

Comprehensive Description of Proposed Priority Options

Agriculture, Forestry, and Waste Management Technical Working Group

All of these have been approved by the Mitigation Working Group with the exception of AFW 11 Soil Carbon Management, which will be integrated into other relevant options. (10-26-07)

AFW 1 – Expanded Use of Forest and Farm Feedstocks and Bi-Products for Energy Production

Increase the utilization of biomass from forest and farm feedstocks and from farm bi-products for generating electricity and heat thereby displacing the use of fossil energy sources. Local electricity or steam production yields greatest net energy payoff.

All sources will be considered and implementation strategies will ensure the sustainability of supply.

Reduce the amount of methane emissions from livestock manure by installing manure digesters and energy recovery projects on livestock operations. Energy from the manure digesters is used to create heat or power, which offsets fossil fuel-based energy production and the associated Greenhouse Gas (GHG) emissions.

MWG Comments:

Reference – DNR’s Maryland Power Plant Research Program (use of biomass specifically) – This is the report that has already been circulated from Dr. Sherwell.

Consider how this may fit in with the Renewable Portfolio Standard.

Consider New Source Review effects on proposed actions.

Discussion:

- *There are currently a few small biomass plants in operation in MD. There is interest and efforts to establish more facilities are apparent. Collectives may be useful.*
- *Consider chicken litter and other ag waste in total biomass available for energy production.*
- *Include urban tree management in feedstock stream.*
- *There are no digesters in MD yet as they are too expensive to install in individual small to medium operations (less than 1000 head). Frederick County MD investigated possibility since digesters are installed in PA (Mason-Dixon). State law and grant programs may not yet allow cooperatives to form to spread costs and benefits. MD farmers would adopt this technology if economically feasible to install, either cooperatively or individually.*
- *MCCC Action Plan could remove roadblocks to collectives installing community digesters and help with costs.*
- *Sawmills – unaware of too many opportunities to better utilize residues – robust market for residues (sawdust into poultry litter or animal bedding; shavings go to bedding; mulch from bark; high quality wood chips sought after by the paper industry in and out of state). These waste uses would compete with energy market but conversely energy markets could prop up residue market.*

- *Combined heat and power create better economies of scale than straight heat.*
- *Net metering law could be made more favorable for electricity generated by wood.*
- *Include other wood residues from pallet recovery, yard wastes, arbor care wastes from urban and rural areas and other wood wastes brought to recycling centers. Support development of energy markets for low-grade wood wastes.*
- *Currently there is no official Fuels for Schools sort of program.*

Recent Actions in MD: Renewable Portfolio Standard requires that 9.5% of all electricity be from renewable sources by 2022. Biomass, solar and wind are in Tier 1. Renewable Electricity Production credit (need more information). Many proposals to use biomass as fuels for energy are beginning to surface. FiberShore is an example of one that proposes to use chicken manure and forest residue for power production.

Clean Energy Incentive Act includes incentives for methane use in heat and electricity production. Quite a few sawmills are converting waste to energy.

There is only one paper mill in the state. They do capture a lot of waste and are looking at even more focused on energy production.

A MD State prison (8th largest in its class) uses 100% wood power for steam, heat, energy.

Not including logging residue, just wood that shows up at recycling centers is estimated at about 300m to 900m tons annually. A significant amount of energy savings could be had by processing these wastes for energy.

AFW 2 - In-State Liquid Biofuels Production

Increase production of ethanol and/or biodiesel fuel from agriculture and/or forestry feedstocks and/or municipal solid and other waste (raw materials) to displace the use of fossil fuels.

Promote the development of cellulosic ethanol technologies and ethanol production systems that use renewable fuels to improve the embedded energy content of ethanol. Increased production and consumption in state give the highest benefits.

Favor the use of non-food source starches in ethanol production and monitor to ensure the sustainability of feedstocks and soil health. Mitigate any increased fertilizer application and run off through proper application rates, best practices, and nutrient trading.

