

Table x.
Agriculture, Forestry, and Waste Management Technical Work Group
Summary List of Mitigation Options

	Mitigation Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2007-2020 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2010	2020	Total 2007-2020			
	AGRICULTURE, FORESTRY, AND WASTE MANAGEMENT						
AFW-1	Agricultural Soil Carbon Management						TBD
AFW-2	Biodiesel Production (incentives for feedstocks and production plants)						TBD
AFW-3	Ethanol Production						TBD
AFW-4	Incentives for Enhancing GHG Benefits of Conservation Provisions of Farm Bill Programs						TBD
AFW-5	Preserve Open Space & Working Lands						TBD
AFW-6	Forest Health Programs for Carbon Management						TBD
AFW-7	Expanded Use of Biomass Feedstocks for Energy Use						TBD
AFW-8	Afforestation and Reforestation Programs						TBD
AFW-9	Improved Management and Restoration of Existing Stands						TBD
AFW-10	Expanded Use of Wood Products for Building Materials						TBD
AFW-11	Programs to Promote Local Food & Fiber						TBD
AFW-12	Enhanced Solid Waste Recovery & Recycling						TBD
	SECTOR TOTAL AFTER ADJUSTING FOR OVERLAPS						
	REDUCTIONS FROM RECENT ACTIONS (table to be added below)						
	SECTOR TOTAL PLUS RECENT ACTIONS						

AFW-1. Agricultural Soil Carbon Management Programs

Mitigation Option Description

Use of conservation tillage/no-till and other soil management practices can increase the level of organic carbon in the soil, which sequesters carbon dioxide. In addition, some practices lower fossil fuel consumption through less intensive equipment use. Other practices, such as the application of bio-char can also increase the level of soil carbon and improve the soil. Organic farming methods may tend toward an increased use of these soil management practices. This option is designed to increase the acreage using soil management practices that lead to higher soil carbon content for both conventional and organic farming.

Mitigation Option Design

- Goals:** The CCAC recommends that Montana adopt programs to increase the acres of cropland managed using best management practices including conservation /no tillage practices by 50%. Currently there are approximately 18 million acres of cropland in Montana. Three million acres are in the Conservation Reserve Program (CRP); 7.9 million acres are in tillage; and, the remaining 7.1 million acres are in summer fallow. A total of 5.5 million acres are in no-till (3.6 million acres) and chemfallow (1.9 million acres). The acreage that could be used to sequester atmospheric carbon dioxide would be the remaining 9.5 million acres, including the 1.7 million acres currently managed by mulch-till practices that sequester a lesser fraction of carbon from the atmosphere.

The CCAC recommends a small organic component in this policy design until additional research can show definite soil carbon increases using organic methods, since organic farming does not necessarily reduce tillage. Compared to no tillage systems, organic uses extensive tillage to manage weeds and to terminate cover crops. Organic farming acreage is increasing at the following projected rates: 126,450 acres in 2005; 215,768 acres in 2010; 305,086 acres in 2015; and, 394,404 acres in 2020. The CCAC recommends maintaining this level of organic farming and encourages further research into establishing consistent organic farming practices that provide the best potential for sequestering carbon in soil.

- Timing:** The CCAC recommends a 15% increase in acres of cropland brought into no-till management practices from 2007-2015, or an additional 0.9 million acres, and an increase of an additional 35% increase in acres by 2025, or 1.9 million acres, for a total increase of 2.8 million acres in no-till/conservation tillage.

This seems to be a reasonable goal considering that 1.7 million acres already in mulch-till practice could be brought into the no-till practices with incentives.

- Coverage of parties:** Local Agricultural Extension Offices, Montana Conservation District Offices, USDA-NRCS field offices, Montana Salinity Control Program (Jane

Holzer, who is interested in carbon credit development), National Carbon Offset Coalition (NCOC), Montana Chapter of Soil and Water Conservation Society (Tom Pick, USDA-NRCS, Bozeman), MSU Land Resource & Environmental Sciences (LRES) program, certified crop consultants, Montana Grain Growers Association, among others.

Other:

Implementation Mechanisms

CSP Program: Federal funding of the Conservation Security Program at levels specified in the 2002 farm bill would help provide incentives for participation in no-till and other conservation soil management strategies.

Equipment Rebate Programs: Economic incentives to go to no-till practices might include a program that gave rebates for machinery traded in for no-till machinery -- such as a 50% rebate, similar to automobile industry for replacing low-mpg older vehicles with new high-mpg vehicles.

Educational Outreach: Change the perception of no-till practices among established farmers who: 1) Use practices that continue in the manner of their ancestors; 2) Are hesitant to apply chemicals to the soil; 3) Need technical and financial assistance to become comfortable with and to acquire the new technology needed; 4) Are concerned that insect control and plant disease management strategies may be impacted; and, 5) Are wary of new practices that aren't used by neighbors and that may negatively impact income from the farming enterprise.

Other Incentives: Improve the federal and state general cost-share programs to include no-till, removing some of the special area and conditions restrictions so it can fit under EQUIP and CSP programs.

Related Policies/Programs in Place

CRP - The Conservation Reserve Program rewards farmers financially for removing highly erodible and marginally productive land from production. CRP is currently capped at 25% of Montana cropland per county.

CSP – The Conservation Security Program

EQUIP – Environmental Quality Incentives Program

Note: Both CSP and EQUIP are relatively new programs designed to increase and cost-share implementation of Best Management Practices including, but not limited to, adoption of no-till farming practices.

MT and US Department of Agriculture program

MSU Agriculture Research and Development programs.

