programs such as Florida Forever, incentives to forest landowners to retain their lands as working forests, consideration of forest management carbon offset projects in emerging cap-and-trade programs, and active engagement with non-government organizations and stakeholders to increase lands with perpetual conservation easements or acquisitions.

AFW-2 Afforestation and Restoration of Non-Forested Lands

This recommendation seeks to increase the sequestration potential of the state's forests by increasing the forest base through afforestation projects, increasing sequestration potential through reforestation (re-stocking of poorly stocked forests), and aggressive urban tree planting programs. The urban tree element of this recommendation has an additional benefit of reducing energy demand through shading of homes and commercial buildings (producing a greater GHG benefit than the sequestration of carbon in these trees). The afforestation goal is to increase the area of forested lands in the state by 50,000 acres annually through 2025. For reforestation, the goal is to implement reforestation activity on all harvested acres by 2025. For urban forestry there are both primary (based on offsetting metropolitan GHG emissions) and secondary (tree canopy cover) goals; both of these could be met through aggressive tree planting goals of 6.7 million trees on average per year through 2025.

AFW-3 Forest Management for Carbon Sequestration

This recommendation focuses on the state's existing forested lands—both private plantation forests and non-federal publicly-owned lands. The recommendation recognizes the significant role that Florida's forests play in lowering the state's net GHG emissions (about 20 $MMtCO_2e/yr$) and that management could be enhanced to achieve greater net GHG benefits. In the state's plantation forests, the 2025 goal is to increase the levels of productivity by 10 percent annually through enhanced management, thereby increasing sequestration rates and timber, pulp wood, or biomass for energy purposes. For non-federal publicly-owned forests in the state, this recommendation calls for improved management practices to be implemented on 25 percent of these lands by 2025.

AFW-4 Expanded Use of Biomass Feedstocks for Electricity, Heat, and Steam Production

This policy dedicates a sustainable quantity of biomass from agricultural crop residue, wood industry process residues, unused forestry residues, and MSW biomass resources for efficient conversion to energy and economical production of heat, steam, or electricity. This biomass should be used in an environmentally acceptable manner, considering proper facility siting and feedstock use (proximity of users to biomass, impacts on water supply and quality, control of air emissions, solid waste management, cropping management, nutrient management, soil and non-soil carbon management, and impacts on biodiversity and wildlife habitat). The objective is to create concurrent reduction of CO_2 due to displacement of fossil fuels considering life-cycle GHG emissions associated with viable collection, hauling, and energy conversion and distribution systems. The primary goal of this option is to increase the use of biomass feedstocks for energy purposes by a factor of five by 2025.

AFW-5 Promotion of Farming Practices that Achieve GHG Benefits

This recommendation addresses both agricultural soil carbon management, as well as nutrient management to achieve GHG benefits. For soil carbon management, conservation-oriented management of agricultural lands, cropping systems, crop management, and agricultural practices may regulate the net flux of CO_2 from soil. This recommendation has four separate elements:

- soil carbon management, where CO_2 reductions occur indirectly via the building of soil carbon levels;

- nutrient management is an element where GHG reductions occur through more efficient use of fertilizer (lowering fossil-fuel use though lower application energy requirements, as well as lifecycle GHG reductions associated with the production and transportation of fertilizers in addition to reduced nitrous oxide emissions following application);

- an agricultural land conversion element to reduce GHG emissions by establishing permanent cover on marginally productive lands (thereby increasing both above- and below-ground carbon stocks);

- an element covering improved harvesting methods, which seeks to produce GHG reductions through the use of more efficient harvesting technologies and practices.

AFW-6 Reduce the Rate of Conversion of Agricultural Land and Open Green Space to Development

By reducing the losses of agricultural lands and open green space, above- and below-ground carbon stocks are protected and more efficient land use is supported (as recommended in TLU-3—Smart Growth Planning). This option seeks to reduce the rates of conversion of these lands to developed use by 50 percent by 2025. Although the levels of estimated direct GHG reductions are moderate (0.5 $MMtCO_2e/yr$ by 2025), the indirect benefits achieved through the linkage to smart growth planning and subsequent reductions in vehicle-miles traveled are expected to be substantial (see TLU Appendix).