Provide financial incentive to research the production of bio-oils from algae grown in wastewater effluents (would also reduce carbon, nitrogen and phosphorus).

MWG Comments:

References – Chesapeake Bay Commission, Renewable Alternative Fuels Taskforce

Include animal fats, used vegetable oil, etc.

Coordinate with TLU TWG

Underscore sustainability of feedstocks, as well as the ancillary impacts and consequences of using food starches for ethanol

Discussion:

- *Note that corn and other agriculture products have different costs than forestry or municipal solid wastes in ethanol production. Forestry feedstock show excellent potential for cellulosic ethanol, but group knows of only one possible plant in the Midwest.*
- *The belief that using corn as feedstock will cause massive crop conversion in MD appears incorrect. MD only planted 10 -12% more corn in recent years.*
- *Converting active cropland to switchgrass is problematic as most farmers economically require three crops through the year: corn, soybeans, winter grain cover crop. Changing to single crop, especially perennial, could be an economic hardship.*
- *Cellulosic ethanol production from agriculture products will be challenging but perhaps feasible with leftover corn stock or winter grain cover crop. The technology is evolving.*
- *Ethanol and biofuels are planned in Norfolk, VA and DE. Cellulosic ethanol plants are being started in Montana and the Midwest.*
- *One practice that shows promise is fractionation of black liquor (from paper mills) which can be refined into valuable products using a thermo-chemical process.*
- *The Renewable Fuels Incentive Act prescribes incentives for the use of biomass to produce ethanol and biodiesel. Currently forestry biomass has a 5 cents per ton incentive while small grains has a 20 cents per ton pay back. These should be equalized.*

Recent Actions in MD: *Renewable Fuels Initiative Act provides incentives for biofuels produced by small grain, soybean and other agricultural products. There are caps in place: ethanol - 15mm gallons with 10mm being distilled from small grains; biodiesel – 5mm gals. with 2.0mm from soybeans. Farmers have option of investing in biodiesel plants. The Incentive program ends in 2017.*

There is a Renewable Fuels Taskforce at the state level.

Maryland Grain Producers are trying to build an ethanol plant in MD – on-going for 10 years. There is a biodiesel production facility on the lower shore in MD.

Old Dominion University in VA is currently studying bio-oils in algae.

AFW 3 - Nutrient Trading with Carbon Benefits *EARLY ACTION ITEM*

Nutrient trading is a flexible and cost-effective means to achieve water quality improvements while also providing significant carbon benefits. Nutrient trading is the transfer of credits created through nutrient reduction, specifically nitrogen and phosphorus. For example, buyers who need to apply or release more nutrients than currently permitted under their state-regulated nutrient management plan could obtain credits from sellers who have produced excess nutrient credits from under-utilizing their allowed nutrient limits. Opportunities extend beyond agriculture to wastewater treatment plants, industrial dischargers, highway contractors and developers.

Besides creating economic benefits, nutrient trading encourages improved efficiency of fertilizer use and other nitrogen-based soil amendments through best management practices and advanced

technologies. Advanced technologies such as GPS and GreenSeeker can assist in precision application of nitrogen on crops.

Many of the best management practices that would be incentivized under the nutrient trading program would also result in significant greenhouse gas reductions, such as no-till, conservation tillage, improved irrigation management, conservation buffers, grassland plantings, green infrastructure, afforestation, reforestation and restoration of wetlands.

Nutrient trading, particularly trading between point sources (such as waste water treatment plants) and non-point sources (such as agricultural operations), provides the opportunity to create significant carbon sequestration benefits in Maryland.

Note: Excess nitrogen not metabolized by plants can leach into groundwater and/or be emitted to the atmosphere as N₂O which has 310 times the effect as one unit of CO₂. Better nutrient utilization can lead to lower nitrous oxide emissions from run-off.

MWG Comments:

State that it's voluntary

Retain as Early Action Item.