Types(s) of GHG Reductions

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-2. Biodiesel Production (incentives for feedstocks and production plants)

Mitigation Option Description

Use of biodiesel offsets the consumption of diesel fuel produced from oil (fossil diesel). Since biodiesel has a lower GHG content than fossil diesel (being derived from biogenic sources), overall GHG emissions are reduced. By producing biodiesel in the state for consumption within the state, the highest benefits can be achieved, since the fuel is transported over shorter distances to the end user. This option covers incentives needed to increase biodiesel production in Montana.

Mitigation Option Design

- **Goals:** Produce sufficient biodiesel from Montana feedstocks, to meet 2-, 10-, and 20-percent of 2004 Montana petroleum diesel consumption by 2010, 2015 and 2020 respectively.
- **Timing:** see above.
- **Coverage of parties:** MT DEQ, MT Department of Agriculture, MT Farmers Union, Resource Conservation and Development, MT Grain Growers, MT State University, MT Livestock Associations.
- **Other:**

Implementation Mechanisms

TBD

Related Policies/Programs in Place

15-70-601 (incentive for incremental production increases over first 3 years); 15-32-702 (production facility tax credit); 15-32-703 (blending and storage tax credit); 15-70-369 (tax refund to distributor/retailer); 15-32-701 MCA (Oil Seed Crushing Facility Credit); and 15-32-702 (Biodiesel Production Facility Credit).

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD

- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

Increased in-state economic activity, oilseeds as rotational crop, reduced herbicide/pesticide and fertilizer use on traditional crops; increased transportation energy security; reduced reliance on imported petroleum.

Feasibility Issues

Sourcing of feedstocks and the size and location of facilities (both crushing and biodiesel production) must be addressed for optimization and planning. There will be interaction with potential ethanol production crops and carbon sequestration, although expanded use of biodiesel will continue to replace/reduce greenhouse gas emissions beyond the ability of the land to sequester carbon. There may be an overlap among TWGs (especially AFW-1 through 3) which should be carefully considered.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-3. Ethanol Production

Mitigation Option Description

Offset fossil fuel use (gasoline) with production and use of starch-based and cellulosic ethanol. Offsetting gasoline use with ethanol can reduce GHGs to the extent that the ethanol is produced with lower GHG content than gasoline. Provide incentives for the production of ethanol from crops, forest sources, animal waste, and municipal solid waste.

Mitigation Option Design

- **Goals:**
- **Timing:**
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

TBD

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO_{2e}

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-4. Incentives for Enhancing GHG Benefits of Conservation Provisions of Farm Bill Programs

Mitigation Option Description

Agricultural lands that have been placed into conservation programs such as those in the US Farm Bill may sequester carbon dioxide as a result of implementing practices that build soil carbon over time. For example, land in the Conservation Reserve Program (CRP) is taken out of production and in the absence of tillage practices, soil carbon is sequestered over time. This policy seeks to extend the GHG benefits of current Farm Bill programs, looking particularly at land that is scheduled to retire from Farm Bill programs and potentially go back into production.

Mitigation Option Design

- **Goals:**
- **Timing:**
- **Coverage of parties:** Implementation of this option would require Governor's Office leadership in directing state conservation programs administered by the Conservation Districts Division of the Montana Department of Natural Resources and Conservation, to include USDA approved carbon sequestration planning criteria in their program literature and training of staff in order to provide technical assistance to landowners desiring to develop a carbon sequestration projects for entry into the NCOC portfolio.

Additionally, the Governor's Office should seek the cooperation of federal agency staff from USDA agencies such as the Natural Resources Conservation Service, the Farm Services Agency, and the Forest Service state and private forest staff.

- **Other:** This strategy would be a low cost option which would bring to bear the existing federal and state staff and programs in a focused approach unlike any other in the U.S.

Implementation Mechanisms

- **Leverage existing federal and state conservation cost share programs:** The proposed program would require Montana Conservation Districts to include terrestrial carbon sequestration benefits, emerging carbon market information and established state or national carbon sequestration planning criteria in their program literature. Conservation District staff would be trained in order to provide such information and technical assistance to landowners desiring to develop a carbon sequestration project for entry into emerging voluntary or federally mandated carbon markets. Such a program would assist Montana landowners and tribal governments to use existing federal and state conservation practice standards, and cost share programs when entering into a private carbon credit trades, providing increased incentives for landowners to establish conservation practices.

- **Education and Training:** Implementation of this strategy would include a series of training workshops and development of literature for inclusion in existing public affairs materials.

Related Policies/Programs in Place

TBD

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-5. Preserve Open Space & Working Lands

Mitigation Option Description

Reduce the rate at which existing crop/pasture, rangeland, and forests are converted to developed uses. The carbon sequestered in the soils and aboveground biomass of these open spaces and working lands is often much higher than in developed land uses. Policies that preserve open space and working lands provide additional GHG benefits by reducing the vehicle miles traveled that would otherwise occur from unwise or unplanned development.