AFW-7 In-State Liquid/Gaseous Biofuels Production

This recommendation promotes sustainable in-state production and consumption of transportation biofuels from agriculture, forestry, and MSW feedstocks in order to displace the use of gasoline and diesel. This recommendation also promotes the in-state development of feedstocks, such as cellulosic material and production facilities to produce either liquid or gaseous biofuels with low carbon content. To achieve true gains in reducing GHGs and offsetting fossil fuel use, promoting biofuel production must be coupled with strong policies to reduce overall transportation fuel consumption. Upon successful implementation of this policy, Florida consumption of biofuels produced in-state will produce better GHG benefits than these same fuels obtained from a national or international market due to lower embedded CO_2 (resulting from out-of-state fuels produced using feedstocks/production methods with lower GHG benefits, and from transportation of biodiesel, ethanol, other fuels, or their feedstocks from distant sources).

AFW-8 Promotion of Advanced Municipal Solid Waste Management Technologies (Including Bioreactor Technology)

This recommendation seeks to improve the GHG profile of MSW management in the state by promoting more efficient collection, transport, and waste management technologies and practices. There are a number of ways that the "cradle to grave" GHG profile of MSW management could be improved. The emissions include those from collection and transport of MSW and the final management of MSW, which currently occurs largely at landfills in Florida. These include more efficient collection vehicles, use of biofuels, route optimization,

management of MSW in bioreactors, more efficient landfill gas collection systems, and more efficient use of landfill methane.

AFW-9 Improved Commercialization of Biomass-to-Energy Conversion and Bio-Products Technologies

This recommendation recognizes the need for programs to ramp up the commercialization of promising technologies to utilize biomass for energy or to produce bio-products with lower net GHG emissions. These could be emerging technologies including emerging biomass gasification combined cycle (BGCC) electricity production, pyrolysis, and plasma arc technologies, as well as technologies that are further along in commercial deployment (anaerobic digestion of organic wastes). Bio-products for use as building materials or other products or bio-based chemicals have the potential for reducing the life-cycle GHG emissions associated with the bio-products' fossil-based or higher embodied energy counterparts.

AFW-10 Programs to Support Local Farming/Buy Local

The Action Team approved this policy as a non-quantified recommendation. The recommendation seeks to enhance Florida's food system to produce more of the agricultural products needed by the state's consumers. When locally produced agricultural products supplant those from out-of-state or out-of-country, the embedded GHG emissions associated with transporting those items are reduced. To achieve this reduction, programs are needed to incentivize local production and consumption of fresh produce, dairy, meat, and fish. The Florida retail campaign has achieved some success in this area in recent years through engagement with the major retail food outlets in the state. More similar programs will need to be developed and implemented. In addition, a much larger and tougher aspect of this option will be to develop new infrastructure to transport, process, package, store, and distribute locally or regionally produced food. The establishment of this enhanced infrastructure will require a significant amount of study, planning, promotion, and investment to occur.

Note the AFW acronym list below will be incorporated into the list for the whole report.

Acronyms and Abbreviations (AFW)

AFW	Agriculture, Forestry, and Waste Management
CH_4	methane
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
CRP	Conservation Reserve Program
DOF	[Florida] Division of Forestry
EPA	U.S. Environmental Protection Agency
EQIP	Environmental Quality Incentives Program
FFA	Florida Forestry Association
FIA	Forest Inventory and Analysis
FWCC	Florida Fish and Wildlife Conservation Commission
GHG	greenhouse gas
GTR	General Technical Report
IFAS	Institute of Food and Agricultural Sciences
LF	landfill
MSW	municipal solid waste
N_2O	nitrous oxide
NRCS	Natural Resources Conservation Service
NRI	Natural Resources Inventory
REIT	real estate investment trust
RPC	Regional Planning Council
TIMO	timber investment management organization
TLU	Transportation and Land Use
UF	University of Florida
USFWS	U.S. Fish and Wildlife Service
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
WHIP	Wildlife Habitat Incentives Program
WW	wastewater

Units of Measure

MMt	million metric tons