Notes:

Nutrient trading, particularly trading between point sources (such as waste water treatment plants) and non-point sources (such as agricultural operations), provides the opportunity to create significant carbon sequestration benefits in Maryland. The Chesapeake Bay Program adopted Water Quality Trading Guidelines for the Bay in 2002. Currently, Pennsylvania has adopted guidance and Virginia has enacted legislation that authorizes point/non-point water quality trading. Maryland has been working on adopting regulations/policy by late Fall 2007/early Spring 2008 and there exists an opportunity to boost this effort.

Many of the best management practices that would be incentivized under the nutrient trading program would also result in significant greenhouse gas reductions, such as no-till, conservation tillage, improved irrigation management, conservation buffers, grassland plantings, green infrastructure, afforestation, reforestation and restoration of wetlands. This early action item presents a unique near-term opportunity to provide both nutrient and carbon benefits and to build on existing efforts in the Bay since 2002.

MDE is the State agency with the lead on developing a nutrient trading program involving point sources in Maryland. Ed Stone (an MDE advisor to the TWG) is of the lead MDE contacts. MDE is close to releasing a public policy regarding Phase I of the approach in which the overall framework for point and nonpoint source trading is established. Phase I will also include specifics regarding point source trades with other point sources and with on site disposal systems. Maryland Department of Agriculture is working with MDE to develop the non-point source trading aspects of the policy to be released as Phase II of the policy.

Some actions may be prescriptive in nature while others are outcome-based.

The TWG noted that there may be some cross over and synergies with carbon trading which is

being considered by the cross cutting TWG. The AFW TWG proposes that both carbon and nutrient trading could be considered in parallel.

Discussion:

- *Nutrients in the form of fertilizers and soil amendments can release nitrogen into the soil, surface water and groundwater when application rates are too high or rain or irrigation washes the nutrients away before full uptake occurs. That nitrogen is then oxidized and released as N₂O (nitrous oxide), a greenhouse gas with a carbon equivalent of 310, meaning each unit of N₂O has the same effect on the atmosphere of 310 units of carbon dioxide (CO₂).*
- *Green Seeker NDVI technology. A farmer applies 50 to 70% of his nitrogen at planting and then in season uses the Green Seeker to apply what the corn or wheat plant needs when it is growing. A more efficient way of applying nitrogen and will result in less nitrogen being over applied. This is a new technology that is still in its early testing stages, but looks to be promising. <http://www.ntechindustries.com/greenseeker-RT200.html>.*
- *Auto swath technology, using GPS to automatically turn the spray boom sections on or off when coming to an area of the field that has been sprayed or needs to be sprayed. This can be used for planting, fertilizing, etc. On odd shaped fields it can be a 3-5% savings: http://www.agleader.com/products.php?Product=directcommand_l.*
- *Variable rate fertilizing and liming is also becoming more popular among Maryland farmers. The farmer has a local Co-op grid sample the field and then variable rate applies the fertilizer or lime as need in the areas of the field that need it. The areas of the field that do not need the fertilizer or lime have none applied on them. This can be as much as 50 to 60% reduction in the amount of lime or fertilizer needed. http://www.agleader.com/products.php?Product=directcommand_g.*
- *Pounds per acre is a measurement of nutrient trading amount and could be determined using look-up tables or on the ground measurements.*
- *There are notable ancillary benefits and synergies from such a system.*
- *Nutrient Management Plans require a minimum level of actions. There are many more that could be done in addition (such as Best Management Practices [BMP's] construction of wetlands, larger buffers along streams.*
- *MWG supports nutrient trading and would like to see it as a priority. Trading entities could include point source as well as more general non-point sources. Include more marketable goals such as water quality.*
- *Examine Farm Bill 2007 for possible tie-ins.*

Recent Actions in MD: *The Maryland Nutrient Management Act of 1998 contains a regulatory enforcement program. A Nutrient Management Plan is required. The Natural Resources Conservation Service (NRCS) and the MD Department of Agriculture are already looking at options for nutrient trading (Phase 2) related to nonpoint sources and expect to have a recommendation this fall.*

The Department of Environment has been working on a Nutrient Trading System since 2001, the Phase 1 (point source) framework is well on its way to completion.