Mitigation Option Design

- **Goals:** By 2020, reduce the rate that forest and agricultural lands are converted to developed use by 50% from current levels.
- **Timing:** By 2015, reduce the rate of conversion by 25%; achieve full 50% by 2020.
- **Coverage of parties:** Montana Department of Natural Resources, Montana Fish, Wildlife, and Parks, USDA Forest Service, USDA Natural Resources Conservation Service; county governments and other political subdivisions of the state, private non-profit land trusts, non-profit organizations; AERO; MT Farmers Union and other farm groups.
- **Other:** NRCS National Resource Inventory data (1987-2003) shows that Montana is losing (on average) over 2,000 acres of forest land and over 34,000 acres of rangeland on an annual basis. While some of that rangeland is turning into pastureland, over 13,000 acres a year (on average) are being developed or becoming other rural lands. There is potential for divestiture of over 1 million acres of industrial forestland and loss of over 5 million acres of ranchlands, with some proportion of those lands being converted to development. There were over 14,500 new subdivisions approved by local governments over past 10 years, resulting in over 1.1 million acres of new development. Many of these (e.g., Yellowstone Mountain Club in Madison County) occur on former forest and agricultural lands. Projections are 200,000 more people in next 20 years, with over 100,000 more homes in western Montana by 2025.

Implementation Mechanisms

- 1) develop a mitigation fund where developers would contribute and funds would be used to offset impacts;
- 2) engage local/county planning boards and zoning departments;
- 3) engage tourism departments and land trusts in the solution.

Related Policies/Programs in Place

There are several existing state programs that are aimed at conserving lands that provide important wildlife habitat. Habitat Montana program administered by FWP uses hunting license fees to protect threatened wildlife habitats. Wildlife Mitigation Program (FWP) aims to replace wildlife and habitat lost during the development of Libby and Hungry Horse Dams. State wildlife grants (FWP) use federal funding through the Land and Water Conservation Fund for projects involving species of special concern and can potentially be used for land and easement acquisitions. The Natural Resource Damage Program (DOJ) provides restoration funds to be used in the Clark Fork Drainage that can be used for land and easement acquisitions. There are also several federal programs that have been critical for funding land conservation through fee or easement purchases. The Forest Legacy Program provides funding to protect environmentally sensitive forest lands. The Habitat Conservation Plan Land Acquisition Grants Program provides funding for acquisition of vital habitat for threatened and endangered fish, wildlife and plants. At the county level, Gallatin, Ravalli, and Missoula counties have passed \$40 million in bonds to protect open space, particularly agricultural land that is rapidly being converted for subdivisions.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO_{2e}

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-6. Forest Health Programs for Carbon Management

Mitigation Option Description

This policy seeks to increase forest carbon stocks through changes in management practices on existing forestland. The focus for this option is to identify elements within existing forest health programs that can be enhanced to achieve carbon benefits. These program elements would increase tree density, enhance forest growth rates, alter rotation times, or decrease the chances of biomass loss from fires, pests, and disease. Existing forest health programs could include the following: Ecosystem Health Risk Reduction Programs; Drought Management Programs; Flood and Riparian Management Programs; Watershed Management Programs; Habitat Management Programs; and Fire Management and Risk Reduction Programs. Note that there is a companion policy option (AFW-9. Improved Management and Restoration of Existing Stands) which promotes new programs for enhancing the GHG benefits on existing forested lands in Montana.

Mitigation Option Design

- **Goals:**
- **Timing:**
- **Coverage of parties:**
- **Other:**

Implementation Mechanisms

- **Voluntary / Negotiated Agreements:** Provide landowners and/or corporations with opportunity to enter into agreements to better utilize biomass energy and/or increase the productivity of carbon sequestered on the landscape.
- **Information and Education/ Research and Development:** Development of a carbon sequestration assessment program that would assess and assign carbon sequestration value to the state's natural, working agricultural, as well as to rangelands and grasslands. This carbon sequestration program could support a variety of GHG reduction policies. The reporting mechanism would enable reporting from the agricultural and forestry sectors, widening market participation in a carbon restricted economy.
- **Technical Assistance:** Public education and outreach to land owners regarding existing federal and state programs.

- **Funding Mechanisms and or Incentives:** Enhancement of incentives for placement of no-development easements on private land through existing or future programs. Possibly through establishment of limited-term carbon sequestration leases whose cost is linked to the “carbon sink” value of natural lands.
- **Establishment of an “Agricultural / Conservation Land Reserve”:** This would establish a pool of permanently protected forest, agricultural or other conserved lands. Owners of natural/agricultural land would be provided with tax incentives to join the reserve.
- **Enhancement of the Existing Programs:** This would allow purchase and trade of development rights between high density and low density areas to conserve open space, agricultural land and forest land on the margins of growing urban areas.

Related Policies/Programs in Place

- **Department of Environmental Quality (DEQ) Open Burning Program:** The Montana / Idaho State Airshed Group was formed in 1978 order to minimize or prevent the accumulation of smoke from prescribed fire to protect state and federal air quality standards and visibility in federal Class I areas. This is accomplished, in part, through DEQ restricting open burning when atmospheric dispersion is not acceptable.

The state of Montana has open burning regulations under ARM 17.8.601 et. seq. DEQ annually issues permits to major open burners allowing them to burn under the open burning regulations. A major open burner is defined as any person, agency, institution, business, or industry conducting open burning that emits more than 500 tons of carbon monoxide or 50 tons of any other pollutant except hydrocarbons per calendar year.

Minor burners contribute emissions to airsheds - but pay no fees. Minor open burners are not required by DEQ to obtain an air quality open burning permit, but must follow other BACT procedures that include calling the smoke management hotline and obtaining a burning permit from their local forestry office.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-7. Expanded Use of Biomass Feedstocks for Energy Use

Mitigation Option Description

This policy seeks to expand the use of biomass energy sources (from forests, agriculture, and other biomass resources). Biomass can be used to generate renewable energy in the form of liquid fuels (such as cellulosic ethanol), or through direct combustion to generate electricity, heat, or steam (through biomass combustion). Carbon in biomass is considered biogenic under sustainable systems; carbon dioxide emissions from biomass energy combustion are replaced by future carbon sequestration. Expanded use of biomass energy in place of fossil fuels results in net emissions reductions by shifting from high to low carbon fuels (when sustainably managed), provided the full lifecycle of energy requirements for producing fuels does not exceed the energy content of the renewable resource. Expanded use of biomass energy can be promoted through increasing the amount of biomass produced and used for renewable energy, and providing incentives for the production and use of renewable energy supplies.