Some farmers are using GPS technologies but no one is aware to what extent.

AFW 4 - Protection and Conservation of Agricultural Land, Coastal Wetlands and Forested Land

Reduce the rate at which agricultural lands are converted to developed uses, while protecting private property rights and responsibilities. This retains the above- and below-ground carbon on these lands, as well as the carbon sequestration potential of these lands. Transportation emissions will be reduced indirectly through more efficient development and lower vehicle use.

Agricultural land conversion may be prevented through conservation land grants and conservation easements facilitated through non-profit land preservation organizations.

Reduce the rate at which existing forests are cleared and converted to developed uses. Much of the carbon stored in forest biomass and soils can be lost as a result of such a land use conversion.

Reverse the rate at which coastlines and associated wetlands are converted to developed uses. Coastal wet zones provide the highest levels of carbon sequestration of land types in Maryland.

Examine tax policy for obstacles and deterrents to protection of lands, or ones that incentivize development. Consider transfer tax for conversion of agriculture, forests lands or coastal wetlands to other uses.

An ancillary benefit is that conservation programs allow for better planning and smart growth vs. sprawl by channeling development, interspersed with open space.

MWG Comments:

Tie in with TLU

There are significant tax policies in place already, make sure they are working.

Discussion:

- *Forests are significant part of the Maryland landscape, yet the state is losing forest cover at a rate of nearly 800 acres a month (100 acres/day in Chesapeake Bay watershed).*
- *Maryland's active program in conservation easements as implemented and planned may not require enhancing but there is a need to prioritize investments of available funds. Initiatives like the Chesapeake Bay Program will result in protection of roughly 250,000 acre of open space. The interim target is 100,000 acres.*
- *The Regional Greenhouse Gas Initiative (RGGI) has a related offset under consideration: sequestration of carbon due to salt marsh restoration and conservation. Maryland could create a similar model and garner offset credits.*
- *There is a need to develop or find existing data on GHG values lost due to development of forests and farmlands so efficacy of open space retention in relationship to emissions can be determined.*

Recent Actions in MD: MD has a many diverse open space initiatives (three major and six smaller programs) which have received a lot of public attention and support. Over \$200 million a year is spent in land/open space conservation. MD state government also has established a Cabinet level position to track the state implementation and progress on Chesapeake Bay plans.

AFW 5 - Afforestation, Reforestation and Restoration of Forests and Wetlands

Establish forests on land that has not, in recent history, been forested (e.g., agricultural land) (“afforestation”) where current beneficial practices are not displaced. Promote forest cover and associated carbon stocks by regenerating or establishing forests in areas with little or no present forest cover (“reforestation”). In addition, implement practices such as soil preparation, erosion control, and supplemental planting to ensure conditions that support forest growth. Identify areas, including coastal wetlands, that are in need of physical intervention to return the habitats to full vigor. Additional areas of concern are linking islands of fragmented forests to restore function, recovering severely disturbed lands such as strip mines, and reversing the effects of continued toxicity on productivity.

Discussion:

- *Rules about how, what, and where to plant will govern costs.*
- *Consider adding a time frame, such as immediate or sequestration of carbon for next 60 years.*
- *Beyond requiring a certain amount of planting, many aspects of the programs mentioned below are voluntary. Reporting and monitoring can be done more efficiently and consistently. The State needs stronger enforcement and monitoring, with stronger incentives.*
- *Expand programs to any tree planting effort where increasing forested acres, including urban areas.*

Recent Actions in MD: MD utilizes the Forest Conservation Act, which requires replacing lost forest land due to new development Mitigation strategies are required. There are additionally about three dozen laws or programs that support reforestation.

RGGI has an Afforestation offset model rule. State has taken this RGGI model rule and is shaping a MD specific rule (see www.rggi.org under Offset Rules).

AFW 6 – Mitigation of Forest Loss Due to Insects, Disease, Pests and Invasive Species

Programs that reduce damage from insects and disease, and reduce pressures by pests and invasive species on forests also reduce GHG emissions by maintaining the carbon sequestration achieved in healthy forests. Some native species, such as white tail deer, due to overpopulation, undermine reforestation efforts, and therefore sustainability, due to excessive browsing.

MWG Comments:

Agree with the severity and keeping this separate from forest management.

Discussion:

The biggest problems are invasives and pest management. MD is losing many trees through insects and disease like the emerald ash borers. Other insects, like the gypsy moth, are under more control. Non-natives invasive plant species driving natives out of their habitat is a strong concern. Native and non-native species both can be considered invasive.

AFW 7 – Forest Management for Enhanced Carbon Sequestration - ~~EARLY ACTION ITEM~~

There is a need to ensure long-term health and productivity of forests because of their ability to sequester carbon, along with ancillary benefits. This option is designed to enhance greenhouse gas sequestration in two ways: first, through increasing the rate of carbon dioxide (CO₂) sequestration in forest biomass through healthier forests, and secondly, through increasing the amount of carbon stored in harvested, durable wood products.

Practices may include: supplemental planting on poorly stocked lands, age extension of managed stands, thinning and density management, fertilization and wood waste recycling, expanding short rotation woody crops (for fiber and energy), expanded use of genetically preferred species, modified biomass removal practices, and/or fire management and risk reduction.

MWG Comments:

This is too complex to be an Early Action Item?

However, it appears that Forest Conservation Act is going to be revised in the current legislation. If that's the case, information will be forwarded as it is developed to assist in the highlighting of carbon emission related forest management opportunities.

Discussion on efficacy of fee-in-lieu. National Academy of Science has questioned their value. Some concern that it releases people from all responsibility simply by writing a check – that often does not come anywhere close to protecting or replacing the values lost.

Include economic discussion where applicable, including incentives and costs.

Discussion:

- *Facilitate foresters applying their skills and reaching out to land owners to help them through adequate funding and policies that support appropriate forest management.*
- *Encourage developers to focus mitigation on large tracts of forests such as an acre-for-acre exchange for forests lost rather than simply protection of small randomly distributed patches of forests. This would only require changing the order of priorities in the existing regulations. Counties can do the same at the local level.*
- *MD needs funding strategies for identification of best practices and highest priority locations for action.*

Early Action (Fast Track) Opportunities:

The TWG identified four possible areas where policies could be quickly amended to improve forest management practices in Maryland with limited controversy or legislative maneuvering.

1. *Assist in connecting forest management products to markets to provide financial incentives for improved forest management practices. Examples include:*
 - *Carbon trading (being considered by the Cross-Cutting TWG)*
 - *Facilitating markets for biomass utilization for energy.*

- *Storm-water run-off reduction credits*
 - *Encouraging value-add production using under-utilized small diameter and wood residues.*
2. *Provide land developers with best management practices and options to maintain forest land tracts. A DNR adaptation work group is looking into a similar issue.*
 3. *Fee-in-lieu programs that allow for developers pay for conversion of forest lands to development rather than set-aside forests lands within their development. Counties, which administer most of such transactions, are limited to investing in the planting stock for reforestation on existing public lands. The actual higher priority for these funds is to purchase, either through easements or fee simple purchase, additional lands for reforestation. This situation discourages counties from meaningful contributions to reforestation, lacking high quality lands for planting. Of highest priority should be lands that can connect existing islands of forest or expand the biodiversity of forest lands by expanding contiguous habitats. (Note: Fees from penalties for development violations can be used for land or easement acquisition.)*

Another option is to move unspent, excess fee-in-lieu funds into State coffers (as a grant) for distribution to areas of higher need and available reforestation opportunities or for urban forestry enhancement. No net loss of forests remains an underlying goal. Some counties already have such policies and the MD Department of Natural Resources is (or has recently) instituted a similar policy.