Mitigation Option Design

- **Goals:** Increase usage of primary source forest biomass residue for renewable energy and heat generation by 900,000 tons/year above 2006 levels by 2020. To use 10% of agricultural waste for energy production by 2020. Voluntary, incentive based programs should be used to foster the development of the industry and associated economic markets. State lands should be managed with these goals in mind.
- **Timing:** see above.
- **Coverage of parties:** DNRC, DEQ, MSU Cooperative Extension, Public Service Commission, Electric utilities, livestock and poultry producers, farmers, forest products manufacturers, logging companies.
- **Other:** Explore and research biomass use and availability for all forms of energy production, either 100% biomass or in combination with other feedstocks.

Implementation Mechanisms

- **State Lead by Example:** Require consideration of renewable resource systems (including biomass heat/energy) in all new state bldg constructions/renovations; Provide state support to the DNRC Biomass Utilization Fuels For Schools Program which identifies financially viable biomass heating opportunities and assists facilities in securing funding, supply and installation.
- **Source Reduction:** Reduce the amount of open slash pile burning on all land ownerships and/or provide viable alternatives to open burning. Revise DEQ Air Quality permits to discourage open burning.

- **Voluntary / Negotiated Agreements:** Provide landowners and/or corporations with opportunity to enter into agreements to better utilize biomass energy and/or increase the productivity of carbon sequestered on the landscape.
- **Funding Mechanisms:** Provide tax incentives to reduce the capital costs of biomass energy production, including electricity generation and heating of residences and public buildings; establish utility “Buyback Rates” for biomass derived energy where utilities offer a standard rate for which they purchase biomass generated energy (electricity and/or heat); and expand/develop renewable energy tax credits to develop new incentives for smaller distributed biomass generation.
- **Codes and Standards:** Increase efficiency standards for wood burning equipment and appliances (e.g., wood burning furnaces and stoves). Develop or expand existing net-metering regulations to enable smaller projects to net-meter at retail energy rates.
- **Pilots and Demonstrations:** Pilot projects on the use of different forestry and agriculture residues for energy production are needed.
- **Research and Development:** Research is needed on techniques for collecting and processing forestry and agriculture residues, as well as markets for these materials.
- **Market-Based Mechanisms:** Incentives (e.g., preferential tax rates) may be needed to spur the use of biomass energy.
- **Provide Tax Incentives:** Incentives to reduce the capital costs of biomass energy production and transport for use in electricity generation and the heating of residences and public buildings. This could include tax reductions in state sales tax for a wide variety of biomass-related equipment, including but not limited to biomass harvesting/collection equipment, biomass gasification equipment, biomass electricity generation equipment, and high efficiency wood pellet stoves. Gross receipts exemptions for biomass generation facilities, project construction and related equipment and materials are also recommended.
- **Establish Utility “Buyback Rates” for “Feed-in-Tariffs”:** Applicable to biomass derived energy where utilities offer a standard rate for which they purchase biomass generated energy (electricity and/or heat). Buyback rates for biomass projects in other regions of the country generally range from 6-7 ¢ / kWh.
- **Expand the MT Renewable Energy Tax Credit:** Lower the eligible threshold capacity from 10 MW down to 1 MW as well as expanding the classification of corporate taxpayers and including general income taxpayers.
- **Codes and Standards:** Work with local communities to develop responsible ordinances that allow the use of EPA-certified wood / pellet burning equipment (instead of broad burn bans that apply to all wood-burning equipment). Expand existing net-metering regulations to enable projects up to 2 MW in size to net-meter at retail energy rates.

Related Policies/Programs in Place

- **Renewable Portfolio Standards:** Requires public utilities to obtain 15% of their retail electricity sales from eligible renewable resources by 2015.
- **Renewable Energy Credits:** Create market for clean power generated by biomass. Western Gov’s Assoc. and California Energy Commission are currently working together to develop Western Renewable Energy Generation Information System (WREGIS), a regional renewable energy tracking and registry system.
- **Alternative Energy Revolving Loan Program:** Provides loans to individuals, small businesses, local government agencies, units of the university system, and nonprofit organizations to install alternative energy systems that generate energy for their own use. Max loan amount is \$40,000 with a fixed interest rate and must be paid back within 10 years.
- **Montana Electric Cooperatives - Net Metering:** Under the model policy, customers generating their own electricity using (but not limited to) wind, solar, geothermal, hydro, biomass or fuel cells may participate in net metering.
- **Mandatory Green Power Program:** NW Energy offers its customers the option of purchasing a product composed of or supporting power from certified environmentally preferred resources generated by renewables including biomass.
- **DNRC Forestry Assistance Programs:** Maintain and improve the health of Montana’s forests, forested watersheds and the communities that depend on them. Tools include Information and Education, Technical Assistance and Financial Assistance.
- **Biomass Utilization Fuels for Schools Program:** Promoting the use of forest biomass as an energy source for heating schools and other public facilities. Utilization of biomass energy for heat creates carbon offsets when compared to utilization of fossil fuels for heat.
- **USFS Woody Biomass Utilization Policy:** Recently implemented, it requires that contractors doing work on federal lands, haul and pile slash at landings to help facilitate removal of biomass during forest operations for utilization.
- **Trust Land Forest Management Program:** Recently implemented, the Forestry Management Bureau has recently changed the timber bid sale process for state trust lands to encourage removal of residues for pulp and biomass as a mandatory condition for the sale.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO_{2e}

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD

- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-8. Afforestation and Reforestation Programs

Mitigation Option Description

Increase carbon stored in forests through expanding the forestland base. Establishing new forests, either on historically non-forested land (“afforestation”) or on land that has not been managed as forest land for some time (“reforestation”) increases the amount of carbon in biomass and soils compared to pre-existing conditions. Afforestation and reforestation accomplished with stocking/planting and other practices (e.g., soil preparation, erosion control, etc.) can increase carbon stocks above baseline levels and ensure conditions that support forest growth.

Mitigation Option Design

- **Goals:** Re-stock 30% of accessible forest lands impacted by stand replacement fires to stocking rates of 200-400 trees/acres (depending on forest type). For lands impacted in the future, complete re-stocking within 5 years post-fire.
- **Timing:** By 2010, perform re-stocking on XX% of accessible lands already impacted; achieve 30% goal of already impacted lands by 2020. Re-stock high severity burned forest lands within 5 years post-fire.
- **Coverage of parties:** Montana Department of Natural Resources, USDA Forest Service, Bureau of Land Management, Bureau of Indian Affairs, Confederated Salish and Kootenai Tribe, USDA Natural Resources Conservation Service; Private industry, Non-industrial private landowners.
- **Other:** Since 2000, over 3.3 million acres have burned in Montana. Therefore, DNRC goals would result in reforestation on an estimates 20,000 acres per year. Currently there is a need for re-stocking on some proportion of these federal, state, and private lands in Montana. Reforestation costs are roughly \$180 per acre.

A 2007 study (Potter et al.) estimates there are over 69 million acres of low-production rangelands in Montana that could be afforested to result in carbon gains. More realistically, only 8.9 million acres are available for afforestation due to precipitation and soil nutrient limitations. The potential results of afforesting 8.9 million acres could be the sequestration of over 15 million tons of carbon annually.

However, a question remains on the efficacy of afforestation in Montana. The best possible means for afforestation could remain with the development of wind break and shelter belts.

Implementation Mechanisms

- **Voluntary / Negotiated Agreements:** Provide landowners and/or corporations with opportunity to enter into agreements to better utilize biomass energy and/or increase the productivity of carbon sequestered on the landscape.
- **Information and Education/ Research and Development:** Development of a carbon sequestration assessment program that would assess and assign carbon sequestration value to the state’s natural, working agricultural, as well as to rangelands and grasslands. This carbon sequestration program could support a variety of GHG reduction policies. The reporting mechanism would enable reporting from the agricultural and forestry sectors, widening market participation in a carbon restricted economy. Provide information and education programs to private landowners (DNRC, NRCS, USDA).
- **Technical Assistance:** Public education and outreach to land owners regarding existing federal and state programs. Develop interagency site-specific reforestation plans post-burn with planting targeted for stand replacement fires.
- **Funding Mechanisms and or Incentives:** Enhancement of incentives for placement of no-development easements on private land through existing or future programs. Possibly through establishment of limited-term carbon sequestration leases whose cost is linked to the “carbon sink” value of natural lands.
- **Establishment of an “Agricultural/Conservation Land Reserve”:** This would establish a pool of permanently protected forest, agricultural or other conserved lands. Owners of natural/agricultural land would be provided with tax incentives to join the reserve.
- **Enhancement of the Existing Programs:** This would allow purchase and trade of development rights between high density and low density areas to conserve open space, agricultural land and forest land on the margins of growing urban areas. Utilize DNRC Conservation Seedling Nursery.
- **State Lead by Example:** Plant 500 new trees in Montana Communities within 5 years through programs such as DNRCs Urban Forestry program.

Related Policies/Programs in Place

- **Forestry Best Management Practices:** Montana has no regulations that direct landowners to replant stands post-harvest or post-burn. However, Forestry Best Management Practices encourage rapid reforestation post-harvest.
- **Long Term Maintenance Goals:** On state trust lands there are general rules to maintain long-term productivity of forest lands, but no specific rules aimed at reforestation. DNRC generally plants 700-1,000 acres per year. In 2007 that level will increase to 1,700 acres due largely to areas impacted by wildland fires.
- **DNRC Forestry Assistance Programs:** Maintain and improve the health of Montana’s forests, forested watersheds and the communities that depend on them. Tools include Information and Education, Technical Assistance and Financial Assistance.

1. Urban and Community Forestry: Provide Montana’s urban communities with assistance in establishing and maintaining healthy, productive and financially beneficial urban forestry programs and urban forests.
2. Conservation Seedling Nursery: Produce and distribute seedlings for conservation plantings to private landowners, state federal and tribal landowners and other conservation organizations.
3. Forest Pest Management: Provide non-industrial forest landowners, and others, assistance in the identification and management of forest insects and diseases.
4. Biomass Utilization: Promoting the use of forest biomass as an energy source for heating schools and other public facilities.
5. Forest Stewardship: Promote forest stewardship by assisting non-industrial forest landowners in acquiring personal knowledge about their forest resources and in developing and implementing a forest management plan for their property.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO_{2e}

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

- **Nursery Capacity:** Consider logistics and funding associated with the existing state nursery capacity and ability to respond to increased seedling demand.

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-9. Improved Management and Restoration of Existing Stands

Mitigation Option Description

This policy seeks to increase forest carbon stocks through changes in management practices on existing forestland. In contrast to the companion policy AFW-6, this policy is not restricted to working through existing forest health programs to promote new practices that increase tree density, enhance forest growth rates, alter rotation times, or decrease the chances of biomass loss from fires, pests, and disease. In addition, increasing the transfer of biomass to long-term storage in wood products can increase net carbon sequestration, provided a proper balance is maintained where enough biomass remains on site as residues to serve as nutrient inputs to the forest. Practices may include management of rotation length, biomass density, biomass energy use, and sustainable use of wood products.

Mitigation Option Design

- **Goals:** Initiate programs to increase forest productivity on 1 million acres of private and state forest lands by 2020.
- **Timing:** Accelerate private forest landowner education programs by 2010; Implement forest improvement projects on 77,000 acres of state and private forest lands per year.
- **Coverage of parties:** Montana Department of Natural Resources, Montana Fish, Wildlife, and Parks, USDA Forest Service, USDA Natural Resources Conservation Service; Bureau of Land Management, Bureau of Indian Affairs and Tribal Governments, county governments and other political subdivisions of the state, private non-profit land trusts, non-profit organizations.
- **Other:** A 2001 study (Fiedler et al.) estimated that 7.5 million acres of Montana's forestlands should be considered for treatment because they are in the moderate or high fire hazard condition in short-term fire-adapted ecosystems. Treating these stands would reduce fire hazard potential, improve forest health and diversity, and restore stand conditions. In 2005, over 1.2 million acres of Montana's forestlands (all ownerships) were impacted by insect and diseases.

Implementation Mechanisms

- **Voluntary / Negotiated Agreements:** Provide landowners and/or corporations with opportunity to enter into agreements to better utilize biomass energy and/or increase the productivity of carbon sequestered on the landscape.
- **Information and Education/ Research and Development:** Development of a carbon sequestration assessment program that would assess and assign carbon sequestration

value to the state's natural, working agricultural, as well as to rangelands and grasslands. This carbon sequestration program could support a variety of GHG reduction policies. The reporting mechanism would enable reporting from the agricultural and forestry sectors, widening market participation in a carbon restricted economy. Increase private forest landowner forest stewardship education workshops and incorporate GFG reduction education and strategies into its curriculum. Provide GHG information and education to Montana urban forest managers to increase carbon sequestration in urban forests..

- **Technical Assistance:** Public education and outreach to land owners regarding existing federal and state programs. Continue DNRC Service Forester assistance to non-industrial private forest landowners, targeting stewardship program graduates with current Stewardship Management Plans and private land management efforts such as The Blackfoot Challenge. Continue Urban Forestry Program of technical assistance to communities with focus on carbon sequestration.
- **Funding Mechanisms and or Incentives:** Timber management focused on stagnant, overstocked, overaged, or debilitated stands of trees would provide increased carbon sequestration. Incentives for this management would be ecologically improved forestlands and through the sale of the harvested logs enough earnings to, at a minimum, pay for the cost of the work. Enhancement of incentives for placement of no-development easements on private land through existing or future programs. Possibly through establishment of limited-term carbon sequestration leases whose cost is linked to the "carbon sink" value of natural lands.
- **Establishment of an "Agricultural/Conservation Land Reserve":** This would establish a pool of permanently protected forest, agricultural or other conserved lands. Owners of natural/agricultural land would be provided with tax incentives to join the reserve. Forestlands managed to provide improved carbon sequestration would be described as natural.
- **Enhancement of the Existing Programs:** This would allow purchase and trade of development rights between high density and low density areas to conserve open space, agricultural land and forest land on the margins of growing urban areas. Also, provide increased guidance and expertise to forestland owners to promote the implementation of proper forest management. DNRC currently has Urban, Non-industrial private forest landowner and forest health programs which provide, at no cost to landowners and urban forest managers, information/education, technical and, when available, financial assistance.

These programs are predominately federally funded through USDA Forest Service State and Private Forestry and the Farm Bill. These programs are targeted for significant reduction in the Presidents 2008 budget proposal. Continuation of these federal programs through State efforts in Washington DC and program enhancement through State of

Montana legislative and fiscal support for these program with a new focus on GHG reduction and carbon sequestration strategies.

- **Hazard Identification:** Identify areas of high hazard within the wildland-urban interface and other high-risk areas (high fire hazard, severe overstocking, insect & disease attacks, etc) to target for accelerated treatments to improve stand conditions, which will also result in improved stand productivity.
- **Improve Inventory:** Collect stand data on 10% of forest stands on state trust lands within 10 years. Educate private non-industrial landowners to do the same.
- **Increase Forest Productivity:** On state trust lands, increase forest productivity on 15,000 to 20,000 acres per year through active forest management.
- **Sustained Yield Calculation:** Consider statewide coarse filter sustained yield calculation across all land ownerships.

Related Policies/Programs in Place

- **Fire Risk and Forest Health Initiatives:** Current fire risk and forest health initiatives directed towards density reduction include the multi-agency National Fire Plan and the Western Governor's Association 10-year Comprehensive Strategy for Implementation of the National Fire Plan.
- **Cost-Share Assistance Programs:** Cost-share assistance for fuels treatment on private lands is provided through Community Protection Fuels Mitigation Grant Program and Western Wildland Urban Interface Grant Program.
- **DNRC Forest Management Objectives:** On state trust lands the DNRC forest management objectives through the State Forest Land Management Plan and the current Administrative Rules are to move stands towards desired future conditions that are based on historical cover type distributions.
- **DNRC Forest Management Goals:** More specific goals for state lands include thinning overstocked stands, reducing fire hazard, and managing for forest health and biodiversity.
- **Department of Environmental Quality (DEQ) Open Burning Program:** The Montana / Idaho State Airshed Group was formed in 1978 order to minimize or prevent the accumulation of smoke from prescribed fire to protect state and federal air quality standards and visibility in federal Class I areas. This is accomplished, in part, through DEQ restricting open burning when atmospheric dispersion is not acceptable.

The state of Montana has open burning regulations under ARM 17.8.601 et. seq. DEQ annually issues permits to major open burners allowing them to burn under the open

burning regulations. A major open burner is defined as any person, agency, institution, business, or industry conducting open burning that emits more than 500 tons of carbon monoxide or 50 tons of any other pollutant except hydrocarbons per calendar year.

Minor burners contribute emissions to airsheds - but pay no fees. Minor open burners are not required by DEQ to obtain an air quality open burning permit, but must follow other BACT procedures that include calling the smoke management hotline and obtaining a burning permit from their local forestry office.

- **DNRC Forestry Assistance Programs:** Maintain and improve the health of Montana’s forests, forested watersheds and the communities that depend on them. Tools include Information and Education, Technical Assistance and Financial Assistance.
 1. Forest Stewardship: Promote forest stewardship by assisting non-industrial forest landowners in acquiring personal knowledge about their forest resources and in developing and implementing a forest management plan for their property.
 2. Urban and Community Forestry: Provide Montana’s urban communities with assistance in establishing and maintaining healthy, productive and financially beneficial urban forestry programs and urban forests.
 3. Forest Pest Management: Provide non-industrial forest landowners, and others, assistance in the identification and management of forest insects and diseases.
 4. Conservation Seedling Nursery: Produce and distribute seedlings for conservation plantings to private landowners, state federal and tribal landowners and other conservation organizations.
 5. Biomass Utilization: Promoting the use of forest biomass as an energy source for heating schools and other public facilities.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW–10. Expanded Use of Wood Products for Building Materials

Mitigation Option Description

This policy seeks to enhance the use and lifetime of durable wood products. Durable products made from wood prolong the length of time forest carbon is stored and not emitted to the atmosphere. Following their useful life which could last for decades, wood products disposed of in landfills may store carbon for long periods under conditions that minimize decomposition. Additional GHG benefits can be achieved when methane gas is captured from landfills and used as an energy source (carbon originally stored in wood products becomes methane during decomposition). Increasing carbon stored in the wood products pool increases carbon sequestration from forests. This can be achieved through improvements in production efficiency, product substitution, expanded product lifetimes, and other practices. In addition, increasing the efficiency of the manufacturing lifecycle for wood products enhances greenhouse gas benefits.

Mitigation Option Design

- **Goals:** The CCAC recommends that Montana adopt programs to expand use of wood products 5% over current levels.
- **Timing:** Increase usage by 2% by 2010 and 5% by 2020, above current trends.
- **Coverage of parties:** Building material suppliers, wood product industries, recycled building materials sellers, etc. All state agencies lead through example.
- **Other:** As needed, identify incentives that encourage expanded usage of wood products for building. Such as giving state tax credits for the use of wood product in building “good sense” homes. Conduct an inventory of needs for durable wood product utilization in Montana.

Implementation Mechanisms

- **State Adopted Policies:** The state should adopt policies that require wood products in the construction and maintenance of all state buildings when those products are feasible and relatively close in price (within 5%) to the alternative.
- **Product Substitution:** Promote using wood products whenever and wherever feasible, instead of metal or synthetic building materials. Replacing petroleum thinners and solvents with those derived from wood and tree sap / pitch.
- **Tax Incentives:** Giving tax incentives for the development and production of new wood products and derivatives. Montana state tax credits for the use of wood product in building “good sense” homes.

- **Expanded Product Lifetimes:** Activities that expand lifetimes through preservatives – these can also be derived from wood.
- **New Products:** Developing wood as fuel, filler for organic composting, bedding for livestock, and creating grants or support for research and development of new products. The Montana University System would be an excellent vehicle for such research and development.
- **Voluntary / Negotiated Agreements:** Provide landowners and/or corporations with opportunity to enter into agreements to better utilize biomass energy and/or increase the productivity of carbon sequestered on the landscape.
- **Education / Outreach:** Develop information and education program to promote product substitution (using wood products whenever and wherever feasible, instead of metal or synthetic building materials) and the benefits gained through carbon sequestration.
- **Identify Incentives:** Encourage the expanded usage of wood products for building through non-tax incentives like low-cost, long-life, give-a-ways, etc.
- **Forest Residue Alternative Use:** Create incentives through low-interest loans or tax incentives to encourage alternative uses for forest residues. Alternative uses may include energy production and/or building materials.

Related Policies/Programs in Place

- **State Hazard Reduction Regulations:** State forest hazard reduction law and administrative rules require the reduction of timber slash during harvest projects. Although not required the current law and rules structure makes burning slash the most feasible method of reducing the hazard.
- **Forest Service:** USFS has recently implemented a policy to require contractors to haul and pile slash as landings to help facilitate removal of biomass during harvest operations.
- **DNRC Logging Contracts:** Slash treatment requirements are currently part of all DNRC logging contracts.
- **Timber Sale Process:** DNRC forestry bureau has changed the timber sale bid process for state trust lands to encourage the removal of pulp and biomass as a condition of the sale.

Types(s) of GHG Reductions

TBD.

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW–11. Programs to Promote Local Food & Fiber

Mitigation Option Description

Programs that promote the production, distribution and consumption of locally-grown food and fiber products reduce transportation and manufacturing emissions by offsetting the consumption of products with higher embodied energy. Food and fiber products consumed in the U.S. can travel thousands of miles before reaching a grocery or clothing store in the form of a final product (on average a typical food product travels 1,500 miles and changes hands 33 times). Increasing the percentage of locally grown food and fiber consumed in Montana will significantly reduce fossil fuel use and its associated GHG emissions.

Mitigation Option Design

- **Goals:** 30% of food consumed in Montana is grown, harvested and processed in Montana.
Fiber goal???
- **Timing:** For food, by 2010 20%, by 2020 30%
Timing for fiber???
- **Coverage of parties:** Promotion by MT Dept of Ag, Farm Bureau, Stock Growers, Montana Cattlemen's Association, Grow Montana, AERO, NCAT, sheep producers, wool growers, grain growers, etc.
Tracking by MT Dept of Ag.
- **Other:** Montana-based food systems are a realistic vision.
 - In 1950, 70% of the food Montanans ate was grown in Montana.
 - Through the 1930's, food processing was our state's number one employer.
 - In the spring of 2003, The University of Montana-Missoula responded to student demand by launching the Farm to College Program, purchasing safflower oil, beef, bread, dairy products, and fruits and vegetables from Montana producers. In the past two years, the program bought more than \$500,000 from in the state. In the same period, the University's overall food costs—as a percentage of its food service budget—decreased.
- Notes to reviewers: I'm suggesting a food goal based on historic information. In 1950, 70% of the food Montanans ate was grown in Montana. Today it is 15%. If we sourced 30% instead of 15% of our food in-state, an additional \$450 million would go directly to

our food producers and the associated carbon dioxide burned as a result of transportation of these products would be saved.

Implementation Mechanisms

TBD

Related Policies/Programs in Place

1. Grow Montana Program <http://growmontana.ncat.org/> . Goal is strengthening our food and agricultural economy. **Grow Montana** is a broad-based coalition whose **COMMON PURPOSE** is: To promote community economic development policies that support sustainable Montana-owned food production, processing, and distribution, and that improve all of our citizens' access to Montana foods.

2. 2005 State Legislature passed:
Legislation to authorize the Montana Department of Livestock to inspect mobile meat slaughter units. By harvesting animals on-farm in an inspected mobile unit, farmers and ranchers can sell meat at any Montana retail, restaurant or direct market. [Read bill text.](#)

3. Introduced in the 2007 State Legislature
SB 328 Montana Food to Institutions: Optional Procurement Exception by Sen Donald Steinbeisser (R-Sidney) allows institutions to buy Montana grown or processed food, even if it costs a little more.

4. **The UM Farm to College Program** <http://ordway.umt.edu/SA/UDS/index.cfm/page/917>
University Dining Services and four UM graduate students teamed-up in the spring of 2003 to create the UM Farm to College Program, dedicated to buying more food locally and regionally to feed the campus community.

5. Agriculture Marketing & Business Development Bureau, Montana Department of Agriculture promotes local Farmers Markets

<http://www.agr.state.mt.us/business/farmersMkts06.pdf>

6. *Abundant Montana*, AERO's Directory to Sustainably Grown Montana Food. Over 80 sustainable farms, ranches, and retailers are listed by region and by farm name, in the 5 th edition of *Abundant Montana*, available in the fall, 2005. Products range from fruits and vegetables to processed foods, to meat products and grains. The directory gives consumers who value sustainability and community the means to express their values through their food purchases while supporting the growers, processors and retailers who share their values.

<http://www.aeromt.org/publications.php>

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

AFW-12. Enhanced Solid Waste Recovery & Recycling

Mitigation Option Description

Programs are needed to increase the quantity of materials recovered for recycling with specific attention given to materials with the greatest ability to reduce energy consumption during the manufacturing process and to materials that may be used as a fuel source (e.g., clean wood waste). Reducing the quantity of materials being landfilled reduces future landfill methane emissions potential, while recycling reduces emissions associated with the manufacturing of products from raw materials.

Mitigation Option Design

- **Goals:** Increase Montana solid waste recycling rates to 17% by 2008, 19% by 2011, 22% by 2015, (targets from the Montana Integrated Waste Management Plan) and 25% by 2020 using a variety of methods including source reduction, reuse, recycling and composting.
- **Timing:** see above.
- **Coverage of parties:** DEQ, MACO, MSU Extension, local governments, other landfill operators (private), recycling firms.
- **Other:**

Implementation Mechanisms

Educational outreach.

Local market development for recycled materials.

Encourage inter-county cooperation using the Headwaters Recycling model.

Increased recycling of waste wood to composting and biomass energy.

Develop better tracking methods for recycling volumes.

Encourage integration of waste-to-energy in sewage treatment plant upgrades.

Encourage composting of biosolids over landfilling.

Encourage Montana landfills to participate in the EPA Methane Outreach Program.

Related Policies/Programs in Place

Montana Integrated Waste Management Act and Plan.

No cost licenses from DEQ for small composters, recyclers, and small biodiesel producers.

Tax credit for purchase of recycling equipment.

Tax deduction for purchase of recycled products.

Types(s) of GHG Reductions

TBD

Estimated GHG Savings and Costs per MtCO₂e

TBD

- **Data Sources:** TBD
- **Quantification Methods:** TBD
- **Key Assumptions:** TBD

Key Uncertainties

TBD

Additional Benefits and Costs

TBD

Feasibility Issues

TBD

Status of Group Approval

TBD

Level of Group Support

TBD

Barriers to Consensus

TBD