Another option is to increase the scope and strength of the existing Forest Conservation Law as natural regeneration is not meeting the forest lands goals as browsing by deer and competition from invasive species is suppressing the spread and vigor of existing forests.

Recent Actions in MD:

The Bay Bank – a management group that oversees forest practices - is up for funding to procure baseline data on policy drivers for mitigation management in MD law. Gary Allen has more information he will share with the group.

AFW 8 – Managing Urban Trees and Forests for Greenhouse Gas Benefits

Maintain and improve the health and longevity of trees in urban and residential areas primarily to avoid emissions and secondarily to protect and enhance the carbon stored in tree biomass. Indirect emissions avoidance occurs by reducing heating and cooling needs as a result of planting shade trees. Also, urban trees contribute to lower summertime temperatures in urban areas and reduce the production of ground-level ozone and the evaporation and volatilization of organic compounds from vehicles.

Fully utilize wood recovered from urban trees for value-added products for long-term carbon storage and energy production.

Discussion:

- *Urban tree canopy (UTC) goals are encouraged and supported as part of voluntary bundle in the State Improvement Plan. Some communities have goals adopted already. Percent coverage of street tree canopy guidelines have been developed by American Forests by development density and type.*
- *Promoting related policies, such as stormwater regs (using natural catchment and vegetative filtration systems) should also help. Plantings should specifically target shading actual surfaces that hold heat.*
- *Encourage investment in street tree planting.*
- *VOC's are a component of ozone stipulations in the State Implementation Plan for Air Quality Improvement, under Clean Air Act (SIP).*
- *RGGI Urban tree canopy carbon offsets under consideration.*
- *Certain tree species are encouraged for planting but size and longevity seem to be more important factors than emissions levels from different species.*

Additional Thoughts from an Arborist:

1. Though urban forests do sequester carbon, they provide a greater benefit via avoidance than via sequestration. In a recent study we conducted in Hyattsville, the dollar value of emissions avoidance provided by the city's street trees was more than 5 times that provided by sequestration. We found similar results in analysis of data from Baltimore and for the city of Boston. Many scientists prefer avoidance to sequestration as the best option is to avoid the emission in the first place rather than to emit it and later capture it. Because rural forests are not normally proximate to improvements, urban forests present a much better opportunity for avoidance than other forests.

2. One major issue with using trees (rural or urban) in the GHG strategy in Maryland is our very high land values; which in much of the state pose a disincentive to tying up the expensive land for a fairly modest offset credit. A benefit of urban forests is that they allow improvements to exist under the trees and take the land value issue out of the equation. When you can simply take the cost of planting and managing a tree and relate it to the benefit of sequestration + avoidance, you are much closer to an economically feasible arrangement.

*Contact: Michael F. Galvin, Arborist & Supervisor, Urban & Community Forestry
Maryland DNR-Forest Service 410-260-8507*

Recent Actions in MD: *MD is required to complete a State Improvement Plan with ozone stipulations due next year. In 2007, use of urban forestry for ozone mitigation was a new voluntary measure – a first for a state. Baltimore and Washington Metro have an Air Quality Plan that covers 3,200 square miles.*

More than 40 laws in MD cover the planting of trees – some are applicable to urban areas. Add vegetative plantings in median strips along highways? Local streets and state highways have some regulation. Grasses or other fast growing species that sequester carbon – low maintenance so as not to encourage expenditures of carbon. Failure to implement existing laws

or lack of direction? Further research from DOT required. Other issues, such as safety, are considerations.

AFW 9 - “Buy Local” Programs for Sustainable Agriculture, Wood and Wood Products

Promote the production and consumption of locally produced agricultural goods, which displace the consumption of those transported from other states or countries. GHG reductions occur from reduced transportation-related emissions.

Using local wood for construction, furniture or other value-added wood products will enhance local economies while reducing carbon emissions by lowering transportation distances and sequestering carbon in those products.

The use of wood products displaces GHG emissions associated with processing high-energy input materials such as steel, plastic and concrete.

Discussion:

Maryland has been a LEED (rating system for green building) leader, but hasn't been given credit for wood products, especially local woods as contributing to energy efficiency and carbon emission reductions. This is an issue in several states. TWG needs to put removing that obstacle into Policy Implementation design. MWG is aware of this problem and supports resolution.

Encourage the creation of value-added products from local woods in lieu of shipping raw materials.

Ensure that wood is harvested sustainably and the products are produced sustainably.

Recent Actions in MD: MD Dept of Ag revitalized and is actively promoting a Buy Local program.

AFW 10 – Waste Management through Source Reduction & Advanced Recycling

Reduce the volume of waste from residential, commercial, and government sectors through programs that reduce the generation of wastes and enhance reuse of product components, manufacturer's lifetime product responsibility. Reduction of generation at the source reduces both landfill emissions as well as upstream production emissions. Increase recycling and reduce waste generation in order to limit greenhouse gas emissions associated with the production of raw materials.

Reduce methane emissions associated with landfilling by reducing and recycling the biodegradable fraction of waste emplaced.

Increase recycling programs, create new recycling programs, provide incentives for the recycling of construction materials, develop markets for recycled materials, and increase average participation/recovery rates for all existing recycling programs to enhance and encourage upcycling (where the remanufactured product is equal to or higher in quality than the original product).

Electronics recycling and recovery of industrial gases from foam products are included.

Discussion:

Quantification of carbon emissions of associated transportation of solid waste may be a useful figure.

Recently, an area of focus in the solid waste industry has been in increase recycling of organic wastes (lawn & garden waste, food waste, wood, paper, etc.) using different conversion technologies, including composting, anaerobic digestion, or hybrids of these technologies. These tend to be problematic and can have negative impacts not only in smell but in groundwater pollution.

The European Union has WEEE (Waste Electronic and Electrical Equipment) Directive. Manufacturers of all electronic and electrical equipment sold in Europe are required to take back all products when no longer useful or desired by the purchaser. This encourages interchangeable, reusable parts; elimination of toxins and heavy metals; and maximum recycling, significantly reducing waste.

Recent Actions in MD: No cradle-to-cradle programs in place but MDE does have an aggressive e-cycling program.

AFW 11 – Soil Carbon Management (?)

MWG Comments:

Agree that this one can be incorporated into other existing policy options. Do find ways to describe successes and accomplishments to date.

Note: MD is the national leader in no-till agriculture (95% no-till) and winter cover crop planting. Funding is available at the state level to assist. The TWG is unsure what additional steps could be taken to significantly increase sequestration already occurring that are not covered in the policy options above (See AFW 3, 4 and 5).

The amount of carbon stored in the soil can be increased by the adoption of practices such as conservation and no till cultivation. Reducing summer fallow and increasing winter cover crops are complimentary practices that reduce the need for conventional tillage. In addition, the application of biochar (i.e., charcoal) may also increase soil carbon content and stabilize soil carbon. By reducing mechanical soil disturbance, these practices reduce the oxidation of soil carbon compounds and allow more stable aggregates to form. Other benefits include reduced wind and water erosion, reduced fuel consumption, and improved wildlife habitat.

Discussion:

Disking does occur, leaving stubble in situ but not deep tillage, except occasionally every 5 years. The Amish community operates under the same requirements of the Nutrient Management Act and tillage regulations. Incorporating manure is a best nutrient use.

It will be important to ascertain if this action is effective and determine if there are better ways to accomplish carbon sequestration in soils.

MWG General Comments:

Climate change impacts should be considered in all aspects of policy and legislation.

Research and development component is very important in all TWG/sectors.

Think ahead – even if it seems unfeasible at this time